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4 The Acquisition of Scottish Gaelic Phonology

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4.1 Introduction

Gaelic speakers today come from a wide variety of backgrounds and acquisition trajectories. For example, these could include simultaneous bilingualism, where two languages are acquired (near-)simultaneously from birth (Zurer Pearson 2009, p. 381); sequential bilingualism, where an additional language is acquired after a child has established the system for their first language (McLaughlin 1978); multilingualism (acquisition of three or more languages simultaneously or sequentially (Wrembel *et al.* 2019)); community transmission (acquisition where Gaelic was the main community language; see discussion in Munro *et al.* 2011); and adult second language learning (sequential bilingualism where the second language is acquired as an adult (Carty 2015; Bihan-Gallic 2020)). All these trajectories can be expected to have differing outcomes in terms of speech production and perception (see also the Introduction in this volume, and Chapter 1). Additionally, it appears that the role of personal identity aims is particularly strong in this minority language setting, which has implications for phonology.

This chapter is structured as follows: I begin by outlining the phonetic and phonological properties of Scottish Gaelic, focusing firstly on consonants and mutations, then vowels and prosody (Section 4.2). Secondly, the chapter covers methods used in research into the phonological acquisition of Gaelic, and I consider the quantitative/qualitative design of work, sampling, and statistics, as well as the age groups and proficiency levels considered. I also outline gaps in research to date and highlight methodologies used in other languages which could be fruitful for studies of Gaelic (Section 4.3). In Section 4.4, I consider the detail of previous work conducted in this area. The section is divided into work with children and work with adult new speakers as these types of multilinguals have differing acquisition trajectories and considerations for research. Section 4.5 outlines future directions for research in the area.

Throughout this chapter, I refer to the language 'Scottish Gaelic' as 'Gaelic' [galık], as is customary in the Gaelic-speaking community. The chapter

considers both *phonology* (the abstract system of sounds internalised and used by speakers) and *phonetics* (the implementation of that system by language users).

4.2 The Phonetic/Phonological System of Gaelic

The phonology of Gaelic differs from English in many ways. The phonological and phonetic properties of Gaelic in comparison to English are discussed here as most people acquiring Gaelic will also be acquiring English either simultaneously, near-simultaneously, or will have already acquired English. I firstly discuss the consonant system and word-initial consonant mutations, before discussing vowels and prosodic features.

4.2.1 Consonants

Table 4.1 gives an overview of the Gaelic consonant phonemes. The large Gaelic consonant system includes palatalised and non-palatalised consonants across most places and manners of articulation. These are often referred to as 'slender' and 'broad' consonants, respectively, in Celtic Studies academic literature as well as in Gaelic education materials (Byrne 2002; Ó Maolalaigh 2008). 'Slender' and 'broad' are conceptually helpful ways of describing consonants as the palatalisation processes in Gaelic include both 'full palatalisation', where a consonant changes primary place of articulation towards the palate, and 'secondary palatalisation', where the primary place of articulation is maintained, but an additional fronting and raising tongue gesture is included in the consonant articulation (Bateman 2011, p. 589). For example, in Gaelic, when /s/ is slender, it is typically realised as [ʃ] (full palatalisation). But when /n/ is palatalised, it is realised as [n̪ʲ] (secondary palatalisation). These realisations are reflected in Table 4.1 as phonemes.

The status of palatalised Gaelic labials is disputed and needs further phonological, articulatory, and perceptual analysis. For example, Borgstrøm (1940, p. 17) says that no labio(-dental) consonants have palatalised counterparts. Oftedal (1956, p. 102) suggests labial consonants combine with a palatal glide to give the impression of palatalisation. However, recent phonetic research on Irish indicates that /pʰ p f/ have palatalised counterparts in Irish (Ní Chiosáin & Padgett 2012), and Ladefoged *et al.* (1998) refer to these as palatalised in Gaelic. In Irish, broad consonants are often reported to be actively velarised (Ní Chasaide 1999, p. 35; Hickey 2014, p. 41). For example, *buí* 'yellow' /bˠi/ contrasts with *bí* 'be!' /bʲi/. This is not reported for Gaelic (Borgstrøm 1940, p. 17; Ladefoged *et al.* 1998, p. 3; Ternes 2006, p. 18), except in the case of laterals, (dental) nasals, and rhotics, which I now describe in detail.

