Towards an articulatory based typology of laryngeal effects on vowel duration

Stefano Coretta (University of Manchester) — 25th Manchester Phonology Meeting



1. Background

- Voicing Effect: vowels are longer when followed by voiced consonants (House & Fairbanks 1953, Chen 1970)
- Aspiration Effect: vowels are longer when followed by post-aspirated stops (Maddieson & Gandour 1976, Durvasula & Luo 2012)
- Laryngeal timing hypothesis: the source of the AE is the relative timing of the initiation of glottal spread, necessary for voicelessness and aspiration (see Halle & Stevens 1967 for related ideas)
- Prediction: vowels followed by pre-aspirated stops should be shorter
- **Icelandic** contrasts pre-aspirated geminates stops with unaspirated geminates in word-medial and final position: i.e., *tökk* 'dark' [thæhk] vs. *tögg* 'dew' [thækk]

2. Research hypothesis

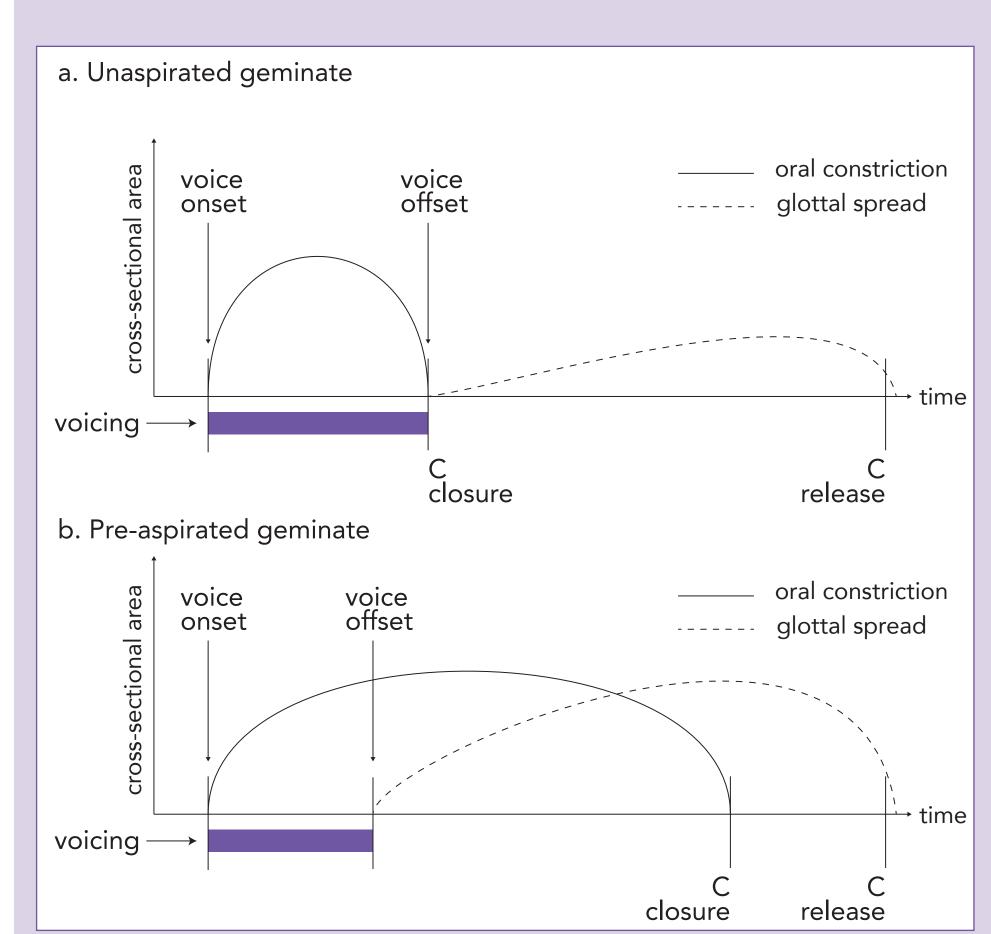


Figure 1. Schematic representation of the timing of oro-laryngeal gestures.

Vowels followed by pre-aspirated (geminate) stops are shorter than vowels followed by unaspirated (geminate) stops.

