technische universität
dortmund

Institut für Sprache,
Literatur und Kultur

Investigating vowel duration in the 21st century:

Aitken's Law in naturally spoken Scottish Standard English



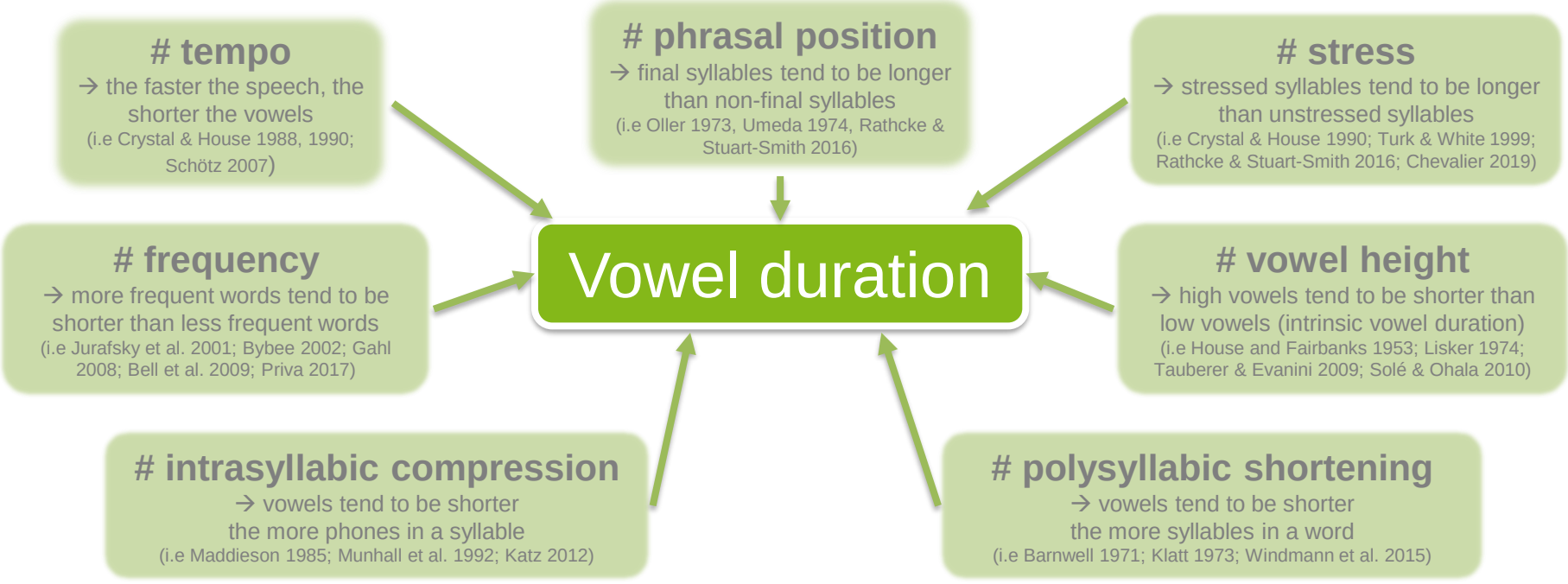


NWAV50 | Stanford University | October 14, 2022

Andreas Weilinghoff

01 Introduction

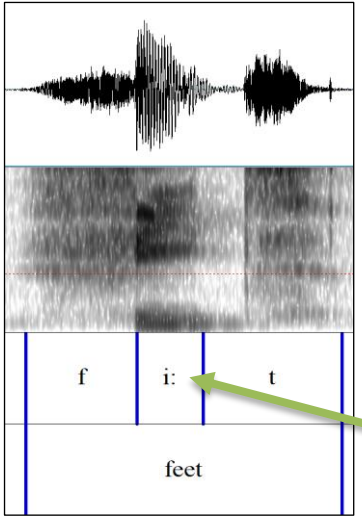
Introduction



Introduction

Voicing effect → vowels tend to be longer before voiced consonants than before voiceless consonants in most varieties of English

(i.e Sweet 1877; Heffner 1937; House and Fairbanks 1953; Peterson & Lehiste 1960; Chen 1970; Tauberer & Evanini 2009; Tanner et al. 2020)

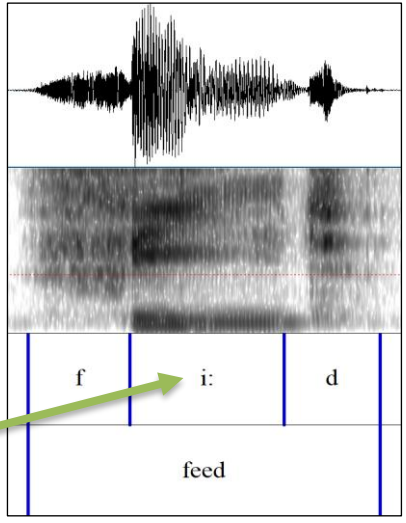


feet

vowel duration:
~ 130 ms

feed

vowel duration:
~ 300 ms



The Scottish Vowel Length Rule (SVLR) / Aitken‘s Law

Table 1. Environments constraining durational allophony in varieties of British English.