Table 4.1 *Consonant system of Gaelic (Nance & Ó Maolalaigh 2021)*

	Bilabial		Labio-dental		Dental		Alveolar		Post-alveolar		Palatal		Velar		Glottal
Plosive	pʰ	p			t̪ʰ	t̪							kʰ	k	
	pʲʰ	pʲ							tʃʰ	tʃ	cʰ	c			
Nasal		m				n̪ˠ		n							
						n̪ʲ									
Tap/trill								r							
								rʲ							
								rˠ							
Fricative			f	v									x	ɣ	h
			fʲ				s		ʃ		ç				
Approximant															
												j			
Lateral approximant						l̪ˠ		l							
						l̪ʲ									

Laterals, (dental) nasals, and rhotics participate in a three-way phonemic contrast between palatalised (slender), broad (velarised in this case), and 'plain' phonemes without secondary articulations, that is three lateral phonemes /l̪ʲ l l̪ˠ/, three nasal phonemes /n̪ʲ n n̪ˠ/, and three rhotic phonemes /rʲ r rˠ/. Static palatographic research indicates that the palatalised and velarised laterals and nasals are produced as dental, rather than palatal (Shuken 1980; Ladefoged *et al.* 1998). In these three-way alternations, broad consonants are velarised, slender palatalised, and the plain realisation has no secondary articulations (Borgstrøm 1940; Oftedal 1956; Ternes 2006). The three-way system is hypothesised to be descended from a four-way alternation in Old Irish (Russell 1995, p. 76) (see also Ternes 2006, p. 19 for details of this historical change). There has previously been some debate as to whether all the phonemes described for Scottish Gaelic are still produced. For example, Ladefoged *et al.* (1998) did not find evidence of a distinct /n̪ˠ/ based on recordings from Lewis Gaelic speakers from Great Bernera. In a series of recent articulatory and acoustic studies, we have demonstrated that speakers of contemporary Lewis Gaelic do produce three-way contrasts in sonorants as already described (Nance & Kirkham 2020, 2022; Kirkham & Nance 2022).

In Table 4.1, the plosives are shown as either voiceless or aspirated, for example, /kʰ/ and /k/. Acoustic phonetic work has found no evidence of voicing in plosives (Ladefoged *et al.* 1998; Nance & Stuart-Smith 2013), and generally Gaelic has a tendency towards devoicing across the system (investigated in Nance & Kirkham 2020). In word-medial and word-final

positions, Gaelic-aspirated plosives are pre-aspirated (Ladefoged *et al.* 1998; Nance & Stuart-Smith 2013). In this respect, there is certainly cross over with varieties of English that some of those acquiring Gaelic will also acquire, due to long-term language contact. Shuken (1984, p. 158) notes pre-aspirated stops in her English-speaking participants, especially from the Outer Hebrides, and a detailed description of Hebridean English pre-aspiration is provided in Clayton (2017).

4.2.2 Mutations

As well as the complex consonant system described in Section 4.2.1, people acquiring Gaelic also need to learn a system of morphophonological alternations in word-initial consonants known as 'mutation'. Initial consonant mutations are a feature of all modern Celtic languages. In Gaelic, the system is relatively simple and only one type of mutation, known as 'lenition', is produced in all dialects, and taught in education. Lenition occurs in specific syntactic contexts such as the definite article (dative case), adjectives modifying a feminine noun, feminine singular nouns after the definite article (nominative case), and the vocative of proper nouns. For example, *am balach* 'the boy' but *leis a' **bh**alach* 'with the boy'; *donn* 'brown-haired', *caileag **dh**onn* 'a brown-haired girl'; *caileag* 'a girl' but *a' **ch**aileag* 'the girl'; *Seòras* 'George (nominative)' but *a **Sh**eòrais* 'George (vocative)'. For a full description of lenition contexts, see Byrne (2002) and Ó Maolalaigh (2008). The changes to lenited consonants are shown in Table 4.2 (for related sound files and examples, see Nance & Ó Maolalaigh 2021). All lenition changes are shown in orthography, except for in laterals, (dental) nasals, and rhotics. Where lenition is shown in orthography, this is indicated by an 'h', for example *muc* 'pig', *mo m**h**uc* (lenited) 'my pig'.

People acquiring Gaelic will also encounter a second mutation, eclipsis or nasalisation, which is not shown in orthography. Eclipsis in Gaelic generally affects initial consonants following a nasal consonant in a closely grammatically related item. The most common context for eclipsis is after the definite article *an* 'the' and it is especially salient in dental plosives, which become nasals in this context. For example, *an doras* 'the door' [ən nɔrəs]. Eclipsis is not realised in the same way across dialects, and not produced in every dialect. For further discussion of eclipsis in Gaelic, see Gillies (2009, p. 251) and Ó Maolalaigh (1996).

Table 4.2 *Initial consonant mutations (lenition) in Gaelic*

Phoneme (IPA)	p^h	p	$t̪^h$	$tʃ^h$	$t̪$	$tʃ$	k^h	c^h	k	c	m	f	s	ʃ	$l̪^j$	$n̪^j$	r^j	$l̪^ɣ$	$n̪^ɣ$	$r^ɣ$
Lenited (IPA)	f	v	h	h	ɣ	j	x	ç	ɣ	j	v	Ø	h	ç	l	n	r	l	n	r

Table 4.3 *Gaelic oral monophthongs and diphthongs*

Short monophthongs	i	e	ɛ	a	ɔ	o	u	ɤ	ɯ	
Long monophthongs	iː	eː	ɛː	aː	ɔː	oː	uː	ɤː	ɯː	
Diphthongs	ei	ui	əi	ai	ɔu	au	iə	ia	uə	ua

