

# Acoustic correlates of the fortis/lenis distinction in early 20th century Donegal Irish

David Wheatley and Pavel Iosad

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## Outline

- Fortis and lenis quality and quantity in the Gaelic languages
- Corpus study of Donegal Irish based on Doegen recordings
  - Fortis/lenis quality accompanied by quantity across the board in sonorants
  - No independent fortis/lenis quantity distinction in stops
- Donegal likely the most archaic quantity system in the Gaelic world
- But still no evidence of phonologically relevant duration in stops

## Fortis and lenis in the Gaelic languages

### Sonorants: the distinction

- Spelled <ll nn rr> vs. <l n r> from the earliest times<sup>1</sup>
- Phonemic distinctions in Old Gaelic (Kelly 1988: pp. 299–399)

<sup>1</sup> Plus [fortis] <m> whose lenis counterpart is <mh> [v]

Sonorant	Fortis	Lenis
Broad <n>	<i>conn</i> [koN] ‘sense.NOM.SG’	<i>con</i> [kon] ‘dog.GEN.SG’
Slender <n>	<i>cuinn</i> [kuNʲ] ‘sense.GEN.SG’	<i>cuin</i> [kunʲ] ‘whence’
Broad <l>	<i>toll</i> [toL] ‘hole.NOM.SG’	<i>tol</i> [tol] ‘will.NOM.SG’
Slender <l>	<i>tuill</i> [tuLʲ] ‘hole.GEN.SG’	<i>tuil</i> [tulʲ] ‘will.GEN.SG’
Broad <r>	<i>tarr</i> [taR] ‘belly.NOM.SG’	<i>tar</i> [tar] ‘over’
Slender <r>	<i>tairr</i> [taRʲ] ‘belly.DAT.SG’	<i>tair</i> [tarʲ] ‘come.IMP.2SG’

### Sonorants: quantity or quality?

- Historically
  - Long sonorants > [fortis] word-medially
  - Extension of [fortis] quality to non-leniting position word-initially
- Likely both quantity and quality
  - Quantity: coda [fortis] sonorants give syllables *síneadh meadhónach* ‘middle quantity’ (Greene 1952)
  - Quality: the MacNeill-O’Brien Law (Hamp 1974): dissimilation of [lenis] sonorants across an unstressed vowel
- Contrast maintained in word-initial position: how?
  - *lám* [L] ‘hand’
  - *a llám* [L] ‘her hand’

- *a lám* [l] ‘his hand’
- Double spelling indicates ‘non-lenition’, not necessarily quantity

### *Sonorants in Present-Day Gaelic: Connacht*

- Quality distinctions just about holding on
- Quantity distinctions: phonology but not phonetics (e.g. Ní Chiosáin 1991)
  - |fortis| sonorants are phonetically short...
  - ...but function as moraic codas through *compensatory lengthening*

Sonorant	Word-final	Medial coda	Intervocalic onset	Gloss
Fortis	<i>geall</i> [ɑ:]	<i>geallta</i> [ɑ:]	<i>gealladh</i> [a]	‘promise’
Lenis	<i>geal</i> [a]	<i>gealta</i> [a]	<i>gealadh</i> [a]	‘brighten’

- Initial mutation pattern still present in mid 20th century (De Bhaldraithe 1945): *neart* [Nʲ] ~ *a neart* [nʲ] ‘his strength’

### *Sonorants in Present-Day Gaelic: rest of Ireland*

- Munster:
  - Similar pattern of quantity to Connacht, no qualitative distinction
- Ulster:
  - Both qualitative and quantitative distinctions reported intact phonetically (Quiggin 1906, Ó Searcaigh 1925, Ó Baoill 1979)
  - No phonological evidence: no lengthening before coda |fortis|
  - Wagner (1959): |fortis| sonorants are longer after short vowels: *gránna* ‘ugly’ [grɑ:Nə] vs. *collach* ‘boar’ [kɔLLax]
  - No fortition after a short vowel: *folamh* ‘empty’ [fɔlu]
    - \* But some examples in LASID: *muinéal* ‘neck’ [mʲnʲqʲ] 86 Teelin, *culaith* ‘suit of clothes’ [kɔli:] 74 Gortahork