Constraint	Examples	Scottish English	Anglo-English
Voiceless consonants	*beat, greet* *brute, cute*	short allophones	short allophones
Voiced (oral and nasal) stops and /l/	*bead, bean, beal* *brood, broom, gruel*	short allophones	long allophones
Voiced fricatives and /r/	*tease, beer* *bruise, smooth, cure*	long allophones	long allophones
Morpheme boundaries	*bee, bees, bee’s* *agree, agreed* *brew, brews, brewed*	long allophones	long allophones

(Retrieved from: Stuart-Smith and Rathcke 2016: 406)

Phonological / historical discussions

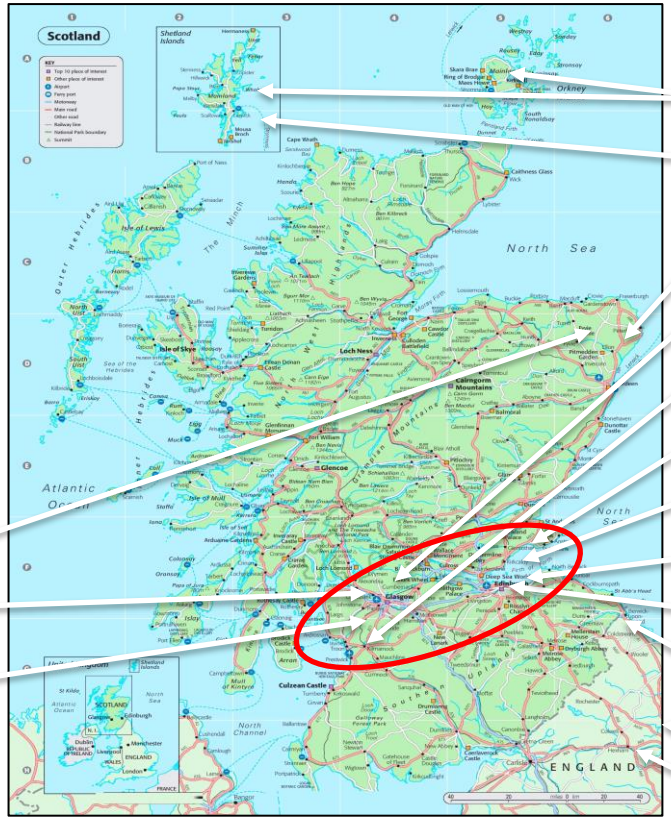
- Lass 1974
- Taylor 1974
- Ewen 1977
- Harris 1985
- Carr 1992
- Anderson 1993
- Kamińska 1995
- Kiełtyka 2003

Perception study

- Smith and Rathcke 2016

Empirical studies in uncontrolled speech

- Warren 2018
- Stuart-Smith and Rathcke 2016
- Chevalier 2019
- Stuart-Smith et al 2019



Empirical studies in controlled speech

- van Leyden 2002
- Scobbie 2005
- Watt and Yurkova 2007
- Scobbie et al. 1999
- Pukli 2006
- McKenna 1988
- Agutter 1988
- McMahon 1991
- Hewlett, Matthews and Scobbie 1999
- Watt and Ingham 2000
- Milroy 1995
- Llamas et al. 2011

Previous findings

- SVLR applies most consistently in the vowels

/i/

McClure 1977
McKenna 1988
McMahon 1991
Hewlett et al. 1999
Scobbie et al. 1999
Watt & Ingham 2000
van Leyden 2002
Scobbie 2005
Pukli 2006
Llamas et al. 2011
Rathcke & Stuart-Smith 2016
Chevalier 2019
Stuart-Smith et al. 2019

/ʉ/

McClure 1977
McKenna 1988
Hewlett et al. 1999
Scobbie et al. 1999
Watt & Ingham 2000
Scobbie 2005
Pukli 2006
Llamas et al. 2011
Rathcke & Stuart-Smith 2016
Chevalier 2019
Stuart-Smith et al. 2019

/aɪ/

Agutter 1988
McMahon 1991
Milroy 1995
Scobbie et al. 1999 Watt & Ingham 2000
Pukli 2006
Llamas et al. 2011

Previous findings – Remaining issues

→ geographical scope of the SVLR?

(e.g. McClure 1977 | Aitken 1981) vs. (Lodge 1984 | Agutter 1988 | Watt & Yurkova 2007 | Warren 2018)

→ age-related variation?

(Agutter 1988 | Milroy 1995 | Watt and Ingham 2000 | Warren 2018) vs. (Scobbie et al. 1999; Llamas et al. 2011)

→ gender-related variation?

(Agutter 1988 | Watt and Ingham 2000 | Stuart-Smith and Rathcke 2016; Chevalier 2019)

→ SVLR in naturally spoken SSE?