4.2.3 Vowels

Gaelic has nine oral monophthongs which also contrast phonemically for length (Ladefoged *et al.* 1998; Nance 2011). These are shown in Table 4.3. Many of the vowels are similar to those Gaelic speakers will also be acquiring, or will have acquired, in English with the exception of the back unrounded vowels /ɤ ɤː ɯ ɯː/. In their realisation, these vowels are phonetically central, rather than strictly back (Borgstrøm 1940, p. 11; Ladefoged *et al.* 1998; Nance 2011). Long vowels are shown by a grave accent in Gaelic orthography, for example *tè* 'woman' /tʃʰeː/, compared to *teth* 'hot' /tʃʰe/. Gaelic has ten diphthongs, shown in Table 4.3 (Oftedal 1956, p. 44; Nance & Ó Maolalaigh 2021).

Some vowels in Gaelic are nasalised, and this is considered a phonemic aspect to the language in works such as Borgstrøm (1940) and Oftedal (1956). However, even in these classic works which aimed to capture the most traditional varieties of Gaelic from speakers born in the nineteenth century, there seems to have been considerable variation present. Oftedal refers to vowel nasalisation as 'one of the most elusive features' of Gaelic phonology (Oftedal 1956, p. 40). Recent work indicates that nasalisation varies according to dialect and age of speakers. Lewis dialects appear to have greater vowel nasalisation, and older speakers are more likely to use vowel nasalisation (Nance & Moran 2022). The dialectal surveys of Oftedal and Borgstrøm suggest that all the monophthongs in Table 4.3, and some diphthongs, can be considered to also have nasal phoneme counterparts. In contemporary Gaelic, it seems more appropriate to say that nasalisation is common in some words, for some speakers, in some areas. For examples and sound files see Nance & Ó Maolalaigh (2021).

4.2.4 Prosody

Gaelic prosody (i.e., aspects of phonology involving units beyond vowels and consonants) differs substantially from English in many aspects. There is also variation depending on dialect and sociolinguistic factors such as age. Here, I first discuss features relating to syllable structure, before turning to stress, tone, and intonation. Traditional varieties of Gaelic are reported to have a VC syllable structure, instead of the typologically much more common CV

pattern (Clements 1986; Bosch 1998; Smith 1999). Syllable structure has implications for two groups of words which behave unusually within Gaelic phonology: words containing *svarabhakti* vowels, and words containing *hiatus*. Svarabhakti vowels are vowels not shown in orthography which are inserted in certain consonant sequences. They occur in consonant clusters after a short vowel followed by a sonorant and another non-homorganic consonant which is not a pre-aspirated plosive (Bosch & De Jong 1997; Hall 2006; Nance & Ó Maolalaigh 2021). Phonetically, the svarabhakti vowel is usually a copy of the preceding vowel, for example *Alba* 'Scotland' [alˠ**a**pə], *dorcha* 'dark' [t̪ɔr**ɔ**xə]. Hiatus occurs in words where historic intervocalic consonants are now no longer produced. Due to the VC syllable structure of Gaelic, a syllable break now occurs across the hiatus. Phonetically, this is realised as an inserted glide, period of creaky voicing, or tonal contrast in Lewis (see below) (Holmer 1938; Ternes 2006). For example, a word containing hiatus such as *lea**bh**ar* 'book' [l̪ʲɔ.ər] contrasts with *gu leòr* 'enough' [kə l̪ʲɔːr].

Some dialects of Gaelic have a lexical pitch accent system comparable to the ones in Norwegian and Swedish dialects. This system is used in traditional forms of north-western island dialects such as Lewis (Borgstrøm 1940; Ladefoged *et al.* 1998; Nance 2015b) and historically north-west mainland dialects such as Applecross (Ternes 2006). In the Gaelic system, monosyllabic words have a rising or high pitch, and polysyllabic words have a falling, high, or rise–falling pitch, see Figure 4.1. Contrasts with hiatus words and svarabhakti vowels can lead to near-minimal tone pairs. For example, *bò* 'cow' [poː] (monosyllabic accent) and *bogha* 'rockpool' [po.ə] (polysyllabic accent due to hiatus). Similarly, *falbh* 'going' [falˠav] contains a svarabhakti vowel and

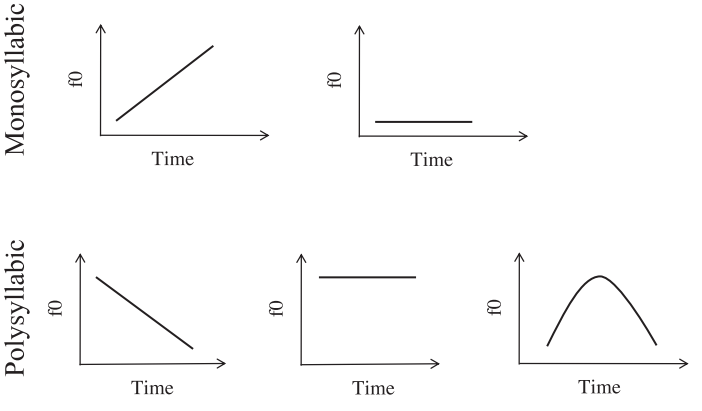

Figure 4.1 Schematic representation of lexical pitch accents in Lewis Gaelic.

