Current Trends in British Sociophonetics

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1. Introduction

This paper represents my contribution to the symposium on Sociophonetics held at Nwav 30. The title should not be taken as an attempt to provide a comprehensive overview of phonetic work currently being pursued by sociolinguists in Britain. Rather, my aim is to outline some areas of phonetic research which are under-represented within variationist sociolinguistics at large. All offer challenging data for models of sociolinguistic variation and the transmission of change, and for models of phonological representation.

The first two topics concern aspects of suprasegmental phonetics, while the other two concern consonantal variables.

2. Phonetic setting/voice quality

Phonetic setting is defined by Laver (1994: 396) as the 'tendency underlying the production of the chain of segments in speech towards maintaining a particular configuration or state of the vocal apparatus'. Speakers who tend to keep the velum lowered, for instance, will possess a habitually nasal voice quality. The term *voice quality* is taken here as a near-synonym of phonetic setting, following Laver (1994), although it is sometimes taken to refer solely to reflexes of the phonatory system. Extensive studies of the phonetic correlates of different settings can be found in Laver (1980, 1994) and Nolan (1983).

It has long been acknowledged that phonetic setting (PS) may vary sociolinguistically and stylistically, for instance in the degree of creaky phonation a speaker may use. Until recently, however, there has been no systematic study of PS on a large body of data. Instead, comments which can be found in the literature tend to be impressionistic and general. For example, creaky phonation has been associated with RP and many regional varieties of US and Australian English (Laver 1980: 4; Henton & Bladon 1988; Redi & Shattuck-Hufnagel 2001). In many dialects creak performs pragmatic functions, in particular marking turn-endings. Honikman (1964) suggests that RP is also characterised by a slightly retroflex tongue setting, and an overall lax articulatory setting. Knowles (1978) comments on

the velarisation and raised larynx setting used in Liverpool, and Trudgill (1974) describes Norwich voice quality in some detail.

The reason for the lack of extensive PS studies is in part due to the highly complex set of parameters which may interact to yield a particular voice quality. The auditory protocol developed by Laver (1994: 422) to capture these parameters is extremely intricate. Furthermore, there are few simple acoustic correlates of most of these features.

Two detailed studies, however, have been carried out on varieties of English spoken in Scotland. Both have revealed significant socially-correlated patterns. First, Esling (1978) found social class differences in voice qualities used by Edinburgh speakers. For example, the working class subjects tended to display protruded jaw and harsh phonation. More recently, Stuart-Smith's (1999) study of 32 Glasgow speakers stands as a model for future studies in a variationist framework, revealing significant differences related to the speakers' class, age, and gender. She found, amongst other things, that working class speakers had a more extensive use of open jaw and whispery phonation (therefore closely paralleling Esling's findings). Males used significantly more creaky phonation and nasalisation, while younger speakers showed a tendency to an overall lax setting.

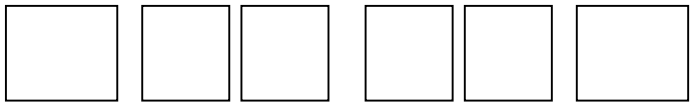
Understanding variation in PS is important on the one hand for descriptive purposes, enabling us to gain a more extensive understanding of the phonetic variables which characterise speakers and speaker groups. On the other hand, it is important also because the acoustic and auditory effects of different PSs may interact with the sorts of segmental variables that have been studied extensively within sociolinguistics. They may therefore offer challenging new perspectives on why, for example, certain types of vowel variations are found so frequently. By way of illustration, loss of lip rounding has the effect of raising vowel formants, with particularly marked effects on the second formant of close back vowels - an acoustic feature we have become used to thinking of in terms of tongue fronting.

3. Rhythm

The rhythmic pattern of speech is a perceptual effect 'produced by the interaction in time of the relative prominence of stressed and unstressed syllables' (Laver 1994: 152). Languages are often categorised as either *syllable-timed* or

stress-timed, although in practice these form two poles of a continuum rather than a dichotomy. In syllable-timed languages (e.g. French), all syllables (bar the final one in a phrase) have roughly the same duration, whether or not they are stressed. By contrast, stress-timed languages like English are characterised by isochrony structured with respect to accented syllables. That is, the time from each stressed syllable to the next is roughly equal, while unstressed syllables are compressed in between. Schematically, the two types can be illustrated as in Figure 1. Each box represents a syllable, and its width represents the duration of the syllable.

