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## Acquisition of Scottish English Phonology: an overview

James M. Scobbie, Olga B. Gordeeva, Ben Matthews

### 1. Overview

Scottish English is usually characterized as “a language continuum from Broad Scots to Scottish Standard English” (Corbett, McClure & Stuart-Smith, 2003, p.2). A 1996 survey preparatory to the 2001 census by the General Register Office (Scotland) estimated that about 30% of the Scottish population use (Broad) Scots to some extent, rising to 90% in the North East. The linguistic situation on the ground is complicated somewhat by population movement and dialect contact (as well as uncertainty about what constitutes Scots or Scottish Standard English (SSE) in the first place).

Scots derives from the Anglian variety of Old English spoken in the 6<sup>th</sup> century, and varies regionally, whereas SSE is far more homogenous geographically. Scots speakers still tend only to be exposed in childhood to a Scottish English continuum which is rooted in their own local variety of Scots and so are not influenced much by other geographically delimited broad varieties. This continuum is of course just one aspect of sociolinguistic variation and is itself always undergoing language change: large differences should be expected between older more conservative speakers and the young as well as regionally and socio-economically. In the urban setting, local housing variation means that adjacent neighbourhoods may have markedly different linguistic profiles. Even the two ends of the Scots-SSE continuum are largely mutually intelligible, though mastery of SSE will not prepare someone new to Scotland (or indeed naïve Scots themselves) for the difficulties they will face in understanding a broad speaker from an unfamiliar area.

In general, the closely-related varieties of Scottish English can be thought of as being parallel with — but independent from — the other Englishes of the UK, but with their own national focus, however vague that is. The size, proximity and influence of England, as well as population movements mean, however, that historically and synchronically, the Scottish English continuum is attracted towards its English neighbour.

### 2. Countries where Scottish English is spoken

Scottish English is spoken in Scotland, one of the constituent countries of the United Kingdom of Great Britain and Northern Ireland (UK). At the time of the 2001 census, 87% of the 5,062,011 Scottish population had been born in Scotland, while about 8% of the Scottish population (approx 0.4m) had been born in England. In the UK as a whole, 5,229,364 million residents (9.2%) had been born in Scotland: so 84% of people born in Scotland live there. In England, 408,948 (1%) had been born in Scotland, (the majority living in London and the

South East). The Scots tongue spread to Ulster through emigration and settlement, so Scottish English and Ulster Scots share a number of features. How many people speak Scottish English is unknown, but a rough estimate would be between 4 and 5 million.

Population data from *Born Abroad* <http://bbc.co.uk> and *SCROL* [www.scrol.gov.uk](http://www.scrol.gov.uk) based on 2001 census data.

### 3. Components of Scottish English

The major authorities on the pronunciation of contemporary adult (including adolescent) Scots and Scottish English whose works are most accessible and appropriate for our readership are Stuart-Smith, Johnston, Macafee and Macaulay. We will give specific references to these researchers' work where most relevant, but for more information on much of the adult material presented here, for useful summaries of Scottish English, for detailed exposition of their extensive empirical research, and not least for further references on Scottish English, see bibliography and references therein.

#### 3.1. Consonants

Scottish English has 25 phonemes and is most closely related to English as spoken in England (see Table 1). Worthy of note are [ç]~[χ] (/x/) and [ʌ] (here /hw/, hence not in Table 1, but often analysed as a 26<sup>th</sup> phoneme /ʌ/). These consonants are rather peripheral to the phonological system (Scobbie & Stuart-Smith, in press) and are low frequency (Macafee, 1983; Macafee, 1994; Stuart-Smith, 2003) though well-exemplified by minimal pairs such as *loch* - *lock* and *witch* - *which*. More controversial is [ʔ], included because it is such an extremely common phone (structurally an allophone of /t/ in medial and final positions) that it is used almost categorically for /t/ in those positions by many broad speakers, a long-standing pattern in the central belt. While a trilled /r/ in adult broad Scots is typical, on the whole Scottish English /r/ is nowadays often an approximant; indeed see below for discussion of further weakening of the rhotic. Any single IPA symbol for the phoneme in Table 1 is over-simplistic: in the text we use phonemic /r/ for convenience. Johnston (1997) says /l/ is characteristically dark ([ɫ]) in all positions, sometimes strongly pharyngealized, though Highland English and some northern and south western Scots varieties have a clear /l/. The "alveolar" stops /t, d, n/ are often dental. The strident fricatives display a fair amount of variation in their placement (Johnston, 1997; Stuart-Smith and Timmins, in press b). /θ, ð/ are being replaced by /f, v/ among (broad) younger speakers, whereas in the north /θ, ð/ remain peripheral phonemes (Johnston, 1997; Stuart-Smith and Timmins, in press a). Stops are still common in the northern isles, for example. Further south, in traditional Scots, /θ/ was replaced by /h/ and /ð/ was absent, particularly in pronouns and determiners, but as with so many other formally phonological patterns, fossilisation and lexicalisation is what is found in the contemporary situation rather than strictly phonological or phonotactic patterning (Macafee, 1994), though it is still common in the north (J. Smith, p.c.).

Table 1. Consonants produced in Scottish English

	Bilabial	Labiodental	Dental	Alveolar	Post alveolar	Retroflex	Palatal	Velar	Uvular	Phar	Glottal
Plosive	p <sup>h</sup> b <sub>ɓ</sub>			t <sup>h</sup> d <sub>ɓ</sub>				k <sup>h</sup> ɡ <sub>ɓ</sub>			(ʔ)
Nasal	m			n				ŋ			
Trill											
Tap or flap											
Fricative		f v	(θ ð)	s z	ʃ ʒ			(x)			h
Lateral fricative											
Approx	w (labial-velar)				r		j				
Lateral approx				ɬ							
Affricate					tʃ dʒ						

Black = articulations judged impossible

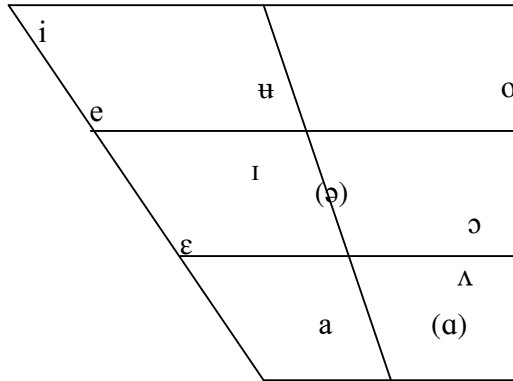
Based on the International Phonetic Alphabet.

Acknowledgement is made to the International Phonetic Association (c/o Department of Linguistics, University of Victoria, Victoria, British Columbia, Canada).

### 3.2. Vowels and diphthongs

Abercrombie (1979) is an excellent starting point for considering the vowel systems of Scottish English. In his scheme there are thirteen vowel phonemes in Scottish Standard English. Ten of them are monophthongs (see Figure 1), of which /ə/ (schwa) appears only in unstressed syllables. /ɪ, ε, ʌ/ mainly appear in closed syllables. There are three diphthongs /ai, ʌu, œ/. An unstressed word-final vowel (e.g. in *happy, baby*) tends to be [e]-like. The Scottish vowel system is small for English because it has maintained post-vocalic /r/ (but see below), however it might be both larger and less like other varieties if we were to accept that the quasi-phonemic contrast of the Scottish Vowel Length Rule (SVLR) establishes three extra phonemes by splitting /i, u, œ/ into “long” and “short” variants, of which more below.