02 PhD Project

PhD Project – RQs and aims

RQ1: **Which vowels** are affected by Aitken's Law / the VE in 21st century spoken SSE?

RQ2: What is the **effect of regional, age- and gender-related variation** on Aitken's Law / the VE in 21st century spoken SSE?

RQ3: **Which prosodic factors** have an influence on Aitken's Law / the VE in 21st century spoken SSE?

→ all vowels of the *Basic Scottish Vowel System* (Abercrombie 1979)

→ representativeness for the whole of the country in terms of age, gender and regional background

→ accounting for all possible prosodic factors

PhD Project Dataset

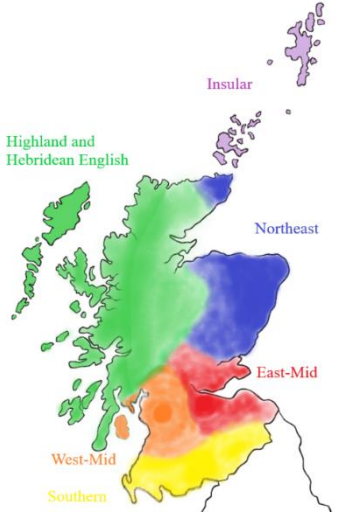
→ Two data sources: ICE Scotland + Self-collected data

(Schützler et al. 2017)

- 130 (64 f) speakers from 3 age groups & 6 dialect regions

→ 150995 words

Variable	Level	Number of words
Regional background	East-Mid	27199
	HHE	23604
	Insular	26147
	Northeast	18007
	South	24412
	West-Mid	31626
Gender	female	67726
	male	83269
Age group	old (60+)	33165
	middle (31-60)	94683
	young (18-30)	23147
Style	scripted	85044
	unscripted	65951
Total		150995



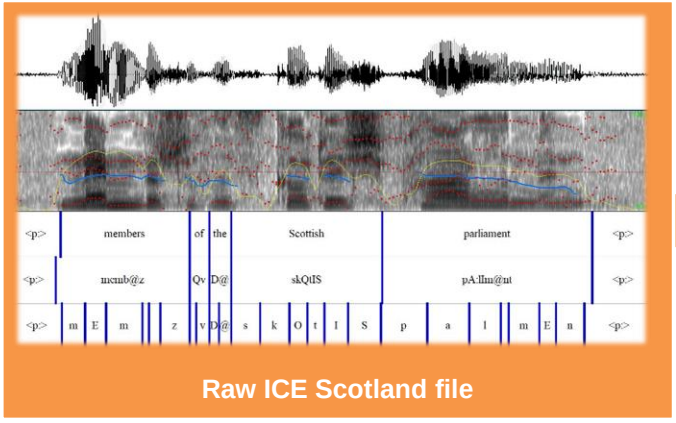
PhD Project – Data preparation

- semi-automatic transcription (correction) of the datasets with different Python scripts (Python software foundation 2022) using the library *textgrids* (Nieminen, 2019)
- force alignment with the updated version of the Montreal Forced Aligner (McAuliffe 2017) and WebMAUS (Kisler et al. 2017)
- implementation of different prosodic levels, prosodic stress identification with ProsoBox (Goldman & Simon 2020) and manual correction of the segment boundaries on the basis of voicing criteria
  (Hewlett et al. 2017; McKenna 1988; Rathcke & Stuart-Smith 2016; Warren 2018)

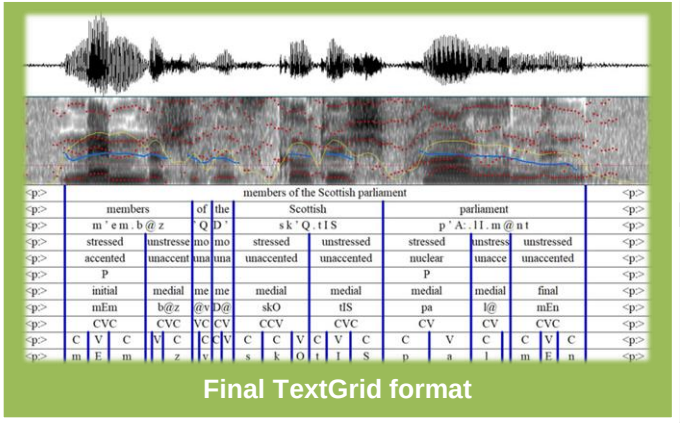
Code
andreas-weilinghoff.com/#code

→ conversion to csv structure

PhD Project – Data preparation



Raw ICE Scotland file



Final TextGrid format

Code
andreas-weilinghoff.com/#code

dataset	filename	phone_ label	phone_ xmin	phone_ xmax	phone_dur	phone_code	syl_ structure	syl_label	syl_ duration	num_phone_ in_syl	+ other columns
ICE	btal_10	m	1.433	1.495	0.062	C	CVC	mEm	0.214	3	…
ICE	btal_10	E	1.495	1.550	0.05	V	CVC	mEm	0.214	3	…
ICE	btal_10	m	1.550	1.647	0.097	C	CVC	mEm	0.214	3	…
ICE	btal_10	b	1.647	1.664	0.017	C	CVC	b@z	0.125	3	…
ICE	btal_10	@	1.664	1.694	0.03	V	CVC	b@z	0.125	3	…
ICE	btal_10	z	1.694	1.772	0.078	C	CVC	b@z	0.125	3	…
+ other rows	…	…	…	…	…	…	…	…	…	…	…