(a) Syllable-timed



(b) Stress-timed

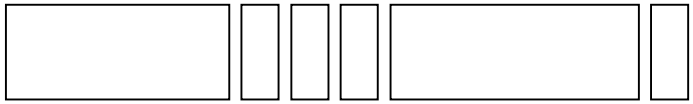


Figure 1. Schematic representation of syllable-timed and stress-timed speech

This difference in rhythmic organisation has also been said to occur across different dialects of the same language. Welsh English, for instance, is generally said to be syllable-timed, but in the city of Cardiff rhythm is more like the stress-timed pattern of standard English (Mees & Collins 1999: 194). Syllable-timing is also suggested as a feature of Bradford Panjabi English (Heselwood & McChrystal 2000) and Jamaican Creole (Sebba 1987). Trudgill (1999: 124) notes the characteristic rhythm of Norwich and Norfolk speech, involving very long stressed syllables and very short unstressed ones. Nolan & Kerswill (1990) make comparable comments for local Cambridge speakers.

As with phonetic setting, comments such as those reviewed above tend to be impressionistic, and there have been few

systematic studies of rhythm across different dialects. However, recent work in phonetics has yielded a useful framework, the Pairwise Variability Index (PVI), which allows us to quantify and therefore compare rhythmic features (Low, Grabe & Nolan 2000, Grabe & Low in press).

The precise method of calculating the PVI has taken various forms in the course of its evolution, but the preferred method (given in Low *et al* 2000) involves measuring vowel duration as an indicator of syllable length, and comparing each adjacent pair of syllables. In syllable-timed speech, all syllables are roughly equal in duration, and thus the average difference between pairs of syllables is small. In stress-timed speech syllable length is more variable and the average difference between syllable pairs tends to be larger. Based on carefully controlled materials, Low *et al* (2000) show that Singapore English is more syllable-timed than standard British English.

The method has also been applied to data from German/English bilingual children (Whitworth in press), and data from British dialects (Spencelayh 2001). Spencelayh (2001) analysed speech from two males and two females from each of four dialects: Buckie, Newcastle upon Tyne, York and Derby. Rather than using controlled materials, Spencelayh extracted data from casual conversations. His results showed a relatively large degree of variability within each dialect, but nonetheless a significant difference between Buckie (the most syllable-timed) and Derby (the most stress-timed).

Whitworth (in press) also finds considerable variability in rhythmic values for adults and children, and overlap between values for German and English. She found, however, that bilingual children acquire different rhythmic patterns for their two languages provided there are significantly different patterns in the input the children receive. She concludes that age and linguistic input are critical factors underlying the acquisition of rhythm, which is only completed around the age of 11.

4. Acoustic studies of consonantal variation

While most acoustic research in sociolinguistics has concentrated on vowel variables, recent work has shown that socially-correlated variation can also reach a remarkably subtle level in consonants.

Docherty & Foulkes (1999) found systematic differences in the coordination of oral and laryngeal gestures in intervocalic

and pre-pausal (t) among speakers of Newcastle and Derby English. Some patterns were found to be restricted to certain social groups, even though the auditory difference between patterns was often imperceptible.

The example of pre-pausal (t) in Newcastle English is particularly interesting. In this dialect, unlike most British dialects, glottal variants are rare in this position. Instead, (t) is usually realised as some form of non-glottalised oral stop. Acoustic analysis showed substantial variation in how this phone is realised. We found variation, for instance, in whether an acoustic transient was present, indicating release of a complete oral closure. For some speakers no transient was found, showing therefore that their articulation was in fact fricative in nature.

We also found significant variability with respect to the relative timing of oral and laryngeal articulations in the transition from a preceding vowel to the (t). In some cases, the voicing appropriate for the vowel was found to continue right through to the release of the oral stop (see Figure 2).

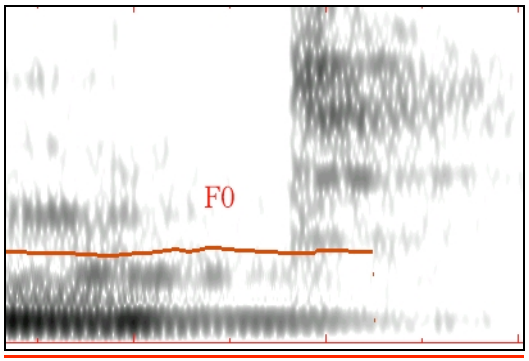


Figure 2. [Vt] section of spectrogram of *boot*, showing extended voicing (picked out by F0 tracking function)

In other cases the voicing ceased early, and the greater airflow which resulted from the abduction of the vocal folds generated a period of high frequency voiceless frication prior to the stop closure. The auditory impression yielded in these latter cases was that of a pre-aspirated stop, and we have used the

transcription [^{h}t] to capture this variant. An example is shown in Figure 3.

