

# Perception of Scottish Gaelic Alternating (Leniting) Consonants

Natasha Warner\*, Ian Clayton\*/\*\*, Andrew Carnie\*, Muriel Fisher\*, Dan Brenner\*, Michael Hammond\*, Diana Archangeli\*, Adam Ussishkin\*

\*Univ. Arizona, Tucson \*\*Boise State Univ.



## Introduction: Questions

- Scottish Gaelic, an endangered Celtic language, has alternations between sets of sounds such as /p<sup>h</sup>/~/f/, /t<sup>h</sup>/~/h/, /t<sup>h</sup>/~/j/ (Table).
- Traditionally called "Mutation" or "Consonant Lenition."
- These alternations appear to neutralize distinctions, since [f] could come from either a lenited /p<sup>h</sup>/ or an underlying /f/.
- Can listeners distinguish these sounds, or are they truly merged?
- Does having a word-onset alternation cause listeners to delay recognition of beginning of the word?

## Methods

- Materials prepared in Tucson Arizona with a native speaker.
- 24 native speakers of Scottish Gaelic, ages 19-69, most from Skye, participated in perception experiments in Scotland. 2 excluded for hearing loss or low accuracy.
- All speakers were monolingual in Gaelic until age 5-6, use Gaelic regularly now, and are literate in Gaelic.
- Matched sets (Table) were recorded by the speaker in Tucson.
- Stimuli were gated to present through target consonant, 2/3 through following vowel, and through the next consonant (Fig. 1). Number of gates was limited by fieldwork situation.
- Gate 1 too short to convey lexical information, Gate 2 contains some lexical information depending on coarticulation and lexical competitors, Gate 3 usually contains lexical information.
- Listeners saw orthographic responses on screen (e.g. *pac* – *phac* – *fàd*) and chose the best match by button box.

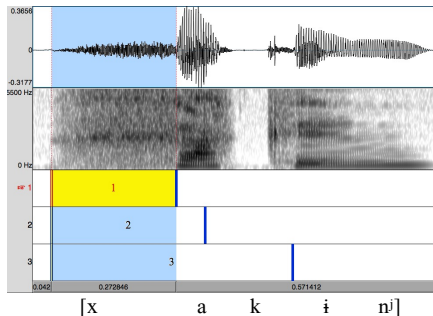


Fig. 1: Gates of lenited item "chagainn" 'chewed,' from unlenited "cagainn" (initial [k<sup>h</sup>]) 'chews'

**Gate 1:** Target C (and any preceding particle)

**Gate 2:** Target C and 2/3 of following V (to prevent perception of next C)

**Gate 3:** Target C plus following VC

	Unlenited	Lenited	Matched Underlying
No particle	pac [p <sup>h</sup> a <sup>h</sup> k] 'packs'	phac [fa <sup>h</sup> k] 'packed'	fàd [fat] 'peat'
	dirich [tirix] 'ascends'	dhirich [j/dʒirix] 'ascended'	dhibh [jiv] '??'
Particle	a peann [a p <sup>h</sup> a <sup>w</sup> n] 'his pen'	a pheann [a f <sup>h</sup> a <sup>w</sup> n] 'her pen'	a feannag [a f <sup>h</sup> a <sup>w</sup> nək] 'her crow'

Table: Sample stimulus items, each presented at 3 gates. Total items: 6 no-particle sets, 5 particle sets.

## Results

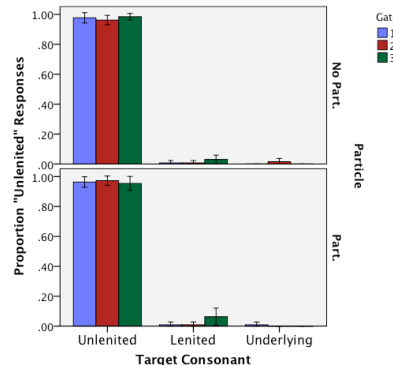


Fig. 2: Proportion choosing unlenited response (e.g. "pac").

