PROSODIC STYLE SHIFTING IN A NORTHERN IRISH VILLAGE

Ellen Douglas-Cowie† and Roddy Cowie#
†*School of English, Queen's University Belfast,*
#*School of Psychology, Queen's University Belfast*

ABSTRACT

This study complements a widely cited report of code switching in a Northern Ireland community. In an earlier study Douglas-Cowie contrasted speech styles at segmental levels during (a) conversation with members of the community and (b) conversation with an outsider. The tapes have been reanalysed to examine contrasts at a prosodic level. Analysis makes two broad points. First, males and females behave differently across a range of prosodic measures. Second, a group of related measures change in a distinctive way between formal and informal conversation. What people do with a high status stranger is to modify the prosodic habits that distinguish their informal speech. Those who tend to make large pitch movements in informal speech reduce them, and those who tend to make small pitch movements in informal speech increase them. The evidence is suggestive rather than conclusive, but the area stands in need of good hypotheses.

1. INTRODUCTION

Sociolinguistic research has been slow to explore prosodic variation. Even apparently straightforward forms of variation have received relatively little attention, and subtler forms have received virtually none. A case in point is the way that speakers shift style in response to audience characteristics. That kind of shift has been observed at segmental, grammatical and lexical levels [1]. However, very little is known about audience-related shifts in prosodic style. This paper provides evidence that such shifts may occur, and can be measured instrumentally.

It is known that prosody plays a part in distinguishing several kinds of speech variety, though the level of documentation is uneven. Of the classic sociolinguistic variables, regional variation is reasonably well documented. Distinctive prosodic features have been reported for varieties of British English, to include Liverpool [2], Tyneside [3], Birmingham [4] and Scotland [5]. Outside Britain, detailed information on regional varieties is slight, though there is some work on American English varieties [6] and on Australian varieties [7]. Social variation is much less often reported, though Douglas-Cowie and Cowie [8] have reported that different social classes in Belfast differ in the frequency with which they use various prosodic features. There has also been an upsurge of interest in the social distribution of a high rising tone (HRT) in Australia, New Zealand, North America and more recently in England. This tone has been shown to be most dominant in the speech of younger people, working class speakers and female speakers [9, 10, 11].

There are well documented relationships between gender and prosody at the level of pitch mean and spread [e.g. 12]. Some relationships between gender and subtler aspects of prosody are also known - for instance, the use of a high rising tone is gender related [9, 10, 11]. Others are less clear. Henton [13] noted that female voices tend to be thought of as more 'swoopy' than male voices, and studied a sample of male and female speakers to test the idea. However, her measures of 'pitch dynamism' did not show the expected difference.

In addition, a number of studies have documented prosodic styles that are associated with particular communicative functions. Crystal and Davy [14] identified a number of prosodic dimensions along which speaking styles vary, and indicated (impressionistically rather than systematically) how some of these dimensions might apply to a range of speaking styles including conversation, a sermon, a lecture, a cricket commentary and a formal radio discussion. Johns-Lewis [15] found differences at the level of mean and standard deviation of F0 for three styles - conversational, acting, and reading aloud. More recently there has been an upsurge of interest in prosody and speaking style. Hirschberg [16] looked at prosodic and other acoustic features that distinguish spontaneous speech from reading, Touati [17] examined pitch range in French political speech, Nushikyan and Kravchenko [18] identified prosodic cues of lecture expressiveness. Douglas-Cowie and Cowie [19] showed that sections of phone calls which serve different functional purposes are prosodically marked.

Against that background, it would be rather surprising if prosodic variables did not participate in the kind of style shift that sociolinguists have described under the heading of 'audience design', i.e. shifts that depend on who is addressing who [1]. However, there appears to have been no direct research into the issue. This study aimed to confirm that such shifts do occur.

The material was chosen to complement a widely cited report of style shift (related to audience) at segmental, grammatical and lexical levels. Douglas-Cowie [20] contrasted the speaking styles of people from a Northern Irish village during (a) their conversation with fellow members of the community and (b) their conversation with an outsider. Style shifts were reported at a segmental, grammatical and lexical level. The degree of shift was shown to relate to a speaker's social ambition. The tapes from that study have been reanalysed to examine contrasts at a prosodic level.

