A Sociophonetic Investigation of the Vowels OUT and BIT in Glaswegian

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ABSTRACT

This paper presents a sociophonetic investigation of the vowels OUT and BIT in the read and spontaneous speech of 16 male Glaswegian speakers (8 boys, 8 men; 8 middle-class, 8 working-class). Auditory and acoustic analysis together confirms social stratification in the realization of the two vowels. OUT is generally fronter in working-class speakers, though middle-class boys also use fronted vowels, suggesting sound change in progress. BIT tends to be low and retracted in working-class speakers, while indications of fronting in middle-class boys again point to sound change in progress in these speakers.

1. BACKGROUND

Recent research on variation and change in Glaswegian accent by Stuart-Smith and colleagues [1, 2] has revealed change in progress in a number of consonants which shows clear social conditioning. At the same time, questions remain about the realization of Glaswegian vowels in the same speakers and the extent to which they might also be changing. A baseline for comparison is provided by Macaulay's [3] study from 1973 of the Glaswegian vowels /ɪ u a au/, which revealed for each vowel a socially-stratified phonetic continuum.

That Glasgow is a 'traditional dialect area' [4] makes research into vowels in speakers of differing socio-economic backgrounds more complex. 'Glaswegian' here refers to a complex sociolinguistic continuum ranging from Urban Scots, used largely by working-class speakers, to Scottish Standard English (SSE), used mainly by middle-class speakers. SSE and Scots share an inventory of vowel phonemes: /i ɪ e ɛ a o ɔ ʉ ʌ əi ae oe ʌʉ/, and the main phonological differences between Scots and SSE vowels occur as differences of phonetic realization and lexical incidence, the latter arising from differing developments during the history of Scots [2]. Differences in lexical incidence, or the selection of particular vowels for particular lexical sets, as in the OUT set (as defined by Johnston [6], corresponding roughly to English English MOUTH, [4]) leads to alternations like SSE /hʌʉs/ beside Scots /hʉs/ for *house*. Much of the lexicon shows similar lexical incidence across SSE and Scots, and for shared items, differences are found in particular realizations. Thus, the lexical set defined as BIT (corresponding roughly to English English KIT, [4]), selects /ɪ/ in both SSE and Scots, but in Glasgow working-class Scots speakers tend to show lower and more retracted variants than middle-class SSE speakers (Macaulay [3]).

This paper reports results taken from a Masters thesis undertaken by the first author [7]. As such it begins the task of describing the vowels of Glaswegian by considering the sociophonetic realization of the vowels in the lexical sets OUT and BIT. These vowels provide examples of potential differences in lexical incidence and phonetic realization. They have also been included in previous studies and so could be used to identify possible changes in progress in Glaswegian vowels.

2. METHODOLOGY

The data for our work are taken from a set of digital recordings made in 1997 [1]. Spontaneous and read speech was collected from 32 individuals, divided equally into males and females and younger (13-14 years) and older (40-60 years) speakers, drawn from working and middle class areas of Glasgow. The methodology used in the data collection, and in the subsequent analysis of the speech has been informed by sociolinguistic research on language variation and change (e.g. [8]). Thus phonetic variation is reported in correlation with extra-linguistic, social factors. This paper presents results for the 16 male speakers alone, restricting the possible social factors to class and age, giving four groups: middle-class men (OMC), middle-class boys (YMC), working-class men (OWC) and working-class boys (YWC).

Shortly after the data were collected, the wordlists were digitized into a Pentium 2 PC running *Xwaves*. Eremeeva subsequently digitized portions of the conversations into a Pentium 4 PC running *Multispeech*. Both auditory and acoustic analyses of the vowels were carried out, since Eremeeva was interested in comparing the two views of the data. Auditory analysis typically allows a (socially-stratified) view of vowel realization in terms of the variants grouped into categories. Acoustic analysis allows an objective view of the range of phonetic variation and consideration of general tendencies for vowel qualities for social groups as a whole. Here we present both sets of results, but due to space constraints we do not explore the relationship between the two analyses. Auditory analysis