- [p<sup>h</sup>] and [f] etc. are acoustically distinct, and Gaelic listeners can distinguish them.
- The morphological relationship between word pairs does not hinder use of acoustic information.

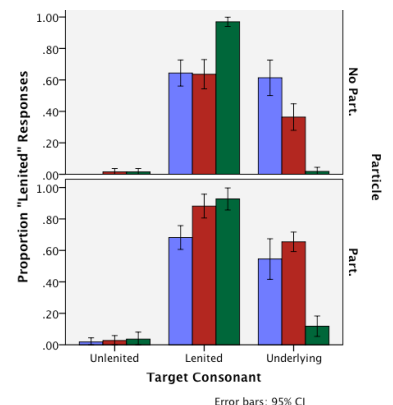


Fig. 3: Proportion choosing Lenited response (e.g. "phac")

- At Gate 1, listeners are (nearly) unable to distinguish lenited C's from matched underlying ones (significant only after a particle at  $p < .04$ ).
- By Gate 2, listeners choose "lenited" significantly more often for lenited C's.
- By Gate 3, the distinction is clear.

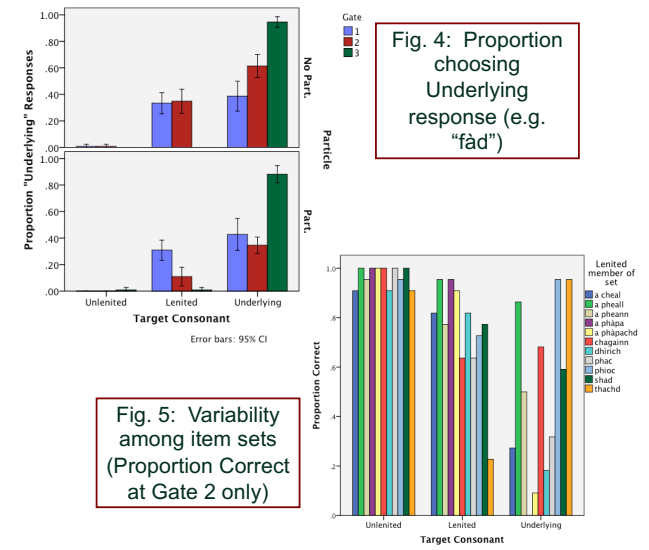
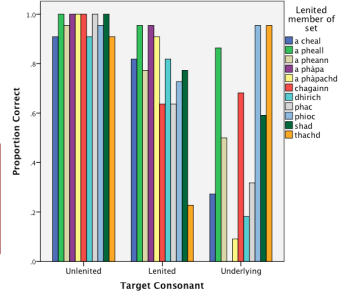


Fig. 4: Proportion choosing Underlying response (e.g. "fàd")

Fig. 5: Variability among item sets (Proportion Correct at Gate 2 only)



- Listeners can easily distinguish unlenited consonants (e.g. [p<sup>h</sup>, k<sup>h</sup>, t]) from the other two types (e.g. [f, x, j]), as one would expect based on the strong acoustic difference.
- Listeners cannot reliably determine whether a consonant comes from lenition or not (Lenited vs. matched Underlying) based on just the consonant. Neutralization is probably complete.
- Listeners have a slight bias toward lenited responses over underlying.
- There is great item variability (Fig. 5), probably reflecting when lexical information and coarticulation distinguish Lenition from Underlying for a given word pair.

## Discussion

- Acoustic information about the target consonant is not enough for listeners to distinguish the source of a potentially lenited consonant. Lexical information is necessary.
- Knowing that lenition could affect the word onset does not prevent accurate recognition of the initial sound (e.g. /p/ vs. /f/). Despite the prevalent word-onset alternation, listeners use acoustic information as it becomes available, as listeners of other languages do.
- This provides comparison data for Spoken Word Recognition tasks (open-response gating, priming) which we also carried out.

Acknowledgments:

Funded by a grant from the US National Science Foundation: BCS-1144318.

With thanks also to the Gaelic speakers who participated in the studies.