The authors had been aware for many years that the shifts in phonological and grammatical features that have been reported appeared to be accompanied by shifts in prosodic patterning. However, the prosodic shifts were not of a form that lent itself to analysis using traditional methods, based either on simple instrumental measures (such as midpoint and spread of F0) or on the phonologically oriented categories of either TOBI or the British system.

The means to examine these apparent changes was provided by a tool that we have developed for other purposes, the ASSESS system [21]. ASSESS automatically generates a battery of statistics summarising the behaviour of variables related to prosody over periods ranging from a few seconds to many minutes. These statistics include familiar measures, such

as mean and pitch range - those will be called pointwise because they consider the F0 contour simply as a collection of points, and take no account the structures formed by sequences of points. However, ASSESS also generates statistics which will be called piecewise, because they deal with simple structures extracted from the F0 contour - including silences; 'level stretches' where there is no substantial pitch change over an appreciable period; and rising and falling pitch movements, where the F0 contour moves consistently in one direction for an appreciable period.

Analysis is complicated by the fact that ASSESS-type variables are known to reflect both the emotion of the speaker [22] and the communicative function of the speech episode [19]. The speech samples studied were chosen to minimise the likelihood that any differences observed could be attributed to change in those aspects of the situation rather than to audience design per se. Extracts were found in which speakers appeared to be talking unemotionally about matters of fact, well after preliminary exchanges had been made and the conversation had settled into a reasonably stable pattern.

2. METHOD

The speech samples were taken from the recordings which were made for the original study. In the original study, speakers were selected to represent a social cross section of the community. Each speaker was recorded for a two-hour period talking to another member of the community in a familiar setting, and was subsequently recorded in the same setting talking for a two-hour period to an outsider to the community. Speakers were unaware that they were being recorded: their consent had been obtained much earlier, and there was nothing distinctive about the occasions when recording actually took place (see [18] for more detail).

The present study used eight of the twelve speakers who were recorded in the original study. They were selected to give a wide social range and to give even numbers of male and female speakers. Seven turns, totalling about a minute, were analysed for each speaker. They were selected from passages of unemotional speech conveying factual content, occurring 30 minutes into the conversation.

Entropic WAVES™, operating on a SUN SPARC II workstation was used to capture samples and to carry out basic signal processing.

The ASSESS system was then used to derive a range of measures from the raw information provided by WAVES™. F0 points were excluded from the data set if the WAVES™ confidence estimate fell below 0.9. Hand editing then removed any remaining points which were judged to be unreliable (all but a few of these were points below 50Hz). A smooth contour was then fitted to the remaining points. Natural landmarks were then identified on the fitted curve. These were the boundaries of silences and 'level' stretches (where pitch changed by a minimal amount over an appreciable period), and local maxima and minima in the remaining parts of the curve. These procedures have been described elsewhere [17] except for the finding of level stretches, which was an extension to the previous system suggested by the intuition that sustained level stretches might be significant in this context.

Pointwise measures included most natural summary statistics for the data produced by editing the WAVES™ output - mean F0, standard deviation of F0, maximum F0, minimum F0, and the 10th, 50th, and 90th percentile points for F0. Piecewise measures were primarily statistical summaries of the 'continuous pitch movements' that run between adjacent 'landmarks' on the fitted F0 contour. Magnitude, duration and slope were found for each continuous pitch movement, and summary statistics were obtained for each type. Summary measures were also extracted for the amplitude of continuous pitch movements, and numbers and duration of pauses were calculated.

Results were subjected to analysis of variance. Two between variables were used, gender and 'informal mobility', which divided the four speakers of each gender into the two who showed most prosodic variation in conversation with other community members and the two who showed least. Style (formal or informal) was a within variable.

3. RESULTS

The data make two broad points about style and style shift.

The first point is that piecewise variables were strongly related to gender. It was not the primary aim of the study to explore gender differences, but the ANOVAS showed they were pervasive: 20 out of 45 piecewise variables showed significant male-female

		Means			Standard Deviations		
	MEASURE	males	females	p value	males	females	p value
Rises	length	134 ms	155 ms	.08	69 ms	92 ms	.006
	magnitude	16.2 Hz	28.6 Hz	.001	13 Hz	27.1 Hz	.0001
	slope	110 Hz/s	160 Hz/s	.0004	60 Hz/s	110 Hz/s	.0012
	amplitude				0.2 dB	0.3 dB	.032
Pauses	mag	10.5 Hz	19.2 Hz	.043	9.5 Hz	18.4 Hz	.0291
Falls	length	147 ms	184 ms	.0474			
	magnitude	13.3 Hz	25.9 Hz	.0091	11.5 Hz	26.4 Hz	.0201
	slope	90 Hz/s	130 Hz/s	.0056	40 Hz/s	80 Hz/s	.0044
Levels	amplitude				0.3 dB	0.4 dB	.0036