PhD Project – statistical analysis

- Linear mixed effects modelling on log-transformed vowel duration with *lme4* and *lmerTest* packages (Bates et al., 2015; Kuznetsova et al., 2017)

  Random factors: speaker, word
  Fixed factors: SVLR / VE categorization, phrasal position, stress, word frequency, local articulation rate, syllable phone count, word syllable count, style, age, gender, region + all possible interactions

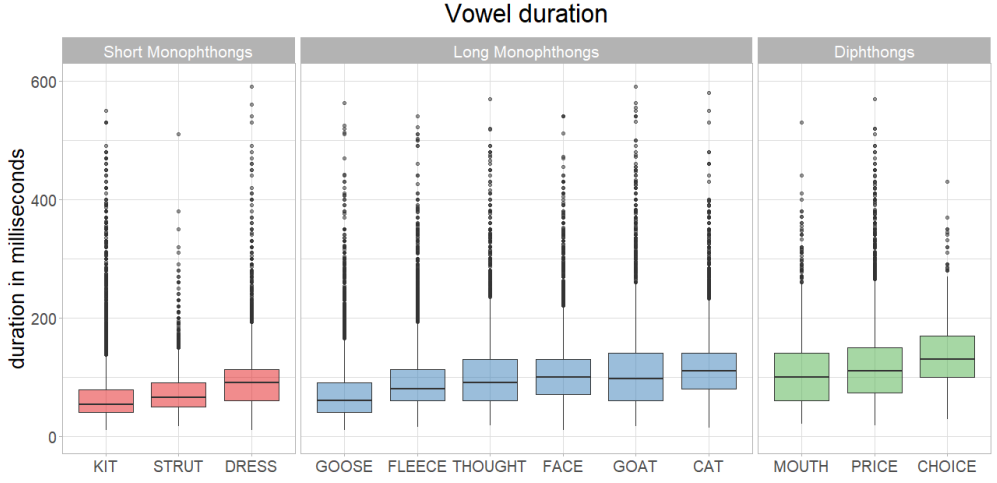
→ stepwise regression with backward selection (AIC | R2) & subsampling technique PrInDT for automatic model generation (Weihs & Buschfeld 2021; Weihs & Weilinghoff forthcoming)

- vowels analyzed collectively and independently; different models for different SVLR and VE classification schemes → avoid collinearity