3. Methodology

- 5 Icelandic speakers
- 14 words (10 CVCC and 4 CVCCV), Segðu ___ aftur
- 3 repetitions per word, 210 repetitions in total
- linear mixed-effects regression analysis (Bates et al. 2015)

Table 1: Word list.

word	gloss	word	gloss
dökk	dark	dögg	dew
kokk	cook	gogg	beak
kopp	chamber pot	kubb	block of wood
sett	put	vídd	width
vítt	far and wide	þítt	thaw
takka	key	kagga	barrel
detta	fall	gedda	pike

4. Results

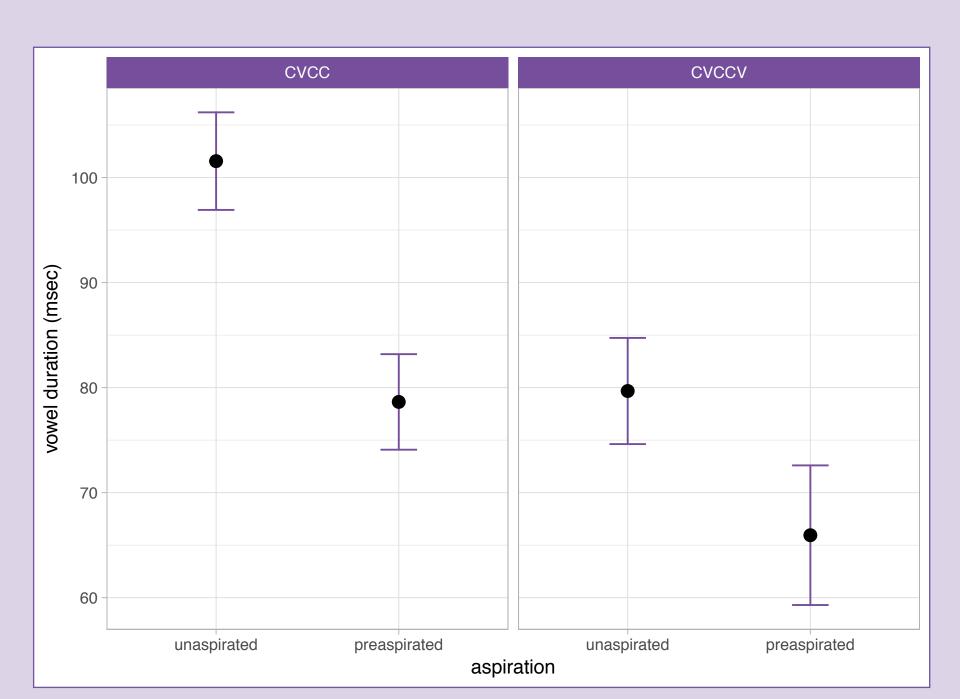


Figure 2. Interaction between laryngeal specification and prosodic context in conditioning vowel duration.

- vowels are 23 msec shorter if followed by a pre-aspirated stop (Figure 2)
 - stronger effect in CVCC words
- the **voiced interval is 20 msec longer** if followed by a pre-aspirated stop (Figure 3)

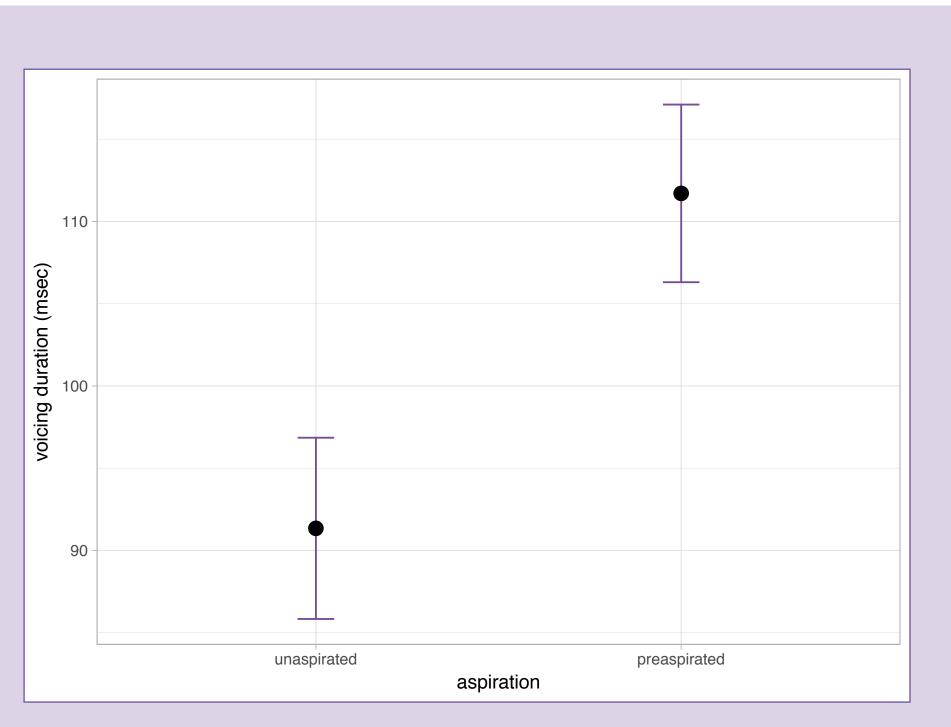


Figure 3. Effect of pre-aspiration on voicing duration.