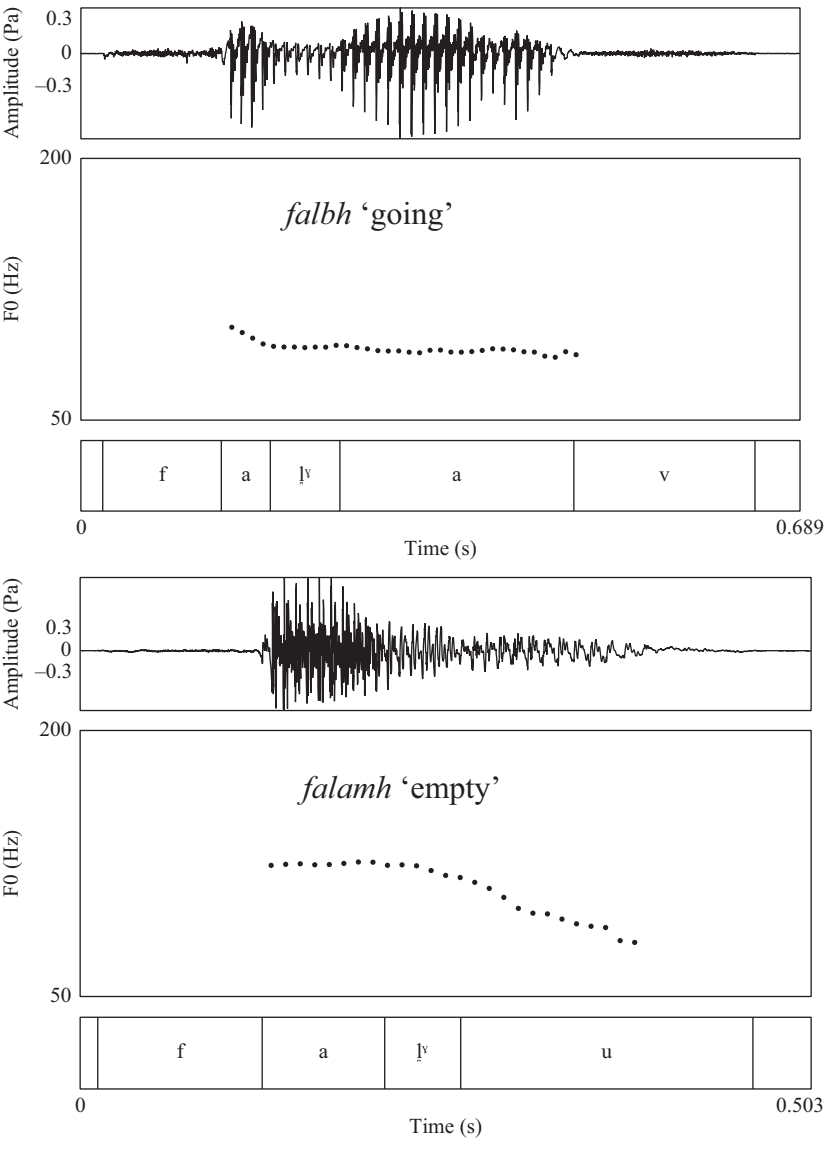

Figure 4.2 Pitch contrast in Lewis Gaelic between *falbh* ‘going’ and *falamh* ‘empty’.

behaves as a monosyllabic word, whereas *falamh* ‘empty’ [fal̪ˠ.u] has the polysyllabic accent. Pitch contours exemplifying this are in Figure 4.2. The data and sound files for this example are available in Nance and Ó Maolalaigh

(2021). While older speakers from Lewis use this lexical pitch accent system throughout their Gaelic, this is not the case with younger speakers (Nance 2015b). I discuss this in more detail in Section 4.4.1.

Stress is mainly placed on the first syllable in Gaelic words. Exceptions include borrowings such as *buntàta* 'potatoes' [punˈt̪ʰaːʰt̪ə], and some nouns and adverbs which are compounds of two separate elements, for example *Didòmhnaich* 'Sunday' [tʃiˈtõniç] (a compound borrowed from Latin *dies Dominica* 'Day of the Lord'). Sentence-level intonation has not been studied in detail for Gaelic using contemporary intonational frameworks such as Autosegmental Metrical analysis. However, the default pattern in declaratives is reported to be a fall in pitch, and if the phrase-final word ends in a rising tone, then this rise reduced (Borgstrøm 1940, p. 53; Oftedal 1956; Dorian 1978; MacAulay 1979).