Figure 1 Scottish English vowel monophthongs



SSE vowels differ from Southern Standard British English (SSBE) in their phonetic realization (Figure 1), their system, and in their lexical incidence. Table 2 summarizes the phonemic (and some significant allophonic) correspondences between the systems, thus addressing the first two points of difference. We have departed in some respects from traditional SSBE transcriptions to highlight similarities and dissimilarities between the systems (and see the section below on common mismatches).

Note that widespread variation in phonetic targets even *within* SSE are found, for example in /ʌ/ (cf. also the endpoint of /ʌʊ/), which is highly variable, especially in the front-back dimension; in /ɪ/ which may be further lowered and backed or raised and fronted; and in the diphthongs /ʌʊ/, /ʌi/ and /ɑ:e/ which may start from a higher or lower point. A minority of SSE speakers have the phonemic contrast /a/ versus /ɑ/, but it is far more common to have just one low vowel /a/ with two allophones (see below), which may have a large phonetic distance between them. The vowels in *face* and *goat* are monophthongs ([fes], [gɔt]). In the latter, /o/ is a (raised) close-mid back vowel with no tendency to front, and strong breaking before /n/ is common (cf. *phone*, *don't* as near disyllabic [fo.ən] [do.ənʔ]).

Table 2. The SSE system of vowel phonemes and major allophones, with representative phonetic labels, compared to the phonemic system of SSBE.

English Examples	Scottish Standard English (SSE)	Southern Standard British English (SSBE)
<i>greed / greet / niece</i>	i	i ↔ i:
<i>agreed / sea / freeze</i>	i:	
<i>grade / greyed / great / say</i>	e ↔ e:	ei
<i>bid</i>	ɪ ↔ ə	ɪ
<i>bed</i>	ɛ	ɛ
<i>Pam</i>	a ↔ ɑ	a
<i>palm</i>	a ↔ ɑ / ɒ	ɑ
<i>shah</i>		
<i>cot</i>	ɔ	ɒ
<i>caught</i>		ɔ ↔ ɒ
<i>coat / code / flowed / sew</i>	o ↔ o:	əʊ
<i>put</i>	ʊ	ʊ
<i>brood / brute / Bruce</i>		u ↔ u:
<i>brewed / bruise / moo</i>	ʊ:	
<i>queue</i>	ju:	ju:
<i>but</i>	ʌ	ʌ
<i>side / price</i>	ʌi	æe
<i>sighed / prize</i>	ɑ:e	
<i>bough</i>	ʌʊ	ɑu
<i>boy</i>	ɔe	ɔe

*Note. An arrow indicates a particularly notable range of productions; a slash separates two categorical alternatives. The SSBE symbols are not typical of the literature, and reflect a compromise between phonetic accuracy and a desire to stress the similarities and dissimilarities with SSE phonetic targets from a Scottish English perspective.*

The low vowel /a/ is complex. In many speakers either a tauto-syllabic post-vocalic /r/ or a word-final open syllable conditions a backish [ɑ], categorically distinct from the very different [a] in *hat*. Less systematically, speakers at the SSE end of the continuum may extend the allophonic distribution of [ɑ] into contexts (at least in some common words) where /a/ precedes a voiceless fricative (*bath, grass*). Among broader speakers, a more homogenous allophony occurs, in which /a/ in *hat* tends to be central or backish, and, especially in the north east of Scotland, extremely similar to the vowel in *car*. However, in Glasgow it may be that even vernacular speakers are developing a categorical front/back *hat/car* allophony (Stuart-Smith, 1999, p. 208). This categoricalness and the phonetic extent of the vowel allophony are important due to the post-vocalic /r/ situation (see the following

paragraph and also section X below): strong categorical allophony is likely to lead to the creation of a new phoneme /ɑ/ (or perhaps /ɑː/) if /ɪ/ is lost, making a future merger between such pairs as *cat* and *cart* as /kat/ less likely.

Vowels in rhotic contexts are presented separately (Table 3), because though post-vocalic /r/ has had only a small effect on the vowel inventory to date, this may change rapidly if the highly derhoticised variants of /r/ described in detail by Stuart-Smith become established (see below). The two crucial factors needed to redefine Scottish English a non-rhotic system with vocalized /r/ are phonetic de-rhoticisation of coda /r/ plus consequential changes in the vowel system. The main thing to be noted about the contemporary situation is the large number of vowel phonemes that are still possible before /r/. More conservative speakers might even have a full set. If /r/ is derhoticised, a centering diphthong with a uvular or pharyngeal quality will generally be the result. This may ultimately lead to mergers and other effects similar to those that have previously occurred in SSBE, at which time these vowels could be phonological diphthongs rather than phonological vowel+/r/ sequences with strong transitions and weak rhoticity.

As things stand, we do not seem to have reached that stage. Even so, and in clearly rhotic speakers, there are nevertheless some typical vowel mergers, and these are indicated in Table 3. An extra dimension to variation arises because broader rhotic Scottish English tends not to rigidly distinguish /er/ from /ɛr/, or less so /ɔr/ from /or/, either neutralizing the contrast or using /o/ and /ɛ/ in some of the lexemes where /ɔ/ or /e/ are used by other speakers, e.g., *border* as [bɔɪdɔɪ] (homophonous with *boarder*) instead of [bɔɪdɔɪ] or *air* as [ɛɪ] (homophonous with *err*) instead of [eɪ]. This distribution of /ɛr/ in particular is quite salient and may be stigmatized (cf. Macafee, 1994, pp. 225-226)

Table 3. The SSE vowel system for monophthongal rhotic contexts compared to SSBE.

English Examples	Scottish Standard English (SSE)	Southern Standard British English (SSBE)
<i>near</i>	ɪr	iə ↔ ɪ:
<i>bear</i>	er / ɛr	eə ↔ ɛ:
<i>bird</i>		
<i>word</i>	ʌr ↔ ər	ɜ:
<i>heard</i>	ɛr / ʌr ↔ ər	
<i>bard</i>	ɑr	ɑ:
<i>cord</i>	ɔr / or	
<i>board</i>	or	ɔ: ↔ o:
<i>tour</i>	ʊr	
<i>cure</i>	jʊr	ʊə
<i>fire</i>	ɑ:ɛr	æə
<i>hour</i>	ʌʊr	ɑʊə
<i>coir</i>	ɔɪr	ɔiə

Post-vocalic /l/ also impacts on vowel phonetics, because it can be very dark, and because it may lack alveolar contact and be rounded. Strong breaking occurs before /l/ after fronter/higher vowels making *feel*, *fail*, *fool* sound disyllabic ([fi:əɫ], [fe:əɫ], [fʊ:əɫ], or, if /l/ is non-alveolar, then something like [fi:əɫ̥] or [fi:ɔ] etc. The vowel inventory may be regarded as altered if the vocalized /l/ is phonologically a vowel, by definition (cf. non-rhotic English), but currently some consonantal reflex of /l/ seems to be always present. Yet even if final (non-alveolar) /l/ is phonologically consonantal, the pairs *foe*, *foal* can be so nearly homophonous ([fo:] vs. [fo:̥] or [fo:w]) that the difference is hard to hear, and similar but lesser difficulties pertain to *law*, *loll* ([lɔ:] vs. [lɔ:ɫ]). If both /r/ and /l/ are very weak, then there might appear to be scope for *foal* and *four* to merge with *foe*, since all are similar to [fo:], but a phonetic distance seems to be maintained at present, the precise nature of which remains to be investigated. The absolute absence of /l/ after historical /a/ in broad Scots (e.g. *ball*, *fall*, where the vowel may be either /a/ or /ɔ/ depending on the dialect) is a separate phenomenon.