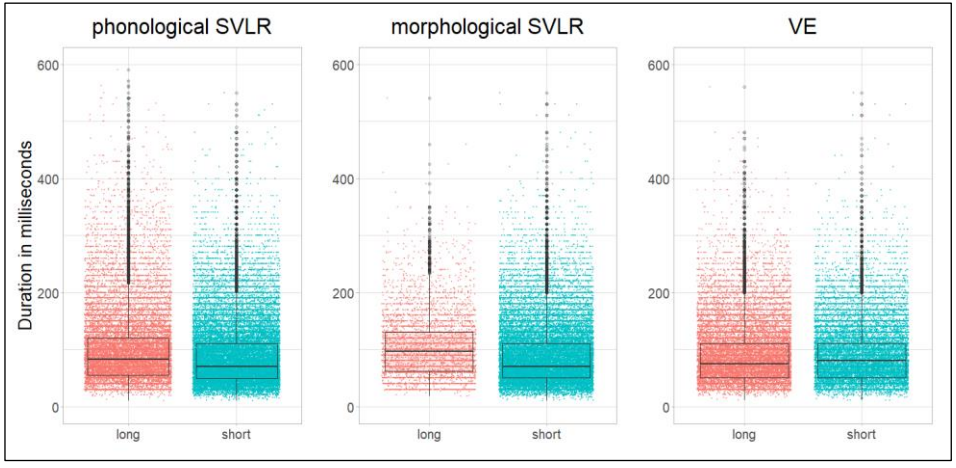
03 FINDINGS

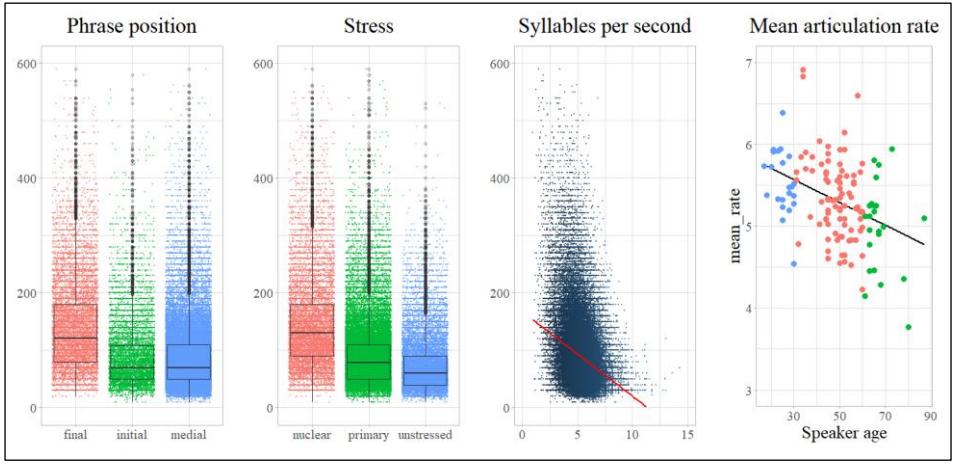
Findings – vowel overview

Vowel(s)	Lexical Set	Type	Tokens	Mean duration (ms)	Standard deviation (ms)
/ɪ/	KIT	Short monophthong	44382	64.71	41.14
/ʌ/	STRUT	Short monophthong	6467	71.72	35.70
/ɛ/	DRESS	Short monophthong	13714	91.76	47.27
/u/	GOOSE	Long monophthong	6351	92.33	55.55
/i/	FLEECE	Long monophthong	9146	100.42	53.91
/ɔ/	THOUGHT	Long monophthong	7762	112.64	55.79
/ʌʊ/	MOUTH	Diphthong	9394	114.90	56.95
/e/	FACE	Long monophthong	6708	113.00	57.34
/o/	GOAT	Long monophthong	10868	119.10	70.32
/a/	CAT	Long monophthong	2992	119.71	51.23
/ʌɪ/ /ae/	PRICE	Diphthong	9540	125.02	60.52
/ɔe/	CHOICE	Diphthong	480	140.74	59.09



Findings – All vowels





Findings - Individual vowels

Lexical Set	Vowel(s)	Aitken's (1981) SVLR status	Phon SVLR	Morph SVLR	VE	VE (plosive contexts)	Highest cond. R^2	Other important observation
KIT	/ɪ/	no	no	no	no	no	0.36	shortest before nasals
STRUT	/ʌ/	no	no	no	opposite	opposite	0.42	shortest before nasals, anti-VE
DRESS	/ɛ/	yes	opposite	no	opposite	no	0.42	shortest before voiced fricatives
GOOSE	/u/	yes	yes	yes	yes	no	0.40	VE1 significant but not VE2; shortest before nasals
FLEECE	/i/	yes	yes	yes	yes	yes	0.49	shortest before nasals
THOUGHT	/ɔ/	regional variation	weak	weak	opposite	no	0.53	shortest before nasals; anti-VE
FACE	/e/	yes	yes	yes	yes	yes	0.49	shortest before laterals
GOAT	/o/	regional variation	yes	yes	yes	yes	0.41	shortest before voiceless fricatives
CAT	/a/	yes	no	weak	no	yes	0.48	shortest before voiced fricatives
MOUTH	/ʌʊ/	yes	yes	no	opposite	no	0.47	shortest before nasals
PRICE	/ʌɪ/ /ae/	yes	yes	yes	yes	yes	0.46	shortest before voiceless fricatives
CHOICE	/ɔe/	yes / regional variation	no	no	opposite	unclear	0.61	shortest before nasals

Findings

- consistent SVLR patterns in GOOSE, FLEECE, PRICE, FACE, GOAT (/ʉ/, /i/, /aɪ/, /e/ and /o/)
- Aitken's Law does not operate in KIT, STRUT, DRESS, THOUGHT or CHOICE (/ɪ/ /ʌ/ /ɛ/ /ɔ/ /ɔe/)
- SVLR patterns less stable in the Highlands, Southern and Northeastern Scotland
- weak influence of *age* and *gender*

Findings

- all vowels are significantly influenced by *tempo*, *stress* and *phrasal position*
- strong interactions between Aitken‘s Law and the factors *stress* and *phrasal position*

→ SVLR is amplified in prominent prosodic contexts

- anti-voicing effect (Stuart-Smith et al. 2019) found in STRUT, DRESS, THOUGHT, MOUTH, CHOICE

→ **strong shortening before nasals**

04 REFERENCES

References

Abercrombie, D. (1979). The Accents of Standard English in Scotland. In: A. J. Aitken & T. MacArthur (Eds.), *Languages of Scotland*. Edinburgh: W & R Chambers.

Agutter, A. (1988). The dangers of dialect parochialism: the Scottish vowel length rule. In: J. Fisiak: *Historical Dialectology: Regional and Social.* Berlin: de Gruyter Publishing.

Aitken, A. J. (1962). *Vowel length in Modern Scots*. Duplicated. Edinburgh: University of Edinburgh, Department of English Language.