4.3 Methods Used to Study the Acquisition of Gaelic Phonology/ Phonetics

Having given a short introduction to the phonological structure and phonetic patterns that people acquiring Gaelic are likely to encounter, I now turn to methods and studies in the area of Gaelic phonological acquisition. The acquisition of Gaelic phonology has mainly been studied from a quantitative perspective comparing samples of different groups of speakers. Studies have aimed to compare phonetics and phonology in different contexts such as differing locations, and different trajectories of acquisition. Vihman (2014, p. 14) identifies three main approaches in the study of child phonological acquisition: (1) Individual or small-group production studies. These can either be in the form of 'diary' studies where a family member keeps a diary of a child's speech behaviour, or a detailed observational study by a researcher (e.g., Zharkova 2005). (2) Larger group studies of production (single timepoint or longitudinal, see Section 4.4 for examples). (3) Experiments eliciting speech perception judgements. These could include eye tracking (e.g., Desmeules-Trudel *et al.* 2020), measurement of brain activity through Event-Related Potentials (ERPs, for example Andersson *et al.* 2023), or for older participants, speech perception tasks such as Two Alternative Forced Choice in response to audio stimuli. In this kind of task, listeners have to make a choice between two phonemes from an ambiguous stimulus. For example, listeners might have to choose between /t/ and /d/ when presented with stimuli containing a range of Voice Onset Times (e.g., McCarthy *et al.* 2014). For adult participants, it is more typical to either consider a larger number of participants from a speech production or speech perception perspective (see production examples in Section 4.4). Sometimes, elicited production data are then rated by listeners for perceptions of phonological proficiency (e.g., Trofimovich & Baker 2006).

So far, Gaelic phonological acquisition has been only considered from the second approach identified by Vihman (2014) discussed in the preceding paragraph. Currently, there is no work on the acquisition of perception. The speech production studies published so far have favoured collecting data from a larger number of speakers at a single timepoint in order to make comparisons, rather than focusing on a detailed, longitudinal design from a smaller number of participants. In Gaelic research, a large naturalistic corpus, including data from young children acquiring Gaelic, was collected during a long-term observational study and analysed in Smith-Christmas (2012, 2016). However, these studies are conducted from the point of view of code-switching research and family language policy in bilingual families rather than phonological acquisition.

No work in Gaelic phonology so far has considered phonological acquisition in a larger-scale longitudinal perspective either. This would be a welcome addition to the literature. For example, it is common for advanced L2 users of Gaelic to have spent an immersion year at the Gaelic college Sabhal Mòr Ostaig (part of the University of the Highlands and Islands). To give an indication of the popularity of this course, and its success in enabling speakers to become fluent Gaelic users, half of the advanced L2 users in McLeod *et al.* (2014) had completed this course. Research in other languages has given fruitful insights into the language interactions in study abroad/immersion participants in terms of acquisition of locally meaningful sociolinguistic variation (Linford *et al.* 2021), and also multidirectional language interaction in multilinguals over time (Kartushina & Martin 2019). Such projects have exploited a longitudinal design with data collection before and after a study abroad year, as well as during the study abroad in some cases (Kartushina & Martin 2019).

Most work in Gaelic phonetics and phonology has considered data elicited via a word list, rather than a corpus study of naturalistic speech. For example, in Nance (2020), children were asked to produce single words in Gaelic and English after looking at an orthographic and picture representation presented on a card. Similarly, Nance (2014) also used word list data for a detailed investigation of lateral acquisition by Gaelic-speaking adolescents. However, data from sociolinguistic interviews were used to provide analysis of more naturalistic speech in Nance (2013, 2015a) and Nance *et al.* (2016). In these studies, either data were extracted for acoustic analysis of vowels or auditory coding was carried out on entire intonational phrases or specific consonants.

In terms of the linguistic analysis performed, studies have generally focused on a subset of Gaelic phonology in order to make detailed acoustic comparisons of differing speakers. The variables chosen have reflected typologically unusual aspects of Gaelic phonology, or ones

which are not shared with English, in order to see what speakers do in comparison to the majority language of Scotland/Canada. For example, the lateral system was considered in Nance (2014, 2015, 2020, 2021). Tone and intonation are examined in Nance (2015b) and Nance (2015a), rhotics in Nance *et al.* (2016), pre-aspiration in Nance and Moran (2022) and Nance and Stuart-Smith (2013), and nasal vowels and dialectal lexical/phonological variants in Nance and Moran (2022). These studies have focused on Gaelic, rather than bilingual Gaelic and English in general, though see Nance (2020) for acoustic comparison of both languages from the same speakers. In each case, acoustic values are analysed using inferential statistics such as linear/logistic mixed effects regression modelling, or conditional inference trees.

Different research projects so far have aimed to target different ages of speakers with differing acquisition trajectories in order to provide an overview of the Gaelic-speaking community. For example, Nance (2015) and Nance and Moran (2022) aimed to document the Gaelic of young people in Glasgow. This was achieved by comparing a sample of Glasgow adolescent speech to a sample of adolescent speech from a traditional dialect area, the Isle of Lewis. Similarly, Nance (2020) recorded different children in order to compare those who used Gaelic at home with one parent, two parents, grandparents, or no family members. Focusing on adult new speakers of Gaelic, Nance *et al.* (2016) aimed to uncover individual trajectories of acquisition, motivation, and language use. This was achieved by coupling quantitative analysis of speech with qualitative analysis of participant narratives of accent aim. Similar qualitative analysis to explain quantitative patterns is employed in Nance and Moran (2022).