Scottish Standard English and many Scots dialects feature a highly systematic allophonic distribution of duration on word-final stressed vowels conditioned by post-vocalic consonantal voicing and manner of articulation (Aitken, 1981; Scobbie, Hewlett & Turk, 1999a; Scobbie, Turk & Hewlett, 1999b). This has been labeled the “Scottish Vowel Length Rule” (SVLR) (Aitken, 1981). SVLR applies primarily to the vowels /i/, /ʊ/, /ʌi/. In closed word-final syllables the long variant is conditioned by a post-vocalic voiced fricative or /r/: all other consonants condition short vowels. Open syllables also condition long variants. This makes possible a morphological function for duration: word-final open syllables for these three vowels are long (e.g., *brew*) and they remain so even if suffixed (e.g., *brewed*). The

differences in application between the phonological and morphological conditioning factors creates a “quasi-phonemic contrast” in a limited number of words like *brood* (short) versus *brewed* (long) (Scobbie & Stuart-Smith, in press), who also point out that word-internal SVLR (in words like *crisis*, *lycra*, *spider*) is far more complex and/or unpredictable.

As for longer term settings, one phenomenon prevalent among young vernacular speakers is that their vowels may be heavily nasalized. Also relevant is that urban working class speech may be characterised auditorily as sounding pharyngeal (Esling, 1978; Stuart-Smith, 1999).

As mentioned, one complex aspect of the Scots-SSE continuum is the variation in lexical incidence of vowels, which, though infrequent overall, is highly salient. For example, the choice between broad /ʌ/ and more standard /Λʌ/ is restricted to a set of high frequency words such as *down*, *out*, *about*, etc. (Macafee, 1994; Stuart-Smith, 2003). Even more restricted mini-regularities abound, involving some different lexical splits than those implied by Table 2, for example *stone*, *floor* have /o/ in SSE, whereas in many broader varieties they have /e/. In Northern Insular Scots, *saw* has /a/ instead of /ɔ/; and so on. /a/ rather than /ɔ/ may be found after /w/ (*wad*, *wander*) and in some broad varieties which kept a consonantal /l/ (*ball*, *wall*). In North East Scots, SSE /ʌ/ can be /wi/, e.g. *school* /skwil/. Such differences (many and various) cause great problems of analysis and for materials preparation.

### 3.3. Phonotactic restrictions

Generally speaking Scottish English shares a lexicon with other British English varieties but many (especially older) speakers have extensive additional Scots lexis. The structure of syllables and phonotactic restrictions on the syllable onsets and codas are largely the same.

### 3.4. Syllables

A more phonological pattern than the strong breaking mentioned above arises because of the way that Scottish English avoids coda /rɪ/, /rɪm/, /lɪm/ clusters. Instead of these clusters, Scottish English tends to have CVC sequence, making homophonous pairs such as *pearl/peril* ([pɛrɪɾ]). Compared to other varieties, there is an extra weak syllable in *world*, *farm* or *film* ([wʌrɛɾɫɔ̃], [fʌrɛɾɫɔ̃], [fɪɾɪɾɫɔ̃]). Such extra syllables are phonotactically obligatory in broader speech, but may be lexicalized in SSE.

There is some regional variability in the syllabic structure. In Shetland dialect, there is a strong tendency towards a CVCC versus CVVC rhyme pattern throughout the vocabulary such as in *fatt* ‘fat’ versus *faat* ‘fault’ ascribed to the historical ‘Scandinavian’ Norn influence on the syllable structure (van Leyden, 2004).

### 3.5. Consonants and consonants clusters

Consonant clusters are generally like British English. Onset /hw/ is still common in “wh” words, and /x/ is limited to codas. In more conservative, especially older broad speakers, /x/ still appears in clusters (e.g., in *daughter* [dɔxtɛɾ]) (Marshall, 2004; Smith 2005). Word-initial /nj/ may be absent (so that *news* has plain /n/) while *tune* and *dune* typically have /tʃ/ and /dʒ/ rather than /tj/ and /dj/. Initial /tr/ and /dr/ are often also post-alveolar affricates, but

rhoticised ones. /r/, generally an approximant, may appear as a tap medially in trochaic position (*carry*) or in initial labial clusters. In older or broader speakers a trill or tap is likely to be more common in prevocalic contexts (Marshall, 2004) but “counter to American stereotypes of what a Scottish accent is like, [a trill] is now sporadic at best” (Johnston, 1997, p. 510). Aspiration of /p, t, k/ may be generally light, and some Scots varieties may have /p/ as a voiceless unaspirated fortis stop and /b/ as a lenis fully voiced stop. The norm for coda and ambisyllabic /t/ is often [ʔ] in the central belt of Glasgow and Edinburgh, in fact “we could even say obligatory for working class adolescents” in Glasgow (Stuart-Smith, 1993, p. 125) but is less common elsewhere, such as in the “heartlands” of Scots, such as rural Buchan (Marshall, 2004, p. 130), where it appears to be an innovation, and in SSE, where it is merely optional. On the other hand, a short *voiced* stop for /t/ (not a flap) is not uncommon in ambisyllabic position. Final devoicing of obstruents is characteristic, leading in some cases (even in SSE) to /z/ being completely voiceless and /s/ being pre-aspirated (Gordeeva & Scobbie, 2004). Ejective variants of word-final stops are common (typically /k/, especially after /ŋ/, but /pt/ and even ejective variants of /bdg/ have been systematically observed in both adult and child speech). The appearance of ejectives is highly influenced by sentence prosody: with phrase-final ejectives being most frequent; although they also occur in non-final phrasal positions (Gordeeva & Scobbie, 2006). Ejective realisation seems to be a distinct type of stop glottalisation in a hyper-articulated mode of communication, which additionally reinforces the place and manner of articulation of the stops.