Aitken, A. J. (1975). *The Scottish Vowel-length Rule*. Duplicated. Edinburgh: University of Edinburgh, Department of English Language.

Aitken, A. J. (1979). Scottish Speech: a historical view, with special reference to the Standard English of Scotland. In: A. J. Aitken & T. MacArthur (Eds.), *Languages of Scotland*. Edinburgh: W & R Chambers.

Aitken, A. J. (1981). The Scottish Vowel-length Rule. In: M. Benskin & M. L. Samuels (Eds.), *So meny people longages and tonges: philological essays in Scots and mediaeval English presented to Angus McIntosh*. Edinburgh: Benskin & Samuels.

Anderson, J. (1993). Morphology, Phonology and the Scottish Vowel-Length Rule. *Journal of Linguistics*, 29 (2), 419-430.

Barnwell, T. P. (1971). *An algorithm for segment durations in a reading machine context*. Technical Report.

Bartón, K. (2022). MuMIn package (Version 1.46.0) [Computer software]. https://cran.r-project.org/web/packages/MuMIn/MuMIn.pdf

Bates, D., Mälcher, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. Journal of Statistical Software, 67(1), 1–48.

Bell, A., Brenier, J. M., Gregory, M., Girand, C., & Jurafsky, D [Dan] (2009). Predictability effects on durations of content and function words in conversational English. *Journal of Memory and Language*, *60*(1), 92–111. https://doi.org/10.1016/j.jml.2008.06.003

Boersma, P., & Weenink, D. (2019). Praat: doing phonetics by computer (Version 6.1.08) [Computer software]. http://www.praat.org/

Bybee, J. (2002). Word frequency and context of use in the lexical diffusion of phonetically conditioned sound change. Language Variation and Change, 14(3), 261–290. https://doi.org/10.1017/S0954394502143018

Chen, M. (1970). Vowel length variation as a function of the voicing of the consonant environment. *Phonetica* 22, 129-159.

References

Chevalier, F. (2019). “On sound change and gender: the case of vowel length variation in Scottish English.” *Anglophonia* [Online] 27. Retrieved from: https://journals.openedition.org/anglophonia/2204 (Date: 20.03.2020)

Crystal, T. H., & House, A. (1990). Articulation rate and the duration of syllables and stress groups in connected speech. The Journal of the Acoustical Society of America, 88(1), 101–112. https://doi.org/10.1121/1.399955

Crystal, T., & House, A. (1988). Segmental durations in connected-speech signals: Current results. The Journal of the Acoustical Society of America, 83(4), 1553–1573. https://doi.org/10.1121/1.395911

Dieth, E. (1932). *A Grammar of the Buchan Dialect (Aberdeenshire): Descriptive and Historical.* Cambridge: W. Heffer & Sons Ltd.

Ewen, C. J. (1977). Aitken's law and the phonatory gesture in dependency phonology. *Lingua*, 41(3-4), 307–329.

Gahl, S. (2008). Time and Thyme Are not Homophones: The Effect of Lemma Frequency on Word Durations in Spontaneous Speech. *Language*, 84, 474–496.

Grant, W. & Dixon J. M. (1921). *Manual of Modern Scots*. Cambridge: Cambridge University Press.

Grant, W. T. (1931). *The Scottish National Dictionary*. Edinburgh: Riverside Press.

Goldman, J.-P., & Simon, A. C. (2020). Prosobox, a Praat Plugin for Analysing Prosody. *Proceedings of the 10th International Conference on Speech Prosody*.

Harris, J. (1985). Phonological variation and change: Studies in Hiberno-English. Cambridge University Press.

Hewlett, N., Matthews, B. & Scobbie, J. M. (1999). Vowel duration in Scottish English speaking children. *Proceedings of the 14th International Congress of Phonetic Sciences, San Francisco, August 1999*, 2157-2160.

House, A. S. (1961). On vowel duration in English. In: *Journal of the Acoustical Society of America,* 33*,* 1174–1178.

House, A. and G. Fairbanks. 1953. “The influence of consonant environment upon the secondary acoustical characteristics of vowels.” *Journal of Acoustical Society of America* 25 (1953): 105-113.

Jurafsky, D., Bell, A., Gregory, M., & Raymond, W. D. (2001). Probabilistic Relations between Words: Evidence from Reduction in Lexical Production. In J. L. Bybee & P. J. Hopper (Eds.), *Typological studies in language: Vol. 45. Frequency and the emergence of linguistic structure* (pp. 229–254). John Benjamins Publishing Company.

References

Kamińska, T. E. (2011). *Problems in Scottish English Phonology*. Berlin: de Gruyter Publishing.

Katz, J. (2012). Compression effects in English. *Journal of Phonetics*, *40*(3), 390–402. https://doi.org/10.1016/j.wocn.2012.02.004

Kiełtyka R. (2003). Aitken's Law: Some Aspects of Scottish Vowel Lengthening. *Studia Anglica Resoviensia* 14, 42-54.