Table 1. Significant effects of gender on piecewise variables

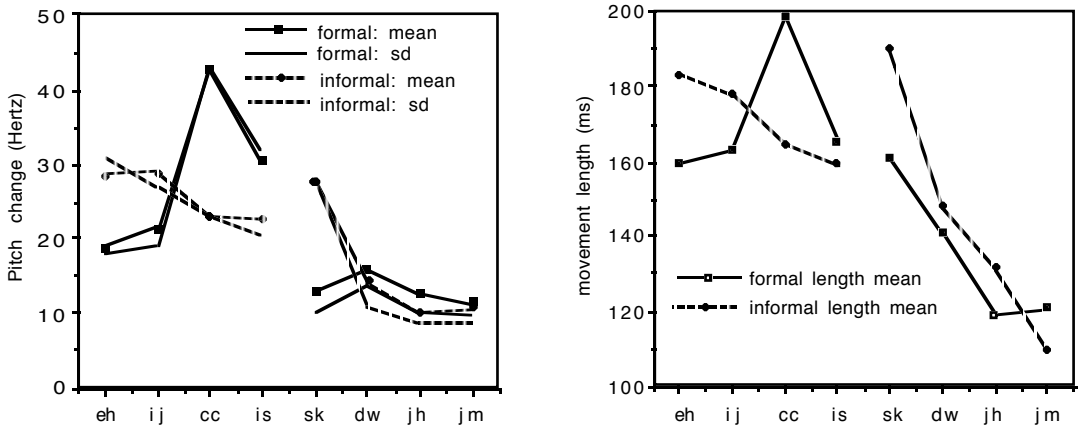

Figure 1. Speech style and the scale of pitch movements (aggregating rising and falling movements)

contrasts. Table 1 summarises the relevant strongest effects and the means associated with them.

These effects do not reduce to effects of a more familiar, pointwise type. There was, as one would expect, a strong effect of gender on mean pitch, but it had no effect on pitch spread as measured by standard deviation (F1, 8=2.8, p=.13), and only a modest effect on pitch spread as measured by the difference between 10th and 90th pitch percentiles (F1, 8=10.1, p=.013). The stronger effects in Table 1 can only be explained by gender differences in the structure of pitch variation.

The second point is illustrated in figure 1. A group of related variables changed in a distinctive way between formal and informal conversation. The horizontal axes in figure 1 show the speakers ordered first in terms of gender (the four females then the four males), and then in terms of the typical scale of individual pitch movements in informal speech. Scale is measured in two ways - by the magnitude of the average pitch change associated with a continuous pitch movement (shown in the left hand panel) and in terms of the average duration of a typical pitch movement (shown on the right). The standard deviation of pitch change is shown alongside the average magnitude: it measures the variability of pitch movement, which is an interesting quantity in its own right.

These graphs suggest that what people do with a high status stranger is to modify the prosodic habits that distinguish their informal speech. Those who tend to make large pitch movements in informal speech reduce them, and those who tend to make small pitch movements in informal speech increase them.

To test the statistical strength of the trends, analyses of variance were carried out in which speakers were grouped according to the scale of pitch change found in their informal speech, counting the two who show most pitch change in each gender as members of one group and who show least as members of another. The key effects are shown in table 2. Analyses of rising and falling movements individually are shown to indicate that the effects are associated with both types of movement rather than one or the other.

Movement	Measure	F (1,4)	p=
rising	magnitude of change		
	• mean	6.9	.0584
	• standard deviation	10.8	.0301
falling	magnitude of change		
	• mean	7.8	.0496
	• standard deviation	6.7	.0609
both types	magnitude of change		
	• mean	9.0	.0403
	• standard deviation	9.5	.0367
	duration of change		
	• mean	6.6	.0625

Table 2. Interactions between style and grouping based on scale of change in informal conversation.

Finally the study found no significant differences related to the social status or social ambition of the speakers, as had been the case in the original study.

4. DISCUSSION AND CONCLUSION

Perhaps the clearest conclusion from this study is that if style shifts linked to audience design extend to prosodic features, they are not easy to find. The evidence reported here suggests that such effects do occur, but it is clearly not conclusive.