Recruiting (relatively) large sample sizes needed for quantitative analysis is always going to be a challenge in the context of a minority language. Indeed, McEwan-Fujita (2020, p. 45) discusses 'research fatigue' among Gaelic speakers who become (understandably) wary of researchers who are not perceived to be giving back to the community. Due to the near lack of intergenerational transmission, even in island communities, it is extremely difficult to recruit young people outwith educational settings. For these reasons, studies focusing on young people have been conducted within Gaelic Medium Education (GME) settings, for example Nance (2013) and Nance (2020). Adult new speakers have been recruited via personal contacts and the community in McLeod *et al.* (2014) and Nance *et al.* (2016).

It is often difficult to make conclusions about a group's behaviour without some kind of 'baseline' or 'control' value. In many of the studies conducted so far, older traditional dialect speakers from the Outer Hebrides have been used as a baseline, for example Nance (2021) and Nance *et al.* (2016). This is not unproblematic as it implies that someone

acquiring Gaelic phonology ought to be aiming for a traditional dialect model, which is not necessarily desirable, relevant, or realistic for all speakers. However, in a quantitative paradigm it is difficult to demonstrate that a particular group is doing something new and innovative without comparison to a baseline value. In typical designs for bilingualism or multilingualism studies, the bi-/multilingual population are compared to monolingual speakers of the languages under consideration. This is not possible in the context of Gaelic as only the very old and very young could be considered 'monolingual' in Gaelic. However, perhaps Gaelic research is leading in this respect: recent position pieces in multilingualism studies have highlighted the extent of individual differences in multilingual acquisition and argue that comparison to 'monolingual' standards is empirically invalid as well as stifling progress in the field (Rothman *et al.* 2023).

4.4 Existing Studies on the Acquisition of Gaelic Phonology

4.4.1 Child Studies

Several previous works have attempted to ascertain the impact of home language background, age, acquisition trajectory, location, and social identity on the acquisition of phonetics and phonology among Gaelic speakers. For example, Nance (2020) considered the acquisition of laterals and pre-aspiration among children aged seven to eleven in GME on the Isle of Lewis. These variables were chosen as Gaelic differs from English phonology in both of these aspects. As described in Section 4.2.1, Gaelic has three phonemic laterals /l̪ˠ l l̪ʲ/, while English has only /l/. In terms of plosives, Gaelic contrasts aspirated and unaspirated, and in word-medial position the aspirated stops are pre-aspirated, that is /ʰp ʰt ʰk p t k/. In English, plosives are voiced or voiceless, that is /p t k b d g/ (though some pre-aspiration is reported in Lewis English due to contact with Gaelic (Shuken 1984)).

The sample size for this study was relatively small, eighteen children, but these represented almost the entire cohort of children at the school concerned. Nance investigated Gaelic phonetics and phonology in children from four language backgrounds: children with (1) no Gaelic-speaking family, (2) Gaelic-speaking grandparents, (3) Gaelic-speaking grandparents and one parent, and (4) Gaelic-speaking grandparents and two Gaelic-speaking parents. She did not find significant differences among the children investigated here, suggesting that differences due to age of input and acquisition trajectory appear to be levelled out in terms of phonology by the time children are aged more than seven. Nance suggests that instead for these pre-teen children, their social identity focus shifts towards integration into the peer group leading to

similarities in pronunciation which override differing bilingual backgrounds (Eckert 2008). Similar results have been reported for other minority languages such as the Welsh of teenagers studied in Mayr *et al.* (2017) (see also Chapter 6 in this volume). Decades of sociolinguistic research have demonstrated the importance of peer group identity on speech (Eckert 2000; Drager 2011; Kirkham & Moore 2013) so it is perhaps unsurprising that these results are also found in minority language-speaking young people.

In terms of the linguistic analysis in this study, children in GME produced the plosive system as is described for traditional varieties of Gaelic as already outlined. This indicates that children as young as seven have fully acquired the aspiration contrasts. For laterals, the children did not produce the distinction between alveolar and palatalised laterals, that is they produced a two-way lateral contrast instead of the traditional three-way distinction. There were some differences for age as well: seven-year-old children have less velarisation in their velarised laterals (higher F2−F1 acoustic values; 'F1' and 'F2' refer to acoustic characteristics of voiced sounds, which can be used to differentiate sounds produced with different tongue positions). Nance (2020) argues that the phonetic implementation differences for seven-year-olds might be developmental in nature. In terms of the phonological contrasts, it could be the case that children in minority language education acquire complex systems later on in development (Thomas *et al.* 2014; Kennard 2018), or it could be the case that a new generation of GME Gaelic-speakers are producing a slightly different system. Future research will be needed in order to test these hypotheses.