### *Sonorants in Present-Day Gaelic: Scotland*

- Qualitative distinctions significantly intact (Musil 2017, 2019)
- Phonological quantity: similar to Connacht, |fortis| sonorants behave as moraic codas (Morrison 2019)
- Phonetic quantity: ambiguous
  - Generally no quantity distinction
  - Long or half-long coda |fortis| in southern dialects: Arran (Holmer 1954), Jura (Jones 2010), Colonsay (Scouller 2017), Islay (Holmer 1938), also in SGDS
  - No vowel lengthening <sup>2</sup>
  - Holmer (1938) reports length for intervocalic |fortis| (*balla* ‘wall’)
  - Contested (Jones 2010, Lewin 2020)

<sup>2</sup> Except Colonsay

*Stops in Old Gaelic*

	*pp tt kk	*p t k	*bb dd gg	*b d g
Unlenited	<i>brocc</i> ‘badger’ [pp? tt? kk?] <pp tt cc> <p t c>	<i>derc</i> ‘face’ [p t k] <pp tt cc> <p t c>	<i>creitid</i> ‘believes’ [bb? dd? gg?] <pp tt cc> <p t c> <bb dd gg>?	<i>derc</i> ‘red’ [b d g] <pp tt cc> <p t c> <b d g> <bb dd gg>
Lenited		<i>tech</i> ‘house’ [f θ x] <ph th ch>		<i>mag</i> ‘plain’ [v ð γ] <b d g>

- Word-initially: *a ppeccad* ‘her sin’
  - Thurneysen (1946): ‘gemination mutation’
  - Greene (1956): double spelling as signal of non-lenition

*Voiceless stops in Old Gaelic*

Context	Singleton	Geminate
#_	<i>tech</i> ‘house’	<i>a ttech</i> ‘her house’
V_	<i>tech</i>	<i>brocc</i> ‘badger’
L_	<i>derc</i> ‘face’	*

- Possible allophony: long (‘fortis’) after a short vowel
- Unless there was degemination?

*Voiced stops in Old Gaelic*

Context	Singleton	Geminate
#_	<i>duine</i> ‘man’	<i>a dduine</i> ‘her man’
V_	<i>mag</i> ‘plain’ <i>écc</i> ‘death?’	<i>creitid</i> ‘believes’
L_	<i>derc</i> ‘red’	*

- Historically both short and long in intervocalic position, but development is contested (Martinet 1952, Kortlandt 1982, McCone 1996)

*Stops in Present-Day Gaelic: Ulster*

- Quiggin (1906): both voiceless and voiced stops are ‘fortis’ after a short vowel word-finally

- *gob* ‘beak’ [gob:], *brat* ‘flag’ [brat:]
- *abar* ‘mud’ [abər], *bata* ‘stick’ [batə]
- Wagner (1959):
  - After short vowels, long stops: *fada* ‘long’ [faD:ə], *beag* ‘small’ [b’əG], *capall* ‘horse’ [kaPəL], *muc* ‘pig’ [mɔK]
  - After long vowels, short stops: *óg* ‘young’ [o:g] (‘short or half-long’), *fágáil* ‘leaving’ [fa:gal’], *píopa* ‘pipe’ [p’i:pə]
  - Similar examples in LASID, but inconsistent
    - \* *scioból* ‘barn’: [ʃk’iBɔl] 86 Teelin, [ʃk’iBəl] 78 Rannafast
    - \* *leaba* ‘bed’: [L’a.bɪ] 85 Meenacharvy, [L’a.Bɪ] 79 Aranmore
- Ó Baoill (1979, 1980): both voiced and voiceless stops can be geminated, but unclear conditioning
  - Intervocalic /p t k/ always geminated (after a short vowel): *peacadh* ‘sin’ [p’hakk’uw]
  - Examples of long /b d g/ in final position: *beag* ‘small’ [b’ig:]
  - No general gemination after a short vowel?

## Our study

### Research questions

- Are |fortis| sonorants longer than |lenis| ones?
  - Across the board?
  - Does preceding vowel length play a role?
  - Does word-final position play a role?
- Is there a |fortis| vs. |lenis| distinction in stops independent of the |voiceless| vs. |voiced| distinction?
  - Are voiceless stops longer than voiced ones?
  - Does position play a role?
  - Are voiceless and voiced stops lengthened
    - \* After a short vowel?
    - \* Word-finally?