• CVCC words are 43 msec shorter if they contain a pre-aspirated stop (non-significant effect in CVCCV words, Figure 4)

not a durational trade-off!

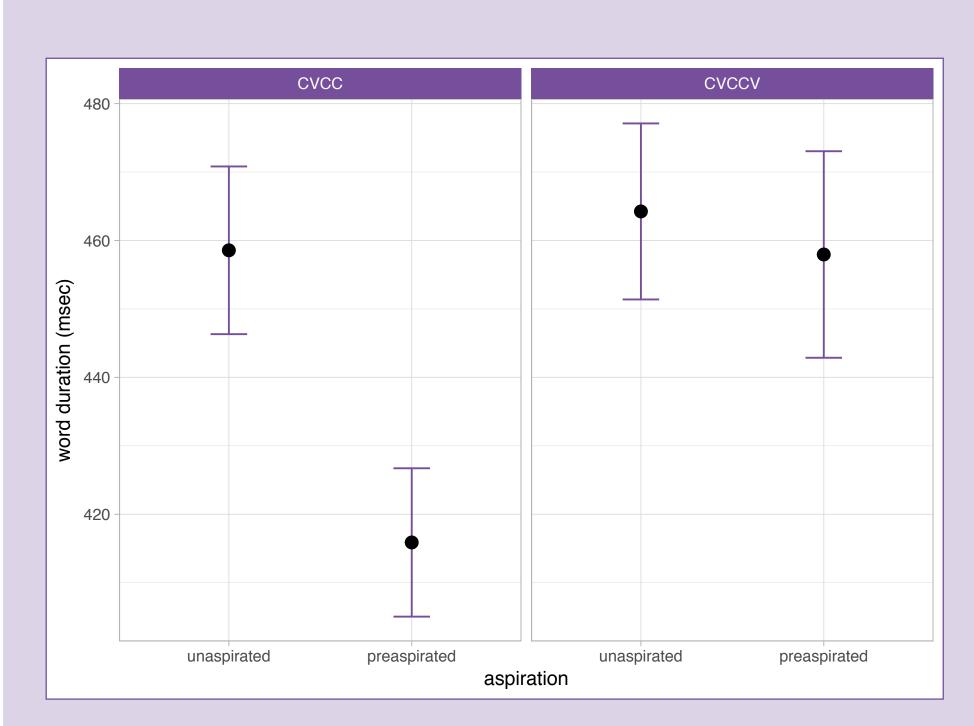


Figure 4. Interaction between laryngeal specification and prosodic context in conditioning word duration.