Reference was made above to post-vocalic /r/ being less overtly rhotic among younger vernacular speakers than either middle class speakers or older vernacular speech. This is quite distinct from the adoption of categorically non-rhotic productions by SSE speakers under influence from English as spoken in England. Rather, younger vernacular speakers in the central belt (at least) have an acoustically weak articulation of /r/ as a central vocoids, apparently with pharyngeal qualities (Romaine, 1978; Speitel & Johnston, 1983; Stuart-Smith, 2003). As a result, many vowel+/r/ sequences sound like diphthongs and /ar/ and /er/ may be monophthongal [ɑ:] and [ɛ:]. The actual articulation of the /r/ itself is highly variable and articulatorily complex: we have ourselves observed some clearly retroflex articulations in (near-)monophthongal productions of *car*, *cart* and *card* (using ultrasound tongue imaging) which are not detectable auditorily and have little effect on the formants (Scobbie and Stuart-Smith, 2005). This is quite unlike truly non-rhotic varieties in which any such obvious reflex of /r/ is absent. This whole Scottish situation is likely to be unstable. Post-vocalic /r/ in word-internal unstressed syllables is often completely absent, so that spelling is the only clue to its supposed existence.

Coda /l/ is dark, and may “vocalize” by losing alveolar contact in a quite radical way (Scobbie & Wrench, 2003), but a simple transcription such as [ʎ], [ɣ], or [ʎ̥] fails to convey the impressionistically lateral-sounding quality which is possible for this type of coda /l/: it can be very hard to distinguish from a very dark alveolar [ɫ] in which case is not like the very rounded vocalized /l/, common in SE England but less so among Scottish adults. Rounded or [o]-like vocalization of /l/ is considered below, since it seems to be more prevalent in younger speakers (Stuart-Smith, Timmins and Tweedie, in press). The effect on tautosyllabic vowels is considered above. In connected speech word-final /r/ and /l/ occur as onset-like consonants before vowels, as sandhi alternants, a process which can be strongly categorical.

### 3.6. *Stress and intonation*

Scottish English is a stress-accent language. It uses duration, spectral characteristics and loudness to a greater extent than pitch to encode the differences between stressed and unstressed syllables. Pitch conveys intonational meaning, and intonational events are generally aligned with stressed syllables.

The intonational system of Scottish English shows important regional variability. Most notable is that in Glasgow and western Scotland statements are pronounced as rises or rise-falls (Mayo, 1996; Ladd, 1996) in the final nuclear accent. This differs from high-rising intonation of “up-talk” statements in that the rise is preceded (and followed) by low pitch turning points. The dialect of Orkney features an accent-lending rise on pre-nuclear accents in statements which phonetically is shifted to a later position, in fact into the unstressed syllable (van Leyden, 2004) resulting in a fall during the stressed syllable. This dipping/rising pattern is sometimes impressionistically described as “sing-song” intonation and also Welsh English (Munro, Ball & Müller, in press). Speakers of the Anstruther variety from the East coast of Fife produce a gradually falling slope towards the end of the intonational phrase (Auferbeck, 2003). It differs from the nuclear slope in Southern British English, where it involves a sharp pitch change immediately after the nuclear syllable to the floor level of a speaker.

### 3.7. *Writing system*

The writing system of Scottish English is largely the same as for other British English varieties, but Scots has a range of local orthographic variants which attempt to capture phonetic and phonological aspects of the variety, especially when they diverge from SSE. An example of West Coast Scots is “Everhin, but everhin, wis ma fault. Anen it caught lik an unwanted fire. Afore lang evrubdy wis sayin it. Faimly. Mates. Schuilmaisters.” (MacDonald, 2003:1), who also uses “gemme” *game*, “thoosan” *thousand* and “hame” *home* to reflect Scottish lexical incidence of /ɛ ʌ e/ respectively. An example of North East Scots is “Bit o luck wis it nae, the skweel veesitin the Hame last wick, an me findin oot that Syd Paterson, their newest pensioner, wis ma verra ain Granda!” (Blackhall, 2003:1). Other aspects of Doric from Blackhall are “een” /in/ *eyes*, “fit” /fiʔ/ *what*, “eneuch” /ə<sup>1</sup>njux/ *enough*. Though there is a strong and vibrant literary tradition, as evidenced by such modern writing in “dense” Scots, nevertheless for many speakers Scots is an oral variety, and any attempt to write it may elicit bafflement or hilarity.

## 4. **Varieties of Scottish English**

Variation in Scottish English has been highlighted throughout this paper. As well as social variation, geographical variation is particularly relevant to Broad Scots, which is usually divided into a number of geographical sub-varieties (cf. for a very detailed account Johnston, 1997). Scots speaker often claim use of one of these varieties, rather than of “Scots” itself, and while rural varieties have a generally positive image, urban varieties (e.g., Glaswegian) have been excoriated by Scottish and non-Scottish observers alike, and often mistaken for degenerate English. Scots are often defensive and critical in their attitude towards broad Scottish speech, and inaccurate in their intuitions and reporting of their own system under the influence of literacy, social attitudes, and partial systemization of other varieties, a situation with clear clinical implications. They may also be inconsistent in production. Stylistic variation and the process of accommodation may be particularly important in the therapeutic setting, however, and cause difficulties in carry-over of linguistic skills learned in the therapeutic context into “real life”.

## 5. A quantitative summary of typical acquisition of Scottish English

Bearing in mind the issues about variation and change which have been highlighted above, we should expect Scottish English to be comparable to other similar English varieties with respect to the acquisition of consonants (though see Scobbie, 2005). The vowel system, however, is different enough to warrant no such assumptions. Moreover, it is the vowel system which is most subject to interference between Scottish English or Scots and other varieties, most commonly the vowel system of English as spoken in England (Howard, in press).

Scobbie, Hewlett and Turk (1999a) quantified the potential for Anglo-English parental influence. They examined the birth registrations from 1997 for children born into an “executive” or “professional” family with a parent who was Scottish, English or mixed Scottish/English from (comprising about 75% of the total) in Scotland’s two largest cities. In Glasgow, 12% of such children have at least one English parent, but this figure rises to almost a quarter in Edinburgh (633/2728). The 2001 census shows that 13.5% of all Scottish households have multiple countries of birth. The actual effects of parental dialect on a Scottish child’s vowel system are highly complex and have only been studied to shed light on specific theoretical questions, not to provide a broad descriptive picture (Hewlett, Matthews and Scobbie, 1999). The flexibility of individuals and their context means that the specific outcomes of dialect mixture for a given individual are impossible to predict, but their results (and see also Scobbie, 2005) suggest that areas such as the SVLR where Scottish and English systems are incompatible are liable to most interference. Diphthongization of /e/ and /o/ as well as SSBE-style non-rhoticity is likely. Smith (2003-5) will reveal a great deal about acquisition in NE Scots. Some initial results relevant to morphophonology are presented by Watt and Smith (2004).

### 5.1. Acquired sounds

The *Edinburgh articulation test (EAT)* (Anthony, Bogle, Ingram, & McIsaac, 1971) was standardized on 510 Scottish children, a process which showed that EAT scores are conditioned by the subject’s age; but social class, birth rank and sex matter hardly or not at all at the level of detail investigated.

#### 5.1.1. Consonants

Normal age of acquisition (based on 90% correct) ages are presented in Table 4 for various consonants based on the work of Anthony et al. (1971).