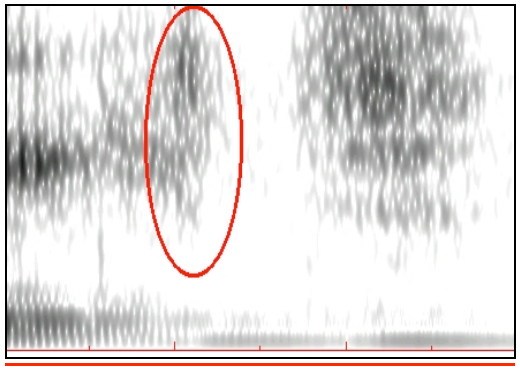


Figure 3. [Vt] section of spectrogram of *kite*, showing pre-aspiration (circled)

More intriguingly, these two patterns of coordination were not equally distributed across the speaker sample. The first type, containing the extended voicing, was significantly more common in the speech of males, with no class or age differences apparent. It might be supposed that this pattern could be explained with reference to the size of the vocal organs - males typically have larger vocal tracts than women. However, analysis of comparable (t) tokens for speakers of the Derby dialect revealed few examples of this variant and no clear gender-correlated differentiation (see Figure 4). It must therefore be viewed as a learned pattern of articulatory coordination.

The pre-aspirated variant also showed a remarkable skewing in its distribution. First, the pattern was found only in Newcastle. Secondly, in this dialect it was largely restricted to the speech of young women, where it is the most commonly used variant (see Figure 5).

Docherty & Foulkes (1999) also report similarly complex variability with respect to the timing of oral and laryngeal gestures appropriate for (t) in word-medial position.

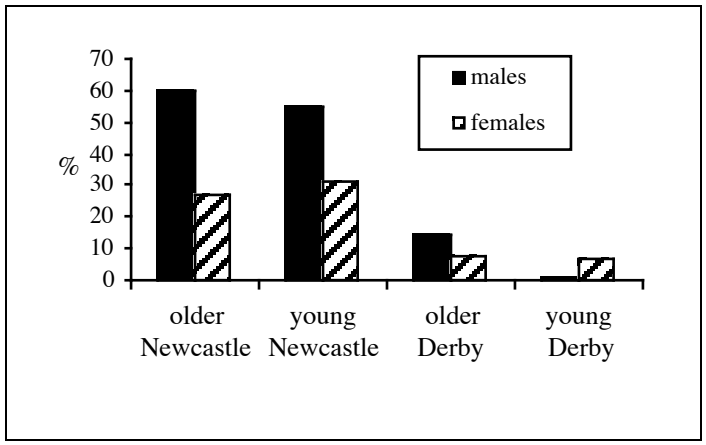


Figure 4. Distribution of tokens with extended voicing by speaker group (classes combined, 8 speakers per column; mean N = 90 per column for Newcastle, 87 for Derby)

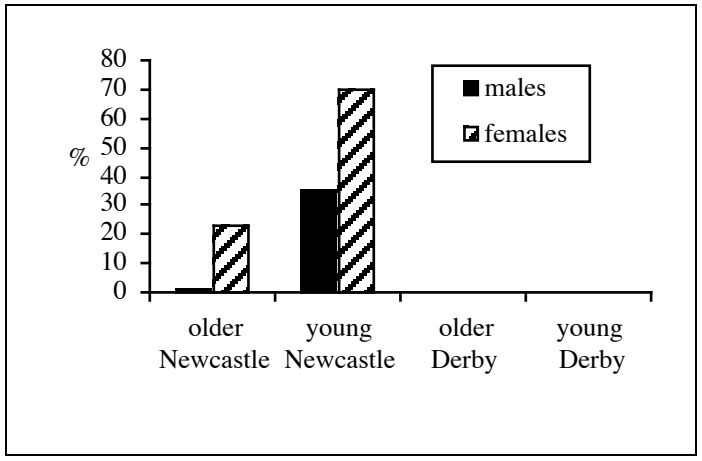


Figure 5: distribution of tokens with pre-aspiration by speaker group (classes combined, 8 speakers per column; mean N = 90 per column for Newcastle, 87 for Derby)