5. Discussion

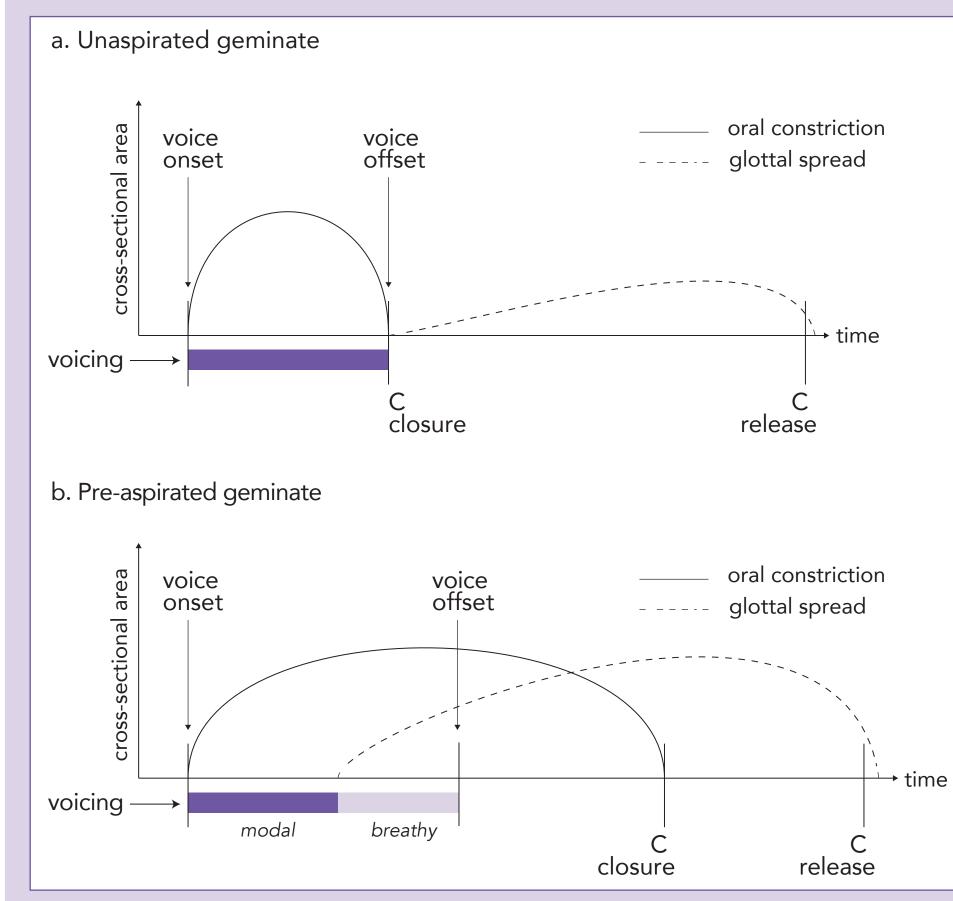


Figure 5. Schematic representation of the timing of oro-laryngeal gestures in the data.

- glottal spread is initiated earlier in pre-aspirated geminates (contra Ní Chasaide 1985)
- the source of the laryngeal effects could be the **transi- tion of modal voice** into breathy voice

Predictions:

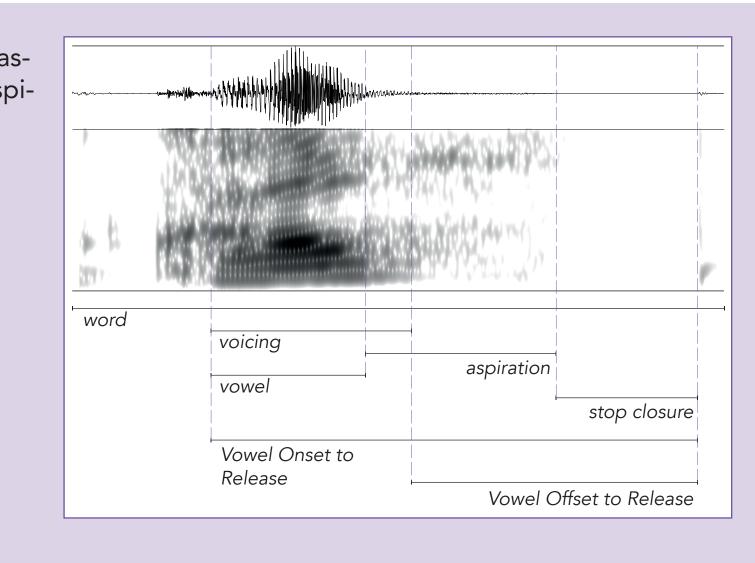
- spreading of English fortis stops should be timed earlier than in lenis stops (Hejná 2015, Hejná & Scanlon 2015)
- spreading in post-aspirating languages (like Hindi) should be timed earlier in (voiceless) unaspirated stops than in post-aspirated stops

Appendix

 Table A1: Socio-linguistic profile of the participants.

id	sex	age	birthplace	other languages
TT	F	24	Reykjavik	English, Danish, German
BRS	F	25	Höfn	Danish, English, Spanish
BTE	F	27	Reykjavik	English, Danish
JJ	F	46	Reykjavik (Kópavogur)	English, Danish
SHG	M	25	Selfoss	English

Figure A1. Example of measurements criteria for pre-aspirated stops.



References. Bates, Douglas, Martin Mähler, Ben Bolker & Steve Walker. 2015. Fitting linear mixed-effects models using phonetics by computer [Computer program]. Version 6.0.23. http://www.praat.org/. Durvasula, Karthik & Qian Luo. 2012. Voicing, aspiration, and vowel duration in Hindi. Proceedings of Meetings on Acoustics 18. 1–10. Halle, Morris & Kenneth Stevens. 1967. Mechanism of glottal vibration for vowels and consonants. The Journal of the Acoustical Society of America 41(6). 1613–1613. Hejná, Michaela. 2015. Pre-aspiration in Welsh English: A case study of Aberystwyth: The University of Manchester dissertation. Hejná Michaela & Jane Scanlon. 2015. New laryngeal allophony in Manchester English. In Proceedings of the 18th International Congress of Phonetic Sciences, 1–5. Maddieson, Ian & Jack Gandour. 1976. Vowel length before aspirated consonants. In UCLA Working papers in Phonetics, vol. 31, 46–52. Ní Chasaide, Ailbhe. 1985. Preaspiration in phonological stop contrasts: an instrumental phonetic study: University of Wales dissertation. Peirce, Jonathan W. 2009. Generating stimuli for neuroscience using PsychoPy. Frontiers in Neuroinformatics 2(10). Acknowledgments. My Icelandic informants and the staff of All Iceland (York); Richard Ogden, Amanda Cardoso, Márton Sóskuthy (University of York); Patrycja Strycharczuk, Ricardo Bermúdez-Otero, PhonLab mates (University of Manchester).