Table 4. Age of phonetic acquisition of consonants by 90% of children (Anthony et al., 1971)

Consonant	Anthony et al. (1971)
p	3;0-3;5
b	3;0-3;5
m	3;0-3;5
t	3;0-3;5
d	3;0-3;5
n	3;0-3;5
k	3;6-3;11
g	3;6-3;11
ŋ	3;6-3;11
f	3;6-3;11
v	3;6-3;11
θ	After 6;0
ð	After 6;0
s	5;6-5;11
z	5;6-5;11
ʃ	5;6-5;11
ʒ	5;6-5;11
tʃ	After 6;0
dʒ	After 6;0
h	3;6-4;0
w	3;0-3;5
r	After 6;0
l	4;6-4;11
j	3;0-3;11

### 5.1.2. Consonant clusters

Typical age of acquisition for a variety of consonant clusters can be worked out from Table 6 below, depending on the criteria chosen.

### 5.1.3. Vowels and diphthongs

In general terms, Anthony et al., (1971, p. 12) say a “stabilised vowel system” is acquired by age 3. Below that age, Matthews (2001) reports substantial phonetic variation in the realisations of vowels of seven children aged 1;9 to 2;10. Different children had different easy and difficult vowels, but of particular note, the vowels /ʌ/ and /Λʌ/ remained non-adult-like throughout (mean 63.8% of adult-like realizations for /ʌ/). By the age of 3;4 to 4;9 the percentage of /ʌ/ vowels remaining non-adult-like phonetically has fallen to 17% (Gordeeva, 2005). The residual non-adult-like production involved lowering and backing to [ʊ] (11.8%), backing to [u] (4.3%) and lip unrounding (0.9%). The vowels which Matthews found were best acquired were far less consistent, but the following five feature most often in his lists of

most accurate vowels per subject-session: /a ʌ i ɔ ʌ/ (in descending order of adult like ranking).

On the other hand, because a vowel system is not merely its list of phonemes, it should not be surprising that particularly important non-phonemic vowel targets appear early. Matthews (2001) shows (in an instrumental study) that allophonic [a] versus [ɑ] are established structurally very early (under 2;1) in two of the three children examined (though this may be related to the fact that /ar/ and /ɔr/ are merged by two of them), as are the allophonic SVLR durational variants of /ʌi/ and /ɑ:e/. The appropriate quality difference seems also to be establishing itself well in all three children. Interestingly, there is no statistically significant difference in duration between [i] and [i:] even by 2;6, though there is a suggestive trend in the right direction. Gordeeva (2005) shows that SVLR is acquired by the age of 3;4, based on results from an acoustic study of vowel duration of seven SSE aged 3;4 to 4;9. Native Scots are less likely to acquire a strong SVLR system if they have non-Scottish parents (Hewlett et al., 1999; Scobbie, 2005). Further information on vowels will come from Smith (2003-2005).

## **5.2. Percent correct**

Anthony et al. (1971) in the *EAT* handbook provides very useful figures on all test items for % correct at different ages. The standardized *EAT* was a refinement of a preliminary test applied to 130 normally developing and 57 speech-retarded children “of high economic status and superior intelligence”, which provides useful differential information on which consonants and clusters vary most by age (for those two groups studied) (see Tables 4-6).

### 5.2.1. Consonants

In addition to the figures presented in Howard (in press), it is useful to look in more detail at the age grading of the less-readily acquired consonants from the *EAT*, particularly since these include the important consonants prevocalic /r/, /θ/ and medial /ð/ (Table 5).

Table 5 Percentage correct for those consonants which do not reach 90% by age 4;6 (apart from /j/ and /l/ in *yellow* which are particularly prone to consonant harmony) (Anthony et al., 1971)

	Word	Word position	3;0	3;6	4;0	4;6	5;0	5;6
v	<i>glove</i>	final	54	70	89	84	83	94
r	<i>red</i>	initial	49	63	65	76	81	86
z	<i>scissors</i>	medial	40	46	65	70	73	74
ð	<i>feather</i>	medial	44	30	53	65	68	81
tʃ	<i>chimney</i>	initial	22	44	63	64	71	58
s	<i>Christmas</i>	final	24	40	53	60	66	67
dʒ	<i>bridge</i>	final	21	28	55	55	68	77
dʒ	<i>garage</i>	final	24	22	51	52	64	86
tʃ	<i>watch</i>	final	18	29	58	51	70	72
ʃ	<i>sugar</i>	initial	15	37	49	48	59	76
ʃ	<i>toothbrush</i>	final	15	19	55	47	66	85
ʃ	<i>fish</i>	final	21	26	59	46	56	71
θ	<i>teeth</i>	final	24	26	26	38	46	55
θ	<i>thumb</i>	initial	22	25	36	28	40	51

Some of the consonants in the *EAT* (Anthony et al., 1971) are particularly good for clinical discrimination, as shown in Table 6 by the indicative differences between matched typically developing children and children diagnosed as speech impaired in the preliminary test. These percentages are not, however, indicative of the normal population and in general are slightly higher for the typically developing children than the *EAT* scores, a notable exception being prevocalic /r/ in *red* and *garage* (see below).

Table 6. Selected consonants from the preliminary test allowing comparison of normal and speech disordered subjects

	Word	Word position		2;6	3;0	3;6	4;0	4;6	5;0	5;6	6;0
r	red	initial	Typical	30	37	56	63	71	79		
			Speech impaired			11	22	29	39		
r	garage	medial	Typical	39	46	61	68	73	81		
			Speech impaired			22	28	39	58		
ʃ	sugar	initial	Typical	34	42	53	69	81	81		
			Speech impaired			32	40	50	66		
ʃ	fish	final	Typical	18	19	26	49	61	74		
			Speech impaired			19	15	29	29		
j	yellow	initial	Typical	25	44	74	82	91	99		
			Speech impaired			30	45	53	71		
l	yellow	medial	Typical	66	88	98	96	97	97		
			Speech impaired			59	62	68	68		
tʃ	watch	final	Typical	30	31	48	62	69	79		
			Speech impaired			22	25	34	42		
θ	teeth	final	Typical	32	41	52	51	53	50		
			Speech impaired			27	20	21	26		
θ	thumb	initial	Typical	30	39	47	60	60	62		
			Speech impaired			27	28	47	50		
ð	feather	medial	Typical	23	42	47	54	64	72		
			Speech impaired			19	20	42	45		
g	garage	initial	Typical	91	98	97	96	99	100		
			Speech impaired			59	68	74	76		
dʒ	garage	final	Typical	11	25	34	50	67	76		
			Speech impaired			19	22	32	42		

Unfortunately, post-vocalic /r/ is not worth presenting, because the figures do not refer to exclusively consonantal productions of /r/: “many Scottish 2½-year-old children used a diphthong in positions where they later developed one of the many forms of [r]. As *this diphthong may also be an acceptable adult realisation, it had to be considered correct in this context.*” [Our emphasis] (Anthony et al., 1971, p. 6). Furthermore, if the /l/ in *milk*, *bottle* and *pencil* was a rounded back vowel, the form was marked correct because these would still be “entirely usual local versions” (Anthony et al., 1971, p. 49), as are initial clusters of consonant plus /r/ with a transitional vowel and coda /r/ in “both [r-] and [r-]less versions”. A glottal stop for /t/ was counted as correct in word-final and also word-medial position, and even for /p/ in *stamps*. Thus something like [bʊʔo<sup>x</sup>] for the item *bottle* would be scored as correct. The exact sociolinguistic situation with post-vocalic /r/ being vocalized cannot be clarified from the published data, because the EAT: “covered a wide range of socio-economic groups... with enormously varied phonetic influences” (Anthony et al., 1971, p. 49), and no further breakdown is given. Since pre-vocalic /r/ is — unusually — less accurate among the subjects in the preliminary test, it may be that high levels of /r/ vocalisation in codas may also have been a middle class Edinburgh feature at that time, but support for more general non-rhoticity comes from Romaine (1978), and Speitel and Johnson (1983) who found vocalized /r/ among working class Edinburgh boys and men respectively (Table 7).