### Materials: the Doegen recordings

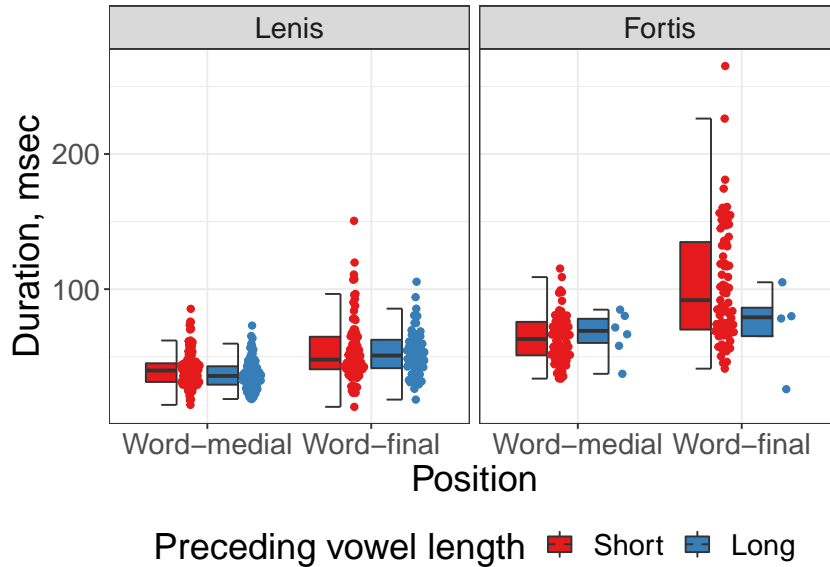
- Conducted between 1928–1931 with support from the Irish Government
- Ethnographic recordings on wax cylinders, transferred to shellac disks
- Now available <https://www.doegen.ie>, also as Ní Bhaoill (2010)
- Quality sufficient for some segmentation and thus study of durations

### Methods

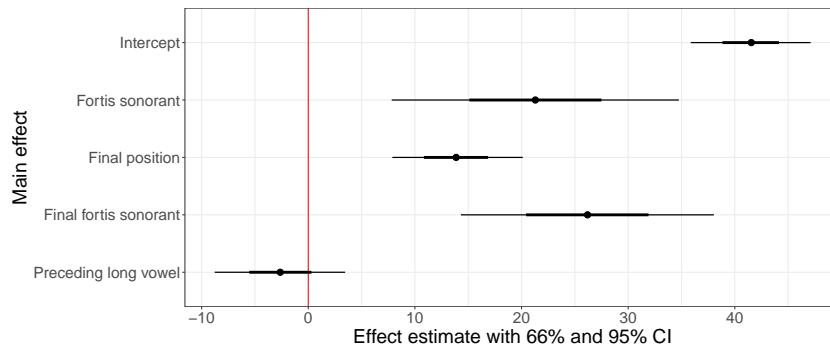
- Speakers from Donegal, currently 23 recordings from 9 speakers
- Preparation: background noise removal in Audacity
- Manual mark-up in Praat based on orthographic transcriptions provided

- Word-medial and word-final stops and sonorants marked up where possible
  - Spelling/etymology, given Ulster Irish is conservative
  - Morphophonology where appropriate
- Statistical analysis: Bayesian hierarchical regression with R package *brms* (Bürkner 2017, 2018)