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involved narrow phonetic transcription from digitized versions of tokens from read (wordlist) and conversational speech by the first author, 10% of which was cross-transcribed by the second author. Acoustic analysis was carried out using *MultiSpeech*. The first and second formants of the vowels were measured from LPC spectra overlaid onto FFT power spectra, alongside wideband spectrograms. For BIT vowels a single measurement was taken at the midpoint of the vowel. For OUT vowels, two measures were taken from the first and second parts of the diphthong respectively. It was usually possible to transcribe the vowels auditorily, but measurements could not always be taken. Sometimes it was difficult to obtain spectrograms of conversational speech which could be used for taking measurements. Despite the physiological differences between the adult males and adolescent boys, the formant measures were not normalized. Our quantitative comparison of the data takes this into account. We report statistical analysis of results within groups sharing physiological characteristics, thus testing for class variation within men and within boys. Age differences within the data, which might potentially reflect sound changes, may also include differentiation caused by developmental age and are therefore noted as trends and with more caution. Statistical analysis was performed where possible on both datasets, with chi-square used for the auditory results and ANOVAs with post-hoc tests where appropriate for acoustic data.

3. RESULTS

3.1. OUT

OUT was analyzed in two ways, first in terms of the alternation of /ʉ~aʉ/, and second in terms of the quality of the two elements of those diphthongs which occurred. Macaulay [3] had found that usage of monophthongs increased as class decreased, with higher usage amongst younger speakers, and similar findings were reported for Edinburgh speakers by Johnston [9]. Johnston also found sociolinguistic stratification in the realization of the first and second elements of the diphthong in Edinburgh, such that for (au1), low vowels were associated with high status and high-mid or back ones with low status, while for (au2), fronter variants were associated with lower status, though these were spreading from working-class to middle-class speakers. Johnston [6] notes OUT-fronting as a widespread feature of Scots more generally.

The wordlist was originally designed to collect tokens for a range of segmental features and only contained three instances of OUT: *mouth, now, out.* In the conversations 12 words were identified as possible sites for the alternation: *about, out, down, now, house, a/round, hour, our, found, ground, town, without*.

Monophthongs were only found in spontaneous speech, and were used most of all by working-class speakers, and in particular by working-class boys (Figure 1). All differences were statistically significant (p <.05).

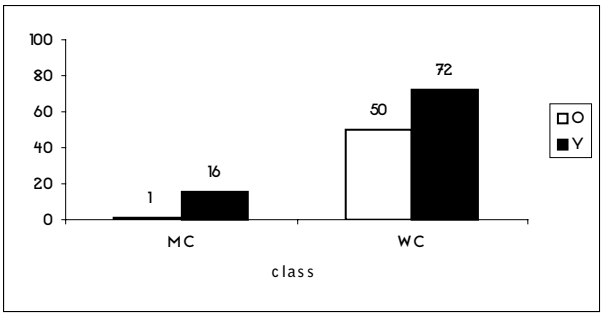

Figure 1: Realization of OUT as /ʉ/ (%; n = 236).

The auditory transcription of the first and second elements of the diphthongs resulted in a number of variants, which were reduced to two sets of variants, whose distribution is presented in Table 1. The variants for each element reflect an auditory continuum along the front/back dimension.

wordlists %	[a̹]	[a̠]	[ʌ̹]	[ʌ]	[ʉ̹]	[ʉ]	[ʉ̠]	[u̹]
OMC	17	33	50	0	25	75	0	0
YMC	33	42	25	0	33	33	0	33
OWC	50	25	25	0	50	50	0	0
YWC	25	58	17	0	17	50	0	33
conversations %								
OMC	19	33	43	5	24	46	11	19
YMC	39	34	22	5	35	49	1	14
OWC	53	27	20	0	71	13	13	4
YWC	21	25	50	4	13	42	0	46

Table 1: Distribution of percentages of variants of first and second elements of diphthongs for OUT in wordlists (n = 48) and conversations (n = 435).

The patterns for both elements are similar for read and spontaneous speech (Table 1). A trend emerges whereby the frequency of the frontest variant rises from middle-class men through middle-class boys to working-class men. This pattern is only significant for the second element of the diphthong in spontaneous speech (p <.05). The variation for middle-class boys and working-class men tends to be dominated by the two frontest variants. For the first element, middle-class men show a split between front and back variants. In all cases, working-class boys show a spread of variation. At first glance the distribution of variation in middle-class men and working-class boys looks similar, particularly for the first element in spontaneous speech. However, we need to remember that in spontaneous speech working-class boys usually use monophthongs and that diphthongs comprise only 18% of their total number of variants for OUT, whilst middle-class men only use diphthongs. Working-class boys retain their spread pattern of variation for read speech. A highly significant correlation (p = .000) was found between the first and second elements, showing a tendency to take a fronter second element if the first element was front and vice versa.