Table 7 Percentage use of variants of coda /r/ (Romaine, 1878:204).

Coda /r/	age 6		age 8		age 10	
	M	F	M	F	M	F
[r]	59	33	48	40	57	45
[ɹ]	16	50	37	54	15	54
<i>nil</i>	25	17	15	6	28	1

Stuart-Smith (2003) presents results from 14-15 year old children which show that working class girls have an overt rhotic consonant for coda /r/ in approximately 10% of cases, boys in about 20%, whereas middle class children and all adults are rhotic. So non-rhoticity does indeed seem to be an extremely common feature, and, in children who do develop rhoticity, post-vocalic /r/ generally appears later than pre-vocalic /r/ (Matthews, 2001).

Unsurprisingly, the loss of [x] (i.e. /x/) and [ʌ] (i.e. /hw/) is more obvious among the young. In teenagers in Glasgow, these phones are in a minority (Lawson & Stuart-Smith, 1999; Stuart-Smith & Tweedie, 2000), but very high levels of coda /t/ were [ʔ], and expected /θ ð/ were largely actually /f v/. In the Doric (or N.E. Scots) of Huntly, Marshall (2004) found high rates of [ʔ] for /t/ among teenagers of both sexes (aged 14-17) and younger boys (age 8-12) but not the younger girls. These child subjects were all rhotic, but trill /r/ was used less than 10% of the time (having been replaced by an approximant) in codas, especially by the girls, whereas it was the norm for adults. Trilled onset /r/ is now the less common option in the 8 – 17 age group, with a lot of individual variation.

### 5.2.2. Consonant clusters

Anthony et al. (1971) also contains figures for various consonant sequences, from which a selection is presented in Table 8. Figures from the preliminary test confirm that the clusters tested are generally very good for identifying developmental speech disorder even in items like *finger* with high scores in the *EAT* (Anthony et al., 1971).

Table 8. Percentage correct for tautosyllabic and other selected clusters from the EAT

Consonant cluster	Word	Word position	3;0	3;6	4;0	4;6	5;0	5;6
st	<i>stamps</i>	initial	19	28	56	55	64	70
sp	<i>spoon</i>	initial	40	36	59	58	68	72
str	<i>string</i>	initial	19	36	48	53	68	70
sm	<i>smoke</i>	initial	21	15	38	45	56	57
sl	<i>sleep</i>	initial	34	33	48	57	64	79
fl	<i>flower</i>	initial	50	65	74	80	88	87
θr	<i>three</i>	initial	12	20	19	35	31	52
pl	<i>aeroplane</i>	initial	68	73	70	79	91	86
br	<i>bridge</i>	initial	50	60	66	73	82	90
tr	<i>train</i>	initial	38	47	56	67	82	81
kw	<i>queen</i>	initial	44	65	80	81	84	88
kl	<i>clouds</i>	initial	43	55	62	59	84	79
kr	<i>Christmas</i>	initial	53	66	70	75	81	85
gl	<i>glove</i>	initial	41	46	54	64	78	72
ŋg	<i>finger</i>	medial	84	88	88	91	94	98
ŋk	<i>monkey</i>	medial	74	80	87	88	90	94
nt	<i>tent</i>	final	84	91	95	99	96	95
ŋz	<i>wings</i>	final	36	31	48	50	60	81
mps	<i>stamps</i>	final	21	21	48	43	61	80
dz	<i>clouds</i>	final	16	31	45	50	56	76
sk	<i>desk</i>	final	22	33	59	58	66	72
lk	<i>milk</i>	final	78	81	87	88	89	86

### 5.2.3. Vowels

Matthews (2001) presents seven longitudinal case studies of Edinburgh children based on conversational speech. Overall mean performance is reported in Table 9.

Table 9. Overall percentages of correct vowels, and individual variation.

Age range	mean	Ben	Beth	Esther	Fionn	Fraser	Lewis	Rory
1;9-2;2	60	57	65	74	n.a.	50	36	77
2;1-2;4	68	53	65	83	n.a.	63	60	85
2;5 -2;8	83	81	84	84	72	79	85	95

### 5.3. Phonological processes

One of the very useful aspects of the *EAT* (Anthony et al., 1971) is the qualitative analysis of immature vs. atypical variations. For example initial /tr/ has “minor” variants such as

/tʃr, tər, tsr/, the “immature” variants /tʃ, tw, tl, tv, tʃ, tð, tç, ts, tʃ, tʃ/, the “very immature” variants /t, ʀr, kr, sr/ and the “atypical” variants /sʊ, θ, sn, ʃ/. Such information is provided for all the consonants and clusters assessed by the test, but may be based on general principles to some extent rather than being entirely empirical. The following immature features are highlighted: consonant cluster reduction, liquid confusion, lengthening, palatalisation and fronting.

Matthews’ (2001) longitudinal study of vowel acquisition in children under the age of three reported a number of immature secondary articulations such as nasalization, rhoticity and rounding, and more extreme processes such as consonantalization (frication and approximation) in addition to plain errors of quality. He also examined the four approximants. The processes affecting onset /j/ and /w/ were vowel-like (e.g., they gain syllabicity) though they were also susceptible to consonant harmony, especially in words with more than just one approximant. Pre-vocalically, /l/ was commonly stopped, deleted, or glided. /r/ was commonly glided, and possibly was a cause of affrication in alveolar stop clusters. The glides [w, w, v] were particularly common, but occasionally [l] was observed, although not commonly in clusters requiring lingual contact. Post-vocalically, /l/ was vocalised as a close back vowel, often with rounding so that *milk* [mok] and *smoke* [smok] rhyme, while /r/ was commonly vocalised as schwa, or in the case of low vowels, as lengthening of the vowel.

#### 5.4. *Phonetic inventory*

Development of the significant non-phonemic vowel categories is early, with front/back /a/ and the SVLR vowels emerging contemporaneously with phonemic distinctions (Matthews, 2001).