*Results: sonorant duration*



*Results: analysis of sonorants*

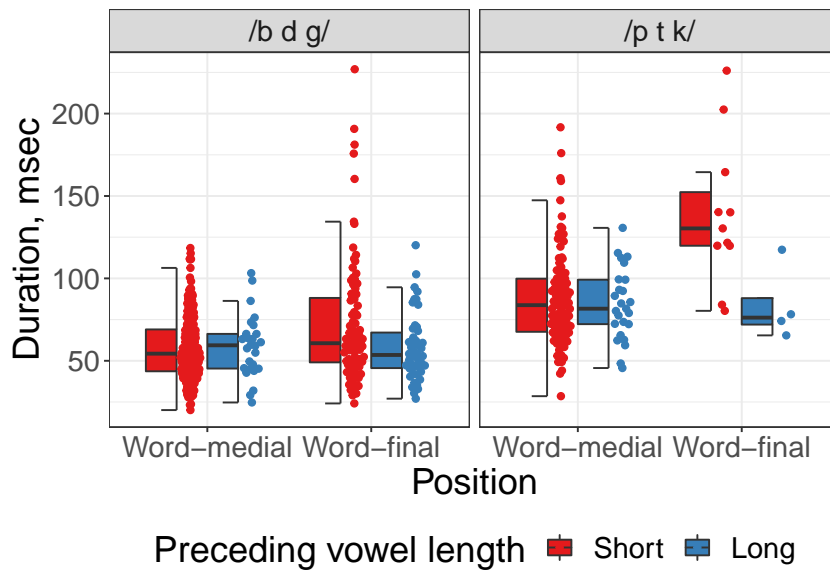


*Sonorant summary*

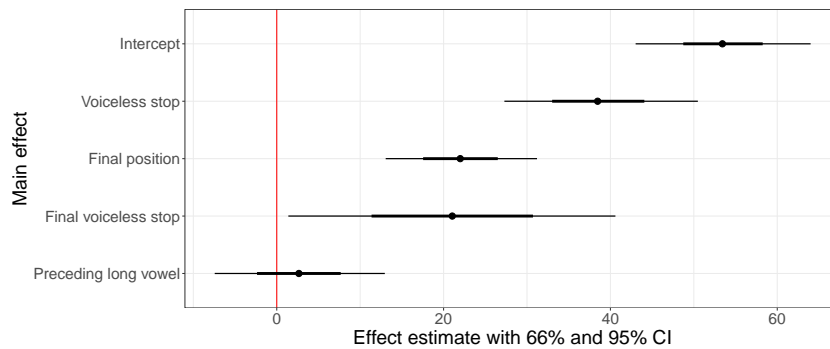
- [Fortis] sonorants are robustly longer than [lenis] sonorants
  - Confirms expectations and reconstructions
- Word-final sonorants are longer than word-medial sonorants
  - Likely precursor to compensatory lengthening patterns (Ó Baoill 1979)
- No clear role for preceding vowel length
  - Very few tokens of long vowel + [fortis] sonorants

- No fortition of sonorants after short vowels

*Results: stop duration*



*Results: analysis of stops*



(Figure excludes some non-significant interactions)

*Stops summary*

- Very similar results
- The /p t k/ series is generally longer than /b d g/
- Lengthening of both in final position, possibly especially with voiceless
  - Caveat: not too many stops, coding might not be very reliable
- No effect of preceding vowel length, *pace* Wagner in particular: no fortition after short vowels

*Why are the voiceless stops longer?*

- Cross-linguistically common, but the magnitude of the effect is comparatively large
  - About 40 msec word-medially, 60 msec word-finally in our data
    - \* Lebanese Arabic  $\approx$  20 msec (Al-Tamimi & Khattab 2018)
    - \* French  $\approx$  22 msec (Abdelli-Beruh 2004)
    - \* Russian  $\approx$  25 msec (Barry 2003)
    - \* English  $\approx$  20 msec (Stathopoulos & Weismer 1983)
  - Though comparable to Portuguese (Lousada, Jesus & Hall 2010), Serbian (Sokolovic-Perovic 2012), other results from English
  - More controlled study needed, but...

*Preaspiration?*

- Denoising removes both background noise and fricative noise: cannot distinguish closure from preaspiration
- Preaspiration in Gaoth Dobhair (Ní Chasaide 1986)
- Iosad (2020), FRLSU 2018: widespread across Gaelic languages

*Overall conclusion**Duration and fortis/lenis in Ulster Irish*

- Robust durational difference in word-medial and word-final position for sonorants
  - Intervocalic quantity in the Gaelic languages previously known only from impressionistic descriptions
    - \* Ulster Irish (Ó Baoill 1980)
    - \* Islay Gaelic (Holmer 1938)
- Large durational difference between voiceless and voiced stops
  - No independent fortis/lenis distinction
  - Possibly due primarily to preaspiration

*Historical interpretation: sonorants*

- Our data on fortis sonorants supports the reconstruction of Lewin (2020: pp. 327–328)
  1. Distinctive quantity both intervocalically and in the coda: Old Gaelic, Donegal, Islay (?)
  2. Shortening intervocalically but not word-finally: South Argyll (Jura, Colonsay), Manx
  3. Shortening in coda with compensatory lengthening, quality distinctions remain: Connacht, most of Scotland
  4. Loss of quality distinctions: Munster, Late Manx

*Historical interpretation: stops*

- We do not find evidence of quantitative allophony except that driven by final position
- Contrary to authors like Wagner (1959), no evidence of distinctively ‘fortis’ /b d g/, or for that matter ‘lenis’ /p t k/ at any stage
- No evidence that an independent ‘fortis’ / ‘lenis’ distinction is relevant to the phonetics and phonology of the Gaelic languages at any stage
  - If it was present in Old Gaelic, it was lost in the development to the present day
  - We suggest that it was never relevant: the /p t k/ vs. /b d g/ distinction is sufficient
  - Supports models like those of McCone (1996) over Martinet (1952); Jackson (1953)

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