Slightly older young people are investigated in a series of studies (Nance 2013, 2014, 2015b, 2015a, 2018; Nance & Moran 2022). Here, Nance compares adolescents aged thirteen to fourteen in Glasgow and on the Isle of Lewis to older traditional speakers (aged sixty to eighty) from Lewis. The aim here was to investigate the extent to which language revitalisation measures are leading to new varieties of Gaelic developing. Nance investigated intonation, laterals, and vowels. In each case, she shows that young people in Glasgow are using different productions from young people in Lewis, and that they sound distinctly Glaswegian. For example, in Nance (2014, p. 15), results indicate differences between Glasgow young Gaelic speakers and young Gaelic speakers from the Isle of Lewis. Specifically, Glasgow speakers produce all their Gaelic laterals in a manner closer to the expected dark lateral in Glasgow English (more velarisation as measured by smaller F2−F1 values), while the young Lewis speakers produce their Gaelic laterals in a manner similar to the expected clear lateral in Lewis English (higher F2−F1 values). Nance argues that Glasgow Gaelic cannot yet be considered a new 'dialect' of Gaelic as it is not yet being transmitted via families on any large scale in Glasgow (Kerswill & Williams 2000). Instead, new young people enter GME each year and acquire a distinctly Glaswegian variety of the language. In the majority of

cases, young Glaswegians do reproduce the traditional phonology of the language, for example producing distinctions between /l̪ l l̪ʲ/, though this was not always the case among all Glasgow young people.

In terms of tone and intonation, the results in Nance (2015b) were divided by generation rather than location: in traditional Lewis Gaelic, a lexical pitch accent system is used, where monosyllabic words have one pitch pattern, and polysyllabic words have another (see Section 4.2.4). Nance's studies show that while this system is produced by speakers from Lewis aged over sixty, teenagers in Lewis do not use the lexical word accents at all, and neither do young people in Glasgow, even though they had substantial input from Lewis dialect speakers during their education (Nance 2015a, 2015b). Nance attributes the loss of this aspect of phonology to the changes accelerated by language obsolescence. In the case of lexical pitch accents, there are some near-minimal pairs differentiated by lexical pitch accent, for example *bò* 'cow' [poː] (monosyllabic accent) and *bogha* 'rockpool' [po.ə] (polysyllabic accent due to hiatus), as already described. However, many of the words involved in these contrasts are infrequent (e.g., *bogha*) so the contrast effectively bears little functional load. In contexts of language obsolescence and revitalisation, it has been suggested that contrasts bearing least functional load are susceptible to loss (Andersen 1982; Jones 1998, p. 250). Similarly, the direction of changes in these sociolinguistic contexts is often shaped by the dominant language: English has no lexical pitch accent system, making this aspect of Gaelic a likely candidate for change (Campbell & Muntzel 1989, p. 186; King *et al.* 2009).

Nance and Moran (2022) consider pre-aspiration, phonemic vowel length, nasal vowels, and Lewis dialect shibboleths in their comparison of adolescents in Lewis and Glasgow, and speakers aged over sixty from Lewis. The results are considered in the context of place identity construction in minority language revitalisation, especially in Glasgow, which is not considered part of Gaelic's more recent 'heartland' areas, though has been home to a migrant Gaelic-speaking population for hundreds of years (Withers 1998). Nance and Moran compare young people in Glasgow to young people in Lewis, and also older speakers in Lewis as Lewis is the dialect of the majority of teachers who were working with the Glasgow young people at the time. Through auditory phonetic analysis, Nance and Moran demonstrate that young people in Glasgow produce fewer audibly nasal vowels than young people in Lewis, who produce fewer again than traditional older speakers. Similar to lexical pitch accents already described, phonemic nasalisation carries little functional load and Gaelic is subject to considerable dialectal and individual variation as discussed in Section 4.2.3. It is likely that these factors explain the low rates of nasalisation produced by younger speakers.

Nance and Moran (2022) also carried out auditory analysis of Lewis dialect shibboleths. This refers to pronunciation in a subset of words which are widely recognised as associated with the Lewis dialect (enregistered). For example, the word for 'milk' in Gaelic, *bainne*, is pronounced [paɲʲə] in many dialects of Gaelic, but pronouncing this word as [pɔɲʲə] is instantly recognisable as a feature of Lewis dialect. The analysis indicates that while Lewis older speakers used dialectal pronunciations most of the time, Lewis younger speakers usually preferred supra-regional forms, and Glasgow young speakers did not produce any Lewis dialect forms. Through qualitative analysis of sociolinguistic interviews about attitudes to dialects, as well as personal conceptions of place and accent, Nance and Moran argue that Glasgow speakers are developing a place identity which is new for Gaelic (McLeod 2017).