#### 5.5. *Common mismatches*

In Tables 2 and 3 we used somewhat unusual transcriptions to emphasize certain structural and phonetic facts about Scottish English and its relationship to SSBE. Additionally, our goal was to assist SSBE-accented therapists in avoiding certain common mismatches between the dialects, which particularly impact on children and elderly listeners. The newer variants of SSBE in Table 3 for example may lead Scots to misinterpret monophthongal *speared* or *spared* ([spe:d] or [spɪ:d] or similar) as *spade* or perhaps *sped*. Even more confusable is the monophthong in SSBE for *caught* and *court*, which is phonetically confusable with SSE /o/: SSBE *law* and *lore* (but not *low*) sound like Scottish *low*. On the other hand, we have avoided using fronted transcriptions for SSBE back vowels and diphthongs to emphasize the differences between the varieties. SSE’s /ʌ/ is fronter and rounder than SSBE’s /u/, but SSBE’s /əʊ/ for example may itself be very fronted, though not so round (Watt and Tillotson, 2001; Watt and Smith, 2005). Indeed, frequent confusions for Scottish speakers include hearing Southern English *goat* as *gate*, *kate* as *kite*, and *kite* as having a /œ/ vowel (with few lexical consequences due to the rarity of that vowel). Even /u/ and /ʊ/ can be misheard as /i/. The converse case, of misperception of normal Glasgow vowels by non-Scottish speakers is investigated by Nathan, Wells & Donlan (1998).

### **5.6. Syllable structure**

There have been no specifically Scottish studies on this topic.

### **5.7. Prosody**

About intonation little is known, but informal observation clearly shows that “up-talk” can be found in primary school children whose parents do not use this feature, presumably acquired from their peer group.

### **5.8. Phonological awareness**

Reid (2003) is a clinical tool intended to develop phonological awareness especially designed for the Scottish vowel system. Mayo (2000) includes a longitudinal study of phonemic awareness development in 15 monolingual and bilingual children with a starting age of between 5;2 and 6;0.

## **6. Speech assessment for Scottish English children**

As mentioned above, the major resource, the *Edinburgh Articulation Test*, (Anthony et al., 1971) has also been applied widely outside Scottish English because it is a consonant assessment, and consonantal dialectal variation is minimal compared to vowel variation. Sadly, the test is now quite out of date, both in terms of some of the lexis and pictures which are used, and more problematically on the way the scoring relies on post-vocalic /r/, /θ/ and /ð/ which, as we have taken care to show, are undergoing change in Scotland.

Additional speech assessments developed in Scotland include:

- ◆ *Profiling Element of Prosodic Systems – Children (PEPS-C)* (Peppé and McCann, 2003 )

## **7. Speech intervention for Scottish English children**

There are a number of studies which have used Scottish children as participants or been developed in Scotland, but no published packages designed specifically for Scottish English. Bates and Watson have substantial materials for the study of Scottish vowel systems (partly published as Bates, Watson and Scobbie (2002). Reid (2003) reports on *Vowel House*.

Electropalatography (EPG) (Gibbon, 2006) is an important articulatory technique which has a tradition of research and development in Edinburgh (Hardcastle et al., 1991; Gibbon et al., 1999; Scobbie, Wood and Wrench, 2004) and is now, following CE certification by Articulate Instruments Ltd. in 2005, able to be used in speech therapy in a non-research clinical context. Treatment in cleft-palate centres is particularly highly developed (Gibbon, Smeaton-Ewins & Crampin, 2005).

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## Appendix A. Resources about Scottish English especially useful for SLTs

The identification code for Scots, defined in ISO 639 is “SCO”, for English “EN”, and for Scottish Gaelic “GD”.

### 1. Books

There are a number of books about speech and language in the UK with good sections on Scotland, such as Foulkes & Docherty (1999), Hughes, Trudgill and Watt (2005) and Wells (1982). Specifically Scottish reference works with a strong linguistic content include Jones (1997), and especially Corbett et al., (2003). A more accessible introduction to urban Scottish English is Robinson and Crawford (2001), which provides copious exemplification as well as discussion. See also Rennie (1999) aimed at school children and the Scots School Dictionary (1999). To “teach yourself” Scots and as convenient references, we recommend Purves (1997) and Wilson (2002). Wilson (2002: 14) gives a warning, however, that “sadly, many speakers are likely to be unable at first to understand why anyone would even *want* to learn Scots, and to be suspicious of the motives of anyone who does so.” Such attitudes are clearly relevant clinically, and it must not be forgotten that it is only a few decades since children even received corporal punishment at school for speaking Scots *with friends in the playground*.

Another useful clinical resource are the numerous children’s books in Scots (e.g., from Itchy-coo or Merkat Press), and there are a large number of generally humorous dialect lexis books, fridge magnets, popular entertainments and so on, which can provide information or materials for use with Scottish English speakers. More serious materials are also appearing in greater numbers, perhaps due in part to an increased interest in Scots in schools.

### 2. CD-ROMs

Robinson and Crawford (2001), Wilson (2002), Foulkes and Docherty (1999) and Hughes, Trudgill & Watt (2005) have accompanying CDs. UK-wide acoustic resources (including websites as well as offline audio such as CDs) will typically include a Scottish dimension. For example – *ABI: Accents of the British Isles corpus* (D’Arcy, Russell, Browning & Tomlinson, 2004) and *The IvIE corpus: English Intonation in the British Isles* (Grabe, Post & Nolan, 2001).

### 3. Journals

There are no SLT academic journals specific to Scotland. International journals published in the UK are:

- ◆ *The International Journal of Disorders of Communication*  
<http://www.tandf.co.uk/journals/titles/13682822.asp>
- ◆ *Child Language Teaching and Therapy*  
[http://www.arnoldpublishers.com/journals/pages/chi\\_lan/02656590.htm](http://www.arnoldpublishers.com/journals/pages/chi_lan/02656590.htm)
- ◆ *Clinical Linguistics and Phonetics*  
<http://www.tandf.co.uk/journals/titles/02699206.asp>

#### **4. Professional Association**

The Royal College of Speech and Language Therapists (RCSLT) is the professional body, just as elsewhere in the UK. Two higher educational institutions train Speech and Language Therapists:

- ◆ Queen Margaret University College in Edinburgh <http://www.qmuc.ac.uk/shs/default.htm>
- ◆ Strathclyde University in Glasgow <http://www.strath.ac.uk/eps/aboutslt.html>

#### **5. Useful Scottish English Websites**

- ◆ Scottish Language Dictionaries <http://www.scotsdictionaries.org.uk/>
- ◆ The Scuil Wab (“school web”) <http://www.scuilwab.org.uk/> Resources for children
- ◆ A Selected Classified Bibliography of the Scots Language  
<http://dinamico.unibg.it/anglistica/slin/scot-bib.htm>
- ◆ BBC Voices <http://www.bbc.co.uk/voices/> greatly expanded to include audio material
- ◆ Scots Language Society <http://www.lallans.co.uk/>
- ◆ The Elphinstone Kist <http://www.abdn.ac.uk/elphinstone/kist/>
- ◆ Scottish Corpus of Text and Speech <http://www.scottishcorpus.ac.uk/>
- ◆ Click and Listen <http://clydesdale.dcs.st-and.ac.uk/cnl3/welcome.htm>
- ◆ Scots Language Resource Centre <http://www.scotsyett.com/>
- ◆ Feasibility study for an Institute for the Languages of Scotland  
<http://www.arts.ed.ac.uk/celtscot/institutelanguagesscotland/>
- ◆ Learning and Teaching Scotland <http://www.ltscotland.org.uk/>
- ◆ 5-14 Online: Scots language  
<http://www.ltscotland.org.uk/5to14/specialfocus/scots/index.asp>
- ◆ Scottish Cultural Resources Network <http://www.scran.ac.uk/homepage/>
- ◆ The Speech Science Research Centre (<http://www.qmuc.ac.uk/ssrc>) is putting a variety of resources online, including phonetic measurements and norms as well as reports of ongoing research on Scottish English.