Kisler, T., Reichel, U. D., & Schiel, F. (2017). Multilingual processing of speech via web services. *Computer Speech & Language*, *45*, 326–347.

Klatt, D. H. (1973). Letter: Interaction between two factors that influence vowel duration. *The Journal of the Acoustical Society of America*, *54*(4), 1102–1104. https://doi.org/10.1121/1.1914322

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest Package: Tests in Linear Mixed Effects Models. *Journal of Statistical Software*, *82*(13), 1–26.

Lass, R. (1974): Linguistic orthogenesis? Scots vowel quantity and the English length conspiracy. In: J. M. Anderson & C. Jones (Eds.), *Historical Linguistics: Proceedings of the First International Conference on Historical Linguistics, Edinburgh, 2nd-7th September 1973. Syntax, morphology, internal and comparative reconstruction*, Vol. II. Amsterdam: North Holland Publ. Co..

Lehiste, I. and G. E. Peterson (1960). Duration of syllable nuclei in English. *Journal of the Acoustical Society of America, 32*(6), 693–703.

Llamas, C., Watt, D., French, P. & Roberts, L. (2011). Effects of the Scottish Vowel Length Rule on vowel quantity in Tyneside English. *Proceedings of the 17th International Congress of Phonetic Sciences, Hong Kong, 17th–21st August 2011*, 1282-1285.

Lodge, K. R. (1984). *Studies in the Phonology of Colloquial English*. London & Sidney: Croom Helm Ltd.

Lisker, L. (1974). On 'explaining' vowel duration variation. Status Report on Speech Research: *A Report on the Stacus and Progress of Studies on the Nature of Speech, Instrumentation for Its Investigation, and Practical Applications*. https://files.eric.ed.gov/fulltext/ed094445.pdf#page=223

Maddieson, I. (1985). Phonetic cues to syllabification. In *Working Papers in Phonetics* (pp. 203–221).

Mather, J. Y. & Speitel H. H. (1986). *The Linguistic Atlas of Scotland: Scots Section Phonology*. Vol. III. London, Sydney & Dover, New Hampshire: Croom Helm Ltd.

McAuliffe, M., Socolof, M., Mihuc, S., Wagner, M., & Sonderegger, M. (2017). Montreal Forced Aligner: trainable text-speech alignment using Kaldi. *Proc. Interspeech 2017*, 498–502. https://www.isca-speech.org/archive/interspeech_2017/mcauliffe17_interspeech.html

References

McClure, J. D. (1977). Vowel duration in a Scottish accent. *Journal of the International Phonetic Association*, 7 (1), 10-16.

McKenna, G. (1988). Vowel duration in the Standard English of Scotland. MLitt Thesis, University of Edinburgh.

McMahon, A. M. S. (1991). Lexical phonology and sound change: the case of the Scottish vowel length rule. *Journal of Linguistics* 27, 29-53.

Milroy, J. (1995). Investigating the Scottish vowel length rule in a Northumbrian dialect. *Newcastle and Durham Working Papers in Linguistics* 4, 187-196.

Munhall, K., Fowler, C., Hawkins, S., & Saltzman, E. (1992). “Compensatory shortening” in monosyllables of spoken English. *Journal of Phonetics*, *20*(2), 225–239. https://doi.org/10.1016/S0095-4470(19)30624-2

Murray, J. A. H. (1873). *The Dialect of the Southern Counties of Scotland: Its Pronunciation, Grammar, and Historical Relations*. London: Asher & Co.

Nieminen, T. (2019). *Praat-textgrids* (Version 1.3.1) [Computer software]. Legisign Software. https://pypi.org/project/praat-textgrids/

Oller, D. K. (1973). The effect of position in utterance on speech segment duration in English. *The Journal of the Acoustical Society of America*, 54(5), 1235–1247. https://doi.org/10.1121/1.1914393

Peterson, G. E., & Lehiste, I. (1960). Duration of Syllable Nuclei in English. *The Journal of the Acoustical Society of America*, 32(6), 693–703. https://doi.org/10.1121/1.1908183

Priva, U. C. (2017). Informativity and the actuation of lenition. *Language*, 93(3), 569–597. https://doi.org/10.1353/lan.2017.0037

Pukli, M. (2006). Scottish English and the Scottish Vowel Length Rule: An empirical study of Ayrshire speakers. *PhD Thesis*.

Python Software Foundation. (2021). *Python* (Version 3.9) [Computer software]. http://www.python.org

R Core Team. (2021). *R: A language and environment for statistical computing* [Computer software]. R foundation for statistical computing. Vienna, Austria. https://www.R-project.org/

Rathcke, T. V. & Stuart-Smith, J. H. (2016). On the Tail of the Scottish Vowel Length Rule in Glasgow. *Language and Speech* 59 (3), 404-430.

