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Timing of Perceptual Cues in Scots Gaelic

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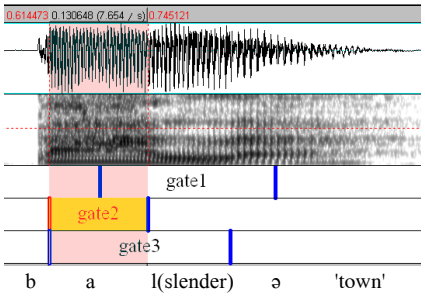
Introduction: Questions

- Scots Gaelic, an endangered Celtic language, has many cross-linguistically unusual sound distinctions.
- Can listeners hear the differences between them, and where in the signal are the perceptual cues located?
- Sound types tested: broad/slender consonants (~palatalization), nasalized fricatives, preaspirated vs. unaspirated stops, hiatus vs. short vowels, epenthetic vs. underlying vowels.

Methods

- Materials prepared in Tucson Arizona with a native speaker from Glendale, Skye.
- 16 native speakers of Scots Gaelic, ages 24-80, most from Skye, participated in perception experiments in Scotland.
- All speakers were monolingual in Gaelic until age 5-6 and use Gaelic regularly now, and are literate in Gelic.
- Matched pairs containing the target sounds (e.g. *baile* 'town' vs. *balach* 'boy' for slender vs. broad "l," *camhal* [v̄] 'camel' vs. *cabhagh* [v] 'hurry' for nasalized vs. oral fricative) were recorded by a native speaker in Tucson
- Stimuli were gated to present specific portions (e.g. preceding vowel with target consonant, preceding vowel only). Number of gates limited by fieldwork situation, chosen to target perceptual cue locations.
- Listeners saw orthographic responses on screen (e.g. *…aile…* and *…ala…* for broad/slender), chose the better match by button box or keyboard. Gates too short for use of lexical information.



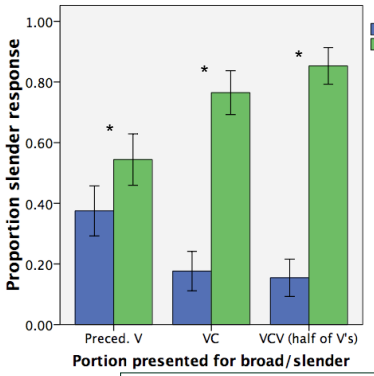
Gate 1: VCV (half of surrounding vowels to prevent word recognition)

Gate 2: Preceding V only

Gate 3: Preceding V plus target consonant

Fig. 1: Sample slender /l/ item

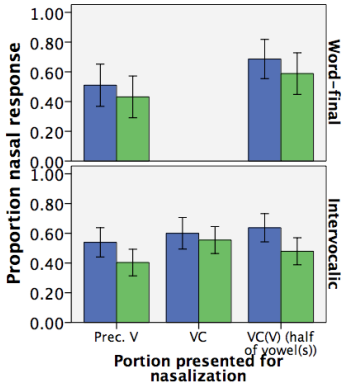
Results



Ex. balach 'boy'
Ex. baile 'town'

- Listeners can hear the distinction.
- The preceding vowel carries some perceptual cues.
- The consonant itself is the primary cue.

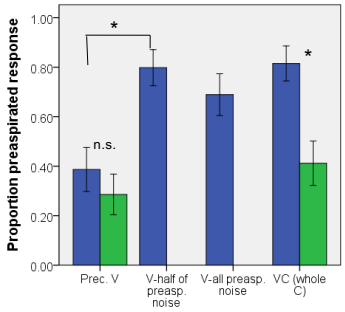
Fig. 2: Broad/slender results



Ex.: cambal [v̄] 'camel'
Ex.: cabhagh [v] 'hurry'

- Listeners may distinguish [v]/[v̄], [h]/[h̃], etc., but only marginally
- Some information is present in the preceding vowel
- No more information becomes available in the consonant

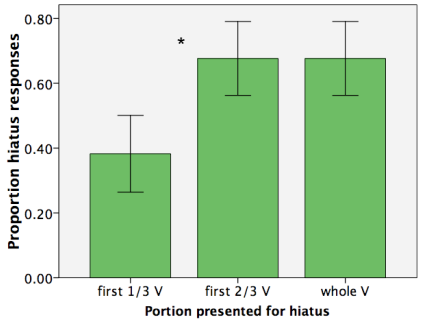
Fig. 3: Nasalized fricative results



Ex.: mac [ʰk] 'son'
Ex.: lag [k] 'hollow'

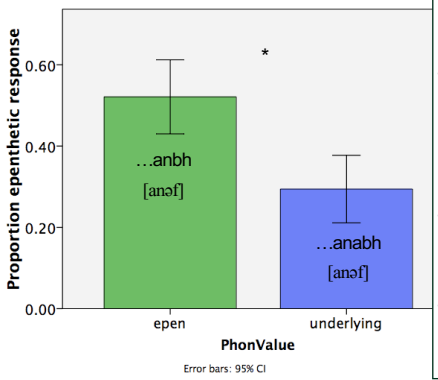
- Listeners can distinguish preaspirated from unaspirated stops
- The first half of the preaspiration noise is a sufficient perceptual cue
- The preceding vowel does not contain cues

Fig. 4: Preaspiration results



- Ex. adharc [ʌʌɾ̥k] 'horn' with responses 'adhar…' (hiatus VV) vs. 'ar…' (short V)
- Only hiatus words presented
- 2/3 of the vowel sequence is sufficient duration to be perceived as VV
- 1/3 of vowel sequence is not long enough, and full vowel does not increase identification

Figure 5: Hiatus (derived long vowels)



- VC(V)C with epen. vs. underlying [ə] presented
- Listeners responded with spelled (underlying) or non-spelled (epen.) vowel
- Listeners can distinguish epen. from underlying [ə]
- Similar result with non-words and open response task

Fig. 6: Epenthetic vs. underlying [ə]

Discussion

- Listeners are able to perceive all of the distinctions we tested.
- Perception of the nasal fricative distinction is extremely weak, matching aerodynamic data: the distinction is marginal and probably only in some of the fricatives (possibly [h/h̃] more than others). What cues do exist are present in the preceding vowel.
- Epenthetic and underlying vowels are perceptually distinct.
- Perceptual work on an endangered, unusual language provides information about how unusual distinctions are perceived, and combining this with acoustics and articulatory methods provides better information about how speakers represent distinctions.