## Appendix B. Summary of studies of typical Scottish English speech acquisition

Authors	Year	No.	Age	Information	Sample type	Data collection
Gordeeva	2001-2005	7	3;4 - 4;9	acoustic analysis of vowel quality, duration, vocal effort in close (-mid) vowels	Cross-sectional & longitudinal, bilingual and monolingual	connected speech & single word, in home and laboratory
Hewlett, Matthews & Scobbie	1999	7	6;0 - 9;0	Vowel duration (SVLR)	Cross-sectional	single word, laboratory
Matthews	1999-2001	7	1;9 - 2;10	Transcriptional analysis of vowel system acquisition	Longitudinal (monthly)	semi-structured spontaneous speech, at home
Peppé & McCann	2002-2006	70 ASD, 120 controls	HFA: 6-14 controls: 5-11	Expressive and receptive prosody, articulation errors	Matched controls for studies on children with Autism and Asperger's syndrome	Computerised PEPS-C test, elicited speech, clinic and laboratory.
Scobbie, Gibbon, Hardcastle & Fletcher	1993-1996	16 & 7 PD.	4;0 – 6;0	acoustic analysis of word initial stops and clusters before /i/, /ʌ/ and /ai/	Cross-sectional, PD longitudinal	Single word in carrier phrase, laboratory and clinic, acoustic analysis.

Smith	2003-2005	24 parent-child pairs	pre-school	Buckie child speech and child-directed speech	Sociophonetic study, longitudinal	Spontaneous discourse between child and carer in the home
Stuart-Smith	1999-2004	44 working class and 8 middle class	10-15	consonants and vowels, spontaneous and read speech	Sociophonetic socially structured sample, cross-sectional	Spontaneous discourse and wordlists in schools
Waters	1992	12	3;8 – 4;10	VOT and other durations	Experimental: multiple repetitions	Words in carrier phrase in laboratory
Windsor	2002	17, and 4 PD.	2;0 – 2;06 & 3;6 - 4;9	Phonological and acoustic measures	Cross-sectional and longitudinal,	Structured play, elicited speech at home
Gibbon, Smeaton-Ewins and Crampin	2005 onwards	30+	School age	Cleft-palate subjects from national CLEFTNET scheme	Clinical with intervention	Wordlists, EPG at clinic

Note. Studies were on exclusively normally-developing (TD) children unless marked.

PD= developmental phonological disorder, ASD = Autistic Spectrum Disorder. Future confirmed projects on Scottish children include a major MRC-funded EPG project on Downs Syndrome, at QMUC.

## Appendix C. Passage: Comma gets a cure ['kʰɔmΛ,ɡetsə'kʰu̯ɔ]

This is a medium-broad phonetic transcription which incorporates typical connected speech phenomena and intra-speaker variation for a representative “central-belt” speaker. Primary and secondary phrasal stress are marked.

[wɛt 'çi:ɪz ʌ ,store fɔɪ jʌ ... 'serʌ 'pʰɛrɛ wʰɔz ʌ 'vɛɪtʰnɪɛ 'nʌɪs ,mʌd bɪn ,wʌɪkɪn 'dɔle ,ɪadn  
 ,oʔ 'dʒu: ɪn ə dʰɪzɛɪtɪd ,dɪstɪkʰt ʰf dʰ 'tʰɛɪtʰɛ ... so fɛ wɪz ,vɛɪ 'hæpɛ tʰ 'stɑɪt ə ɲɪ: 'dʒ  
 ɔb ʌrə sʰpʰɛɪbʰ 'pʰɪævɪtʰ 'pʰɪkʰtɪs ɲ 'nɔɪθ 'skweɪ n ɪɔɪ ʰdʒɪk 'stɪtʰ 'tʰəu̯ɔ... 'dɑ? ,ɪɛɛ  
 ə wʰɔz 'mʌtʃ ,ni:ɪɪ ,fɔɪɪ ɲ 'moɪ tʰə əɪ 'lʌɪkɪn ... 'i:vɲ 'so ... ,ɪɔnɪ 'fʌɪstʰ 'mɔɪnɪn ... fɪ ,fɛʰ? 'stɪɛst ... fɪ ,ɛtʰ ʌ ,boʔ ə 'pʰɔɪdʒ ... 'tʃɛkʰt ɪ sɛʰf ʰnə 'mɪrɪ ... ʰwɔʃt ɪ 'fɛs ɲ 'hʌrɛ ... 'dɛn fɪ ,  
 pʰɪʰɔnə 'plɛn jɛlo 'dʒɛs ɲə ,flɪs 'dʒakɪ? ... 'pʰɪkʰ tʰʌpɪ 'kʰi ... ɲ 'hɛdɪd fɪ 'wɪk ... ,mɛn fɪ 'gɔʔ  
 dɛɪ ... ʰɪ wʰɔz ə 'wʌmʰn wɪθ ə 'gʌs ,wɛtʰɪn fɔɪ ɪ ... ʰwʌmʰn 'gɛv ,serʌ ʰʌn ʰfɪʃt 'lɛɪ  
 fɪm ʰvɛt ... ʰɪ ,lɛʰɪ ɪm ,plæd:ʌ? ʰə 'ʌnəmʰt kʰɪdʰ bɪ 'sʌfɪn fɪɔm ə 'ɪɛɪ ,fɔɪm ʰfɪʰ ɲ 'mʌ  
 ɪd dʰɪzɪz ... ,mɪtʃ wʰɔz sʰɪpɪæzɪn ... ʰbʰkʰɔz 'nɔɪmʰle jʌ wʰɪd 'ɲonle ʰkʰspɛkʰt:ʰɪ ,sɪ: ətʰɪ  
 n ʌ 'dʒɔɪ ... ,ɲɔɪ 'gɔt ... 'serʌ wʰɔz ,sɛnʰə'mɛnɪtʰɪ ... sə 'ðɪs mɛdɪ ,fɪʰt 'sɔrɛ fʰ dʰ ,bɪjɪrʌft ,bʌɪ  
 d]

*Well, here's a story for you: Sarah Perry was a veterinary nurse who had been working daily at an old zoo in a deserted district of the territory, so she was very happy to start a new job at a superb private practice in North Square near the Duke Street Tower. That area was much nearer for her and more to her liking. Even so, on her first morning, she felt stressed. She ate a bowl of porridge, checked herself in the mirror and washed her face in a hurry. Then she put on a plain yellow dress and a fleece jacket, picked up her kit and headed for work.*

*When she got there, there was a woman with a goose waiting for her. The woman gave Sarah an official letter from the vet. The letter implied that the animal could be suffering from a rare form of foot and mouth disease, which was surprising, because normally you would only expect to see it in a dog or a goat. Sarah was sentimental, so this made her feel sorry for the beautiful bird. (Honorof, McCullough & Somerville, 2000).*