Such findings indicate first that consonantal variation, like that repeatedly seen in acoustic studies of vowels, stretches

down to a very fine degree of articulatory control. In this example the locus of variability appears to be subsegmental, at the level of the timing relationships between articulatory gestures. It is not immediately obvious how such variability might be captured within segmental models of phonological representation. The model of Articulatory Phonology (Browman & Goldstein 1992, McMahon, Foulkes & Tollfree 1994), on the other hand, is well equipped to account for variability of this type, although it has so far received little attention in variationist work.

These findings also suggest that detailed articulatory strategies must be differentially learned in the process of acquisition, which leads me to the final topic I want to outline.

5. Children's speech and speech to children

Rather little work has been carried out on the issue of how variable forms are acquired by children (notable exceptions include Roberts & Labov (1995), Kerswill & Williams (2000), Scobbie, Gibbon, Hardcastle & Fletcher (2000), and work in bilingualism by Khattab (2000, in press) and Whitworth (2000, in press)). In light of our findings on (t) in Newcastle, we are currently investigating the acquisition of phonological variables by a group of 40 Newcastle children, aged between 2 and 4 (for full details of the methodology see Foulkes, Docherty & Watt (2001)). At the time of writing the analysis is almost complete, and data reported here are based on 30 mother/child recordings.

The children themselves show mastery of contextually and socially conditioned variants from age 2 years (Foulkes *et al* 2001). Our findings offer support to claims made by Chambers (1995) that the learning of variable forms occurs at the same time as the learning of the resources of categorical phonology. In fact we argue that aspects of sociolinguistic detail *precede*, and contribute to, the development of phonological knowledge.

We also find interesting variability in (t) realisation by the children's mothers. They display different patterns of (t) when speaking to children, compared with adult-to-adult speech.

In word-medial position (such as in *water, bottle*) the principal local variant is a creaky voiced stop [d̰]. This is used upwards of 90% of the time by almost all speakers in casual style. It is also the locus of a classic style-shifting pattern: in formal word-list readings, almost all women, but few men,

avoid the local variant in favour of near categorical usage of a standard-like [t^h] (Docherty *et al* 1997).

In speech to children, mothers also show substantial reduction of the local [d̰] form in favour of the standard-like [t^h]. Overall [d̰] is found in only 37% of tokens used in speech to children, with the [t^h] form accounting for around 58% of tokens. There is furthermore evidence that mothers speaking to boys differ quantitatively from mothers speaking to girls. The use of standard-like forms is significantly more frequent in speech to girls than to boys ($p < .0001$), as shown in Table 1.

	% [t^h]	% [d̰]	N tokens	N mothers
to boys	48.8	42.2	240	16
to girls	67.1	29.1	234	14
all	*57.8*	*36.7*	*474*	*30*

Table 1. Distribution of medial (t) variants.

It is well known that features of intonation, syntax, speech rate and vocabulary are modified in speech addressed to children (Snow 1995). Our data show that segmental features may also differ from those found in inter-adult speech. Relatively few other studies have analysed segmental variability, although Kuhl *et al* (1997) found that the acoustic vowel space (defined in terms of F1 and F2) used in speech to babies was larger than that used in inter-adult speech. Kuhl *et al* interpreted their finding as indicative of a subconscious attempt by the mothers to increase the acoustic differences between realisations of phonemes, in order to help the children locate the contrastive elements of their language.

It might be possible to interpret our findings in a similar light: the oral stop [t^h] is characterised in most phonological models as a more fully specified unit than [d̰], which would often be viewed as the product of some sort of lenition process (involving voicing and glottaling). It could also be argued that [t^h] is a more transparent realisation of what might be assumed to be the canonical underlying form, /t/. However, whatever the value of hypotheses such as these, the socially heterogeneous distribution of variants in our study demonstrates that child-directed speech is here playing a different role. The segmental

variability in our data represents a form of sociolinguistic training: it provides boys and girls with differential opportunities to learn socially meaningful pronunciations.

6. Conclusion

I have attempted to offer a brief sketch of some areas of phonetic research which I think provide very interesting material for variationist sociolinguists. In all cases a great deal of further research needs to be carried out to assess fully the importance of these phenomena for sociolinguistic and phonological theory, and I hope others will join the challenge.

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