4.4.2 Adult New Speakers

Adult new speakers (adult L2 users) are considered in Nance *et al.* (2016) (see also Chapter 1 in this volume for discussion and fuller definition of 'new speakers'). This study analyses interview data collected for McLeod *et al.* (2014), which aimed to document and qualitatively analyse the narratives of fluent new speaker adults in Glasgow and Edinburgh. This population is often politically active and highly involved in the Gaelic community. For example, participants in this study worked as Gaelic language officers, translators, authors, and teachers of Gaelic. They were from a diverse background, including lowland Scotland, highland Scotland, but also Ireland, Germany, the USA, and Hong Kong. Nance *et al.* (2016) consider the production of rhotics in Gaelic. As described in Section 4.2.1, Gaelic traditionally contrasts /rʲ r rˠ/, and these are often produced as palatalised/plain/velarised taps, or rhotic fricatives (Nance & Kirkham 2022). Nance *et al.* (2016) analysed the production of palatalised and plain rhotics only, as velarised rhotics are comparatively rare in naturalistic speech. They found that adult new speakers usually produced the phonemic contrast between palatalised and plain rhotics, but also identity factors were very important for this population, as described in detail in the next paragraph.

At times, speech production reflected the first language background of the speakers, but this was not the only determining factor, as explored in case studies of three individuals: 'Ben' aims for a traditional dialect variety of Gaelic, and the quantitative analysis of his speech shows he uses a proportion of palatalised fricative/rhotic productions which is near-identical to the traditional speakers used as a comparison to the new speakers in this study. Conversely, 'Polly' states that a traditional dialect model would be inauthentic for her, as she has never visited areas with a high proportion of Gaelic speakers.

Analysis of her rhotics in Gaelic indicates greater influence from her first language, North American English, and includes a high proportion of strongly rhotic vowels. 'David' specifically aims to acquire a dialect of Gaelic which has few or no remaining traditional speakers. His Gaelic rhotics do not reflect his first language, Glasgow English, where substantial derhoticisation could be expected and is demonstrated by other Glasgow speakers in the data set. The authors suggest that in the context of learning a minority language to expert levels of proficiency, these new speakers have often made conscious choices about their accent and are able to deploy this as a resource in their speech production above and beyond the impact of cross-linguistic influence from their language-learning background.

4.5 Future Directions

The research discussed in this chapter indicates that there are still gaps in our understanding of how Gaelic phonetics and phonology are acquired. One particular gap concerns speech perception, which has not been investigated. In terms of the literature on bilingual/multilingual phonetics and phonology, perception is often investigated as the primary indicator to whether someone has acquired a particular sound system. Indeed, models such as the Speech Learning Model and the Perceptual Assimilation Model of L2 speech learning suggest that perception would precede production (Best & Tyler 2007; Flege & Bohn 2021). The extent to which Gaelic users acquire the ability to hear sounds in Gaelic must therefore be investigated as an indication of the acquisition of phonology. Similarly, while the studies discussed in Section 4.4 have considered children, adolescents, and adults, they have not so far considered the acquisition of phonology in early childhood and infanthood. While it would be difficult to build a relatively large sample size, much could be learned from a smaller-scale in-depth longitudinal study such as that described in Yip and Matthews (2007) for Cantonese–English bilingual children. Due to the relatively large numbers of children now in GME, there will of course be children with additional support needs in this group. The acquisition of Gaelic phonology, and any additional support needed by such students, needs further research as the sector expands and develops (MacQuarrie & Lyon 2018).

In terms of adult communities, Gaelic speakers come from diverse backgrounds as discussed in Section 4.4.2 (see also Chapter 1). Future work could consider these in more detail as it is certain that differing speakers will bring new identity aims and influences to their phonology from different perspectives. For example, it is now relatively common to acquire Gaelic in the context of intensive undergraduate courses at universities such as Glasgow, Edinburgh,

Aberdeen, and University of the Highlands and Islands. Future work could follow such speakers as they acquire phonology throughout their university degrees. While Gaelic sociolinguistic work has considered those using and acquiring Gaelic in Canada (Dunmore 2021), their phonology has not been studied in detail yet.

New speakers come from diverse linguistic backgrounds, yet work on Gaelic has not yet considered the impact of different previously acquired languages on speech production and perception. As discussed in Section 4.4.2, it is relatively common for adults from Germany, the Netherlands, or Ireland to acquire Gaelic as an L3 (McLeod & O'Rourke 2017). In such contexts, we would expect cross-linguistic influence from the speakers' first and second languages into Gaelic (Wrembel 2010); however, this is likely to be mediated by motivation and identity aims (Nance *et al.* 2016). The extent and balance of these factors is yet to be fully investigated. Similar to new speakers, heritage speakers change their language use patterns and language dominance over the lifespan. This group has not been investigated in terms of the acquisition of phonetics and phonology.

4.6 Conclusions

This chapter has considered the possible outcomes of phonetic and phonological acquisition among different sectors of the Gaelic-speaking community. A recurring theme throughout the chapter has been the diversity of Gaelic speakers, and the wide variety of acquisition trajectories. While some phonological outcomes are predictable from this variety of acquisition trajectories, such as the likelihood of cross-linguistic influence in multilingual speakers, other factors are related to the speakers themselves. For example, I have noted throughout that the high levels of motivation and linguistic awareness in members of this minority language community make it even more likely that individuals to some extent choose their own linguistic output (unconsciously or consciously). Hopefully, future research along the lines identified in Section 4.5 will be able to track further developments and also cater to the educational and cultural needs of the community.

4.7 References

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