The acoustic results are represented in terms of group means in Figures 2 and 3. Scatter plots showing

individual variation, which formed visual groupings, can be found in Eremeeva [7]. Differences in F1 (Hz), assumed to correspond to vowel height, and F2-F1 (Hz), corresponding to front/backness of the vowels, were tested for statistical significance.

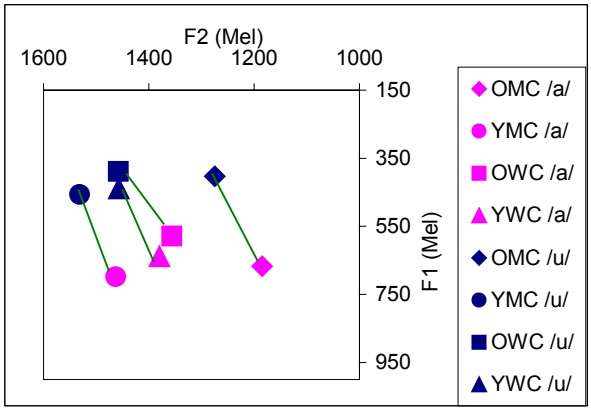

Figure 2: Mean formant frequencies in Mel for F1 and F2 of OUT diphthongs for read speech (n = 329).

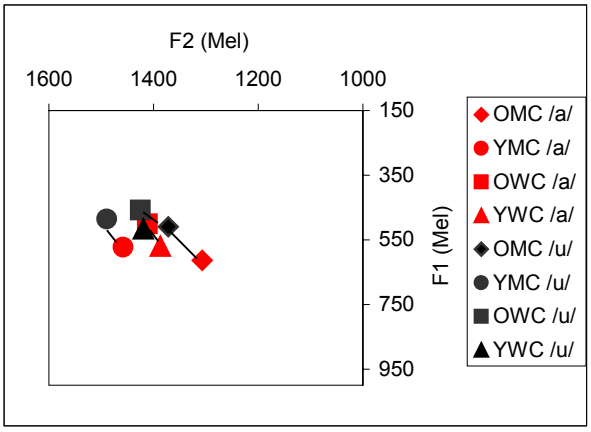

Figure 3: Mean formant frequencies in Mel for F1 and F2 of OUT diphthongs for spontaneous speech (n = 329).

The figures clearly show that the main dimension for the social stratification of the diphthongs is front/backness. In read speech the first element of the diphthong showed a significant effect of class on F1 (p = .002) and F2-F1 (p = .008), and post-hoc tests showed significant class difference within adults for both measures. Working-class men use a fronter and higher first element than their middle-class counterparts. Conversely, middle-class boys use fronter and lower variants than working-class ones, though the spread of variation in working-class boys prevents this from being significant. Similar results were obtained for spontaneous speech for men (class is significant at p = .000 for both measures), and post-hoc tests showed that this also held for boys for F2-F1. Age shows different patterns according to class. Even allowing for physiological differences, middle-class boys have a first element which is much further front than middle-class men, and apparently fronter than those for all working-class speakers, who form a tight group despite age.

Class did not emerge as a significant effect for either measure for the second element of the diphthong in read or spontaneous speech, though Figures 2 and 3 suggest clear trends along the front/back dimension. As for the first element, middle-class boys are frontest, working-class speakers pattern together, and middle-class men are most retracted. Once again, there were significant correlations (p = .000) between the first and the second elements, reflecting fronting of the whole diphthong.

The acoustic and auditory data together show, albeit differently, that working-class men use a fronter diphthong than middle-class men. Within boys this trend is reversed, with middle-class boys using fronter pronunciations than working-class boys, who in any case are very variable. In terms of age, middle-class boys use the frontest variants acoustically for both elements of the diphthong. Auditorily this holds for the first but not the second element with respect to middle-class men, but their position with respect to working-class men is interesting, since acoustically they outstrip the men in fronting, but auditorily they show fronting to a similar extent.

3.1. BIT

Macaulay's analysis of BIT found that lower class speakers used lower and more retracted variants than those from the higher classes, and Johnston [9] reports similar findings for Edinburgh. While OUT was not found to show much variation according to phonetic environment, both studies of BIT found effects, particularly in the environment of /r/ and /l/. These were then avoided when selecting tokens from the wordlists and conversations (n = 412). From the wordlists 10 words were analyzed: *bit, bid, fit, kit, hit, slid, pin, tin, kin. fin.* As for OUT, the range of variation was reduced to 4 categories, and the results are presented in Table 2.