Schötz, S. (2007). Acoustic Analysis of Adult Speaker Age. In Christian Müller (Ed.), *Speaker Classification I: Fundamentals, Features and Methods* (pp. 88–107). Springer Berlin Heidelberg.

References

Schützler, O., Gut, U. & Fuchs, R. (2017). New perspectives on Scottish Standard English: Introducing the Scottish component of the International Corpus of English. In: S. Hancil & J. C. Beal (Eds.), *Perspectives on Northern Englishes*. Berlin: de Gruyter Publishing.

Scobbie, J. M., Hewlett, N. & Turk, A. (1999). Standard English in Edinburgh and Glasgow: the Scottish Vowel Length Rule revealed. In: P. Foulkes & G. Docherty (Eds.), *Urban Voices: Accent Studies in the British Isles.* London: Arnold Publishing.

Scobbie, J. M. (2005). Interspeaker variation among Shetland Islanders as the long term outcome of dialectally varied input: speech production evidence for fine-grained linguistic plasticity. *QMUC Speech Science Research Centre Working Paper WP2*, 1-9.

Solé, M.-J., & Ohala, J. J. (2010). What is and what is not under the control of the speaker: Intrinsic vowel duration. In C. Fougeron (Ed.), *Phonology and Phonetics /PP]: 4-4. Laboratory phonology 10* (pp. 607–655). Mouton de Gruyter.

Stuart-Smith, J. H. (1999). Glasgow: accent and voice quality. In: P. Foulkes & G. Docherty (Eds.), *Urban Voices: Accent Studies in the British Isles.* London: Arnold Publishing.

Stuart-Smith, J. H., Macdonald, R. and the SPADE consortium (2019). The fate of the Scottish Vowel Length Rule in contemporary Scottish English. [Online] Retrieved from: https://spade.glasgow.ac.uk/wp-content/uploads/2019/09/svlr_uklvc12_asgiven.pdf (Date: 20.03.2020)

Tanner, J., Sonderegger, M., Stuart-Smith, J., & Data Consortium, S. (2019). Vowel duration and the voicing effect across English dialects. *Toronto Working Papers in Linguistics*, *41*(1). [Online] Retrieved from: https://doi.org/10.33137/twpl.v41i1.32769

Tauberer, J., & Evanini, K. (2009). Intrinsic vowel duration and the post-vocalic voicing effect: some evidence from dialects of north american English. In INTERSPEECH. http://www.evanini.com/papers/evanini_INTERSPEECH09a.pdf

Tsao, Y.-C., & Weismer, G. (1997). "Interspeaker variation in habitual speaking rate: Evidence for a neuromuscular component." *Journal of Speech, Language, and Hearing Research*, 40, 858–866.

Turk, A. E., & White, L. (1999). Structural influences on accentual lengthening in English. *Journal of Phonetics*, *27*(2), 171–206. https://doi.org/10.1006/jpho.1999.0093

Umeda, N. (1975). Vowel duration in American English. *The Journal of the Acoustical Society of America*, *58*(2), 434–445. https://doi.org/10.1121/1.380688

van Leyden, K. (2002). The Relationship between Vowel and Consonant Duration in Orkney and Shetland Dialects. *Phonetica* 59, 1-19.

References

Warren, D. (2018). *The Scottish Vowel Length Rule in North East Scotland*. Unpublished PhD thesis. University of Aberdeen.

Watt, D. & Ingham C. (2000). Durational evidence of the Scottish Vowel Length Rule in Berwick English. In: D. Nelson & P. Foulkes (Eds.). *Leeds Working Papers in Linguistics* 8, 205-228.

Watt, D. & Yurkova, J. (2007). Voice Onset Time and the Scottish Vowel Length Rule in Aberdeen English. *Proceedings of the 16th International Congress of Phonetic Sciences, Saarbrücken*, *6th-10th August 2007*, 1521-1524.

Watson, G. (1923). *The Roxburghshire word-book: being a record of the special vernacular vocabulary of the county of Roxburgh, with and appendix of specimens.* Cambridge: Cambridge University Press.

Wettstein, P. (1942). *The Phonology of a Berwickshire Dialect*. Zurich: Schuler.

Windmann, A., Šimko, J., & Wagner, P. (2015, September 6). Polysyllabic shortening and word-final lengthening in English. In *Interspeech 2015* (pp. 36–40). ISCA. https://doi.org/10.21437/Interspeech.2015-8

Wölck, W. (1965*). Phonematische Analyse der Sprache von Buchan*. Heidelberg: C. Winter.

Zai, R. (1942). *The phonology of the Morebattle dialect.* Lucerne: Räber & Co.

Thanks for your attention!

Slides
andreas-weilinghoff.com/˜docs/NWAV50_presentation.pdf

Special thanks to:

NWAV organizing committee
Prof Sarah Buschfeld
Prof Jane Stuart-Smith
Prof Ulrike Gut
Prof Ole Schützler
Prof Claus Weihs
The Chairs of English Linguistics at TU Dortmund University
The GULP Team at the University of Glasgow