Lenition of voiced fricatives in Icelandic: Interplay of stress and style

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Voiced fricatives in Icelandic can reduce and even delete in connected speech (Helgason 1993), e.g. in careful pronunciation, *nefnilega* 'namely' is pronounced [nɛpnilɛɣa], but reduces to [nɛpnilɛa] in "normal" speech or even [nɛplɛa] (Árnason 2011:293). Deletion can thus lead to further reduction. Some contracted pronunciations have arguably been lexicalized, e.g. [nɛpla] for *nefnilega,* spelled *nebbla* in informal writing. To date, no experimental research has been done on this topic. This paper reports the results of an articulatory study done on the voiced fricatives [ð] and [ɣ] intervocalically. The results show that **(I)** lenition appears as gestural undershoot, with relevant articulators not reaching their target position to a varying degree, including the gesture fully deleting. **(II)** Lenition occurs both in clear and casual speech but is more pervasive in the latter. **(III)** There is less lenition following a stressed syllable.

Method: Acoustic and articulatory (EMA) data were collected from 4 native Icelandic speakers around the age of 30 (3F; 1M). Target segments appeared in two vowel environments and three stress conditions; an onset (1) following a stress initial syllable (long/heavy vowel), (2) following an unstressed syllable (short/light vowel), and (3) for [ɣ], following a syllable with secondary stress, 19 stimuli total (Table 1). Target words were produced in a carrier phrase. Participants alternated blocks where they were instructed to speak either clearly/formally or casually/ informally, a total of 24 blocks for each speaker. Two speakers did not always show expected lenition; one would reduce the carrier phrase but not the target word and the other claimed to not know the difference between formal and casual speech when receiving instructions. Data were hand-segmented in Praat, when the acoustic signal showed no indication of the target, it was labeled in an estimated location. Kinematic landmarking was done based on the acoustic segmentation. For the [ɣ], information on the vertical movement of the tongue body (TB) was gathered, and for [ð] the vertical movement of the tongue tip (TT). Values of maximum velocity associated with TB and TT gesture were extracted as well as preceding minimum and following maximum and the gestural onset and target.

Results: Preliminary results show that both style and stress/syllable position affect lenition. There is both inter- and intraspeaker variation with some speakers showing a near categorical difference between clear and casual speech, see Figure 1 for an example comparing SP1 and SP4. SP1 shows a clear difference between clear and casual speech with the latter either showing a reduced TB movement or no TB rise at all, indicating a deleted gesture. SP4 does not show the same distinction. Comparing condition (1) and (3) for SP1 for the same stimulus (Table 2), shows that in the absence of primary stress the TB movement is shorter, and the maximum TB constriction is lower. There is also a difference between clear and casual speech with both a lower TB maximum constriction and smaller TB movement in casual speech in both conditions. Condition (3) in casual speech shows the highest degree of reduction, with half of the tokens showing no TB rise, indicating a deleted gesture. This shows a clear interplay with these two factors of lenition. The preliminary results can be summarized thus: **(I)** Lenition is the result of relevant articulators not reaching their target position to a varying degree, including a gesture fully deleting (i.e. no movement of relevant articulators). **(II)** Lenition is more pervasive in casual speech than clear speech. **(III)** There is less lenition following a stressed syllable than when following an unstressed syllable or a syllable receiving secondary stress. **Conclusion:** The results show that lenition is dependent not just on style but also on syllable position and stress, furthermore, they interact. This has implications for modeling speech production. Any viable model needs to capture not just prosodic influences and style, but also the interplay between these two influences.

Previous syllable:	Primary stress		Unstressed		Secondary stress	
Environment:	a_a	e_a	a_a	e_a	a_a	e_a
Dental	ba**ð**a sta**ð**a	be**ð**a sle**ð**a	aðsta**ð**a döbba**ð**a	rauðbe**ð**a snjósle**ð**a		
Velar	da**g**a la**g**a	ve**g**a le**g**a	bardaga tillaga	farve**g**a mannle**g**a	æskuda**g**a ferðala**g**a	jeppave**g**a

Table 1 Stimuli Target segments appeared intervocalically in an onset. There are three stress conditions, following a primary stressed (initial) syllable, an unstressed (2nd) syllable and a (3rd) syllable with secondary stress. There are two vowel environments [a_a]/[ɛ_a] and two tokens for each vowel environment. 19 stimuli total.

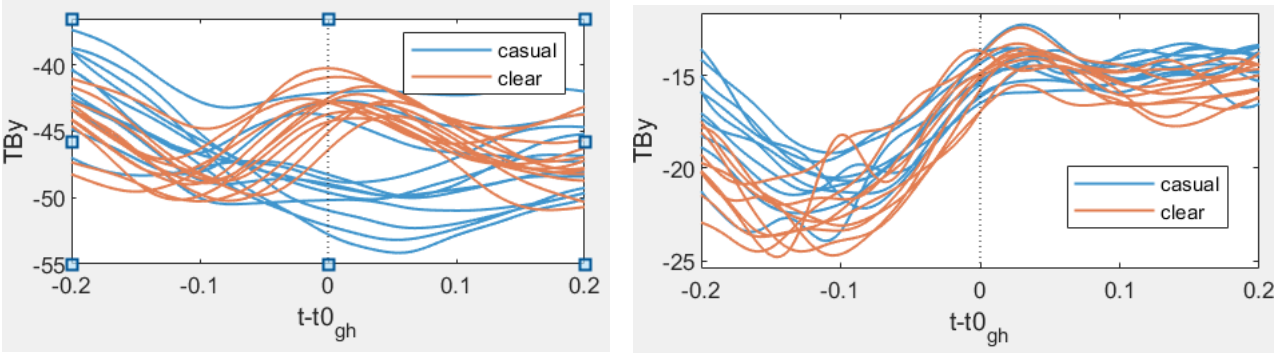

Figure 1- Comparison of TB movement (raw) from two speakers (SP1 left SP4 right). The production of *æskudaga* (condition 3) aligned with the start of the fricative (t0) according to the segmentation. SP1 shows clear difference between casual and clear speech; casual speech shows a reduced TB movement and even no upwards movement indicating a deleted gesture. SP4 does not show the same categorical difference but there is still a difference between clear and casual speech with the former shows a larger TB movement with a steeper curve.

	(1) *daga*	**(3) *æskudaga***
Clear	Average Max position: -40.4 Average Min position: -52.58 Average Max-Min: 12.18 No rise: 0	Average Max position: -42,53 Average Min position: -48,84 Average Max-Min: 6.31 No rise: 0
Casual	Average Max position: -43.2 Average Min position: -53 Average Max-Min: 9.79 No rise: 1	Average Max position: -45,65 Average Min position -47,75 Average Max-Min: 2.10 No rise: 6

***Table 2 Comparing condition 1 (daga) and 2 (æskudaga) from SP1*:** Showing the average maximum TB position, the preceding minimum position, the difference between the two and the number of examples showing no TB rise.

References

Árnason, K. (2011) *The Phonology of Icelandic and Faroese*. Oxford: Oxford University Press.
Helgason, P. (1993) *On Coarticulation and Connected Speech Processes in Icelandic*. Reykjavík: Málvísindastofnun Háskóla Íslands.