%	[ɪ]	[ë]	[ɛ̈]	[ʌ]	[ɪ]	[ë]	[ɛ̈]	[ʌ]
OMC	98	3	0	0	61	36	3	0
YMC	38	28	15	18	22	46	19	14
OWC	38	43	10	10	22	40	26	11
YWC	15	28	23	33	14	38	22	27

Table 2: Distribution of variants for BIT in wordlists (left; n = 159) and conversations (right; n = 412).

There was significant class variation overall in spontaneous speech (p = .000) and within men (p = .000) in read speech. In both cases, middle-class men use the highest and frontest variants. The other three groups show lower and more retracted variants, with working-class boys as the most extreme. Interestingly, though, the bulk of their variation is shared across variants other than [ɪ], [ë] is most common.

The acoustic results are again presented as group means (see Figure 4). Variation mainly occurs on the front/back dimension, except for middle-class men who are higher than the other speakers. For both kinds of speech, class was found to have a significant effect on vowel height and

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front/backness ($p < .05$), and post hoc tests confirmed these differences for men generally, and for front/backness for boys in read speech.

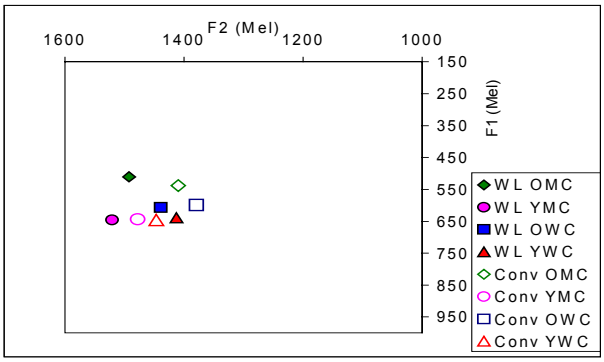

Figure 4: Mean frequencies in Mel for F1 and F2 of BIT for wordlists (n = 159) and conversations (n = 412).

Both auditory and acoustic results confirm class differences in the realization of BIT within men, with middle-class men using higher and fronter variants. In read speech middle-class boys show variants at the same vowel height as working-class boys, but they are fronter. The two groups show similar qualities in spontaneous speech. Age differences seem to be clearest within middle-class speakers, with middle-class boys generally using lower variants than men.

4. DISCUSSION

Our results for OUT confirm that the use of the monophthong /ʉ/ observed in earlier research is still a vigorous feature of working-class speech, and in particular working-class boys, and moreover that it has remained stable over the last thirty years (see Stuart-Smith [2] for comparative figures). Differences of analysis of the diphthong make it difficult to compare our results directly against those of Macaulay, though his observation of a sociophonetic continuum in terms of lowness/centrality of the first element inverse to class can also be seen in our adult speakers. Our results are largely similar to those of Johnston for Edinburgh. We also found working-class speakers tending to use a higher first element combined with a fronter second element. Thus we can confirm OUT-fronting for Glaswegian working-class speech. We can also suggest that the fronting apparent in the middle-class boys probably represents change in progress, probably influenced by local vernacular norms. That such fronting is not also apparent in working-class boys is not surprising. Their variation is distinctive by the high degree of monophthongs used, and where diphthongs occur, by a wide spread of variation. Just such wide ranges of variation are consistently found in the consonant productions of the same speakers.

Again, for BIT, we can confirm previous results and find new trends. We too found that middle-class men used higher and fronted variants, while working-class speakers used more lower and more retracted variants. We note two novel findings. Working-class boys do not use the most retracted variants, but seem to be moving to fronter pronunciations, perhaps moving away from the strongly retracted variant which is a local stereotype. Middle-class boys are lowered but even further fronted. Again, this may be explained with reference to local vernacular pronunciation.

5. CONCLUSIONS

Our investigation has revealed sociolinguistic stratification in vowel alternation in OUT and in the realization of OUT as a diphthong and in the realization of BIT. In some respects the sociophonetic variation is generally in line with the findings of earlier studies, suggesting some stability in pronunciation of these vowels over the past thirty years. At the same time there are indications of change in progress in the speech of the middle-class boys, and in both cases these changes appear to be moving as a response to local vernacular norms.

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