Results reinforce one intuition behind the study, which is that the piecewise measures provided by ASSESS may be a useful tool for the study of prosodic style. They support the intuition that there are substantial gender differences in pitch dynamism in a way that pointwise measures do not, and they offer evidence of style shift associated with audience design.

Results also point to a feature of prosody which is both isnteresting and problematic, which is that it is subject to large individual differences. Figure 1 shows that both males and females show a considerable range of prosodic patterning in informal conversation, so that style shift has to be detected against a variable background.

It should be noted that the variation just described affects passages which were selected for comparability in content and

attitude. Clearly variation associated with emotion and verbal content would add a further dimension of difficulty.

Against that background, it is perhaps less surprising that 'audience design' type shifts in prosody have not been described before. However, the task of finding subtle effects is transformed if one knows what to look for. We are reasonably convinced that effects of this kind do exist, and the present study offers a hypothesis to follow.

REFERENCES

[1] Bell, A. 1984. Language style as audience design. *Language in Society*, 13, 2, 145-204.

[2] Knowles, G. 1975. 'Scouse: the urban dialect of Liverpool.' Unpublished Ph.D. thesis, University of Leeds, UK.

[3] Pellowe, J. and Jones, V. 1978. On intonational variability in Tyneside speech. In Trudgill, P (ed.), *Sociolinguistic patterns in British English*. London: Edward Arnold, 101-121.

[4] Wells, B. and Local, J. 1993. The sense of an ending: a case of prosodic delay. *Clinical Linguistics and Phonetics*, 7, 59-73.

[5] Brown, G., Currie, K.L. and Kenworthy, J. 1980. *Questions of intonation*. London: Croom Helm.

[6] Tarone, E. 1976. Aspects of intonation in Black English. *American Speech*, 48, 29-36.

[7] Horvath, B. 1985. *Variation in Australian English: the sociolects of Sydney*. Cambridge: Cambridge University Press.

[8] Douglas-Cowie, E. and Cowie, R. 1995. The social distribution of intonation patterns in Belfast. In Windsor-Lewis, J. (ed.), *Studies in English and general phonetics: essays in honour of Professor J. D. O'Connor*. London: Routledge, 180-186.

[9] Guy, G., Horvath, B., Vonwiller, J., Disley, E.and Rogers, I. 1986. An intonational change in progress in Australian English. *Language in Society*, 15, 23-52.

[10] Britain, D. 1992. Linguistic change in intonation: the use of HR terminals in New Zealand English. *Language Variation and Change*, 4, 77-104.

[11] Cruttenden, A. 1995. Rises in English. In Windsor-Lewis, J. (ed.), *Studies in English and general phonetics: essays in honour of Professor J. D. O'Connor*. London: Routledge.

[12] Graddol, D. Discourse specific pitch behaviour. In Johns-Lewis, C. (ed.) *Intonation in discourse*. London: Croom Helm, and San Diego: College-Hill Press, 221-237.

[13] Henton, C. 1995. Pitch dynamism in female and male speech. *Language and Communication*, 15, 1, 43-61.

[14] Crystal, D. and Davy, D. 1969. *Investigating English Style*. London and Harlow: Longman.

[15] Johns-Lewis, C. 1986. Prosodic differentiation of discourse modes. In Johns-Lewis, C. (ed.) *Intonation in discourse*. London: Croom Helm, and San Diego: College-Hill Press, 199-220.

[16] Hirschberg, J. 1995. In Elenius, K. and Branderud, P. (eds.), *Proceedings of X111th International Congress of Phonetic Sciences*, 2, 36-43. Stockholm:KTH and Stockholm University.

[17] Touati 1995 ICPhS In Elenius, K. and Branderud, P. (eds.), *Proceedings of X111th International Congress of Phonetic Sciences*, 4, 244-247. Stockholm:KTH and Stockholm University.

[18] Nushikyan and Kravchenko 1995 ICPhS In Elenius, K. and Branderud, P. (eds.), *Proceedings of X111th International Congress of Phonetic Sciences*, 3, 266-269. Stockholm:KTH and Stockholm University.

[19] Douglas-Cowie, E. and Cowie, R. 1998. Intonational settings as markers of discourse units in telephone conversations. *Language and speech*, 41 (3-4), 347-370.

[20] Douglas-Cowie, E. 1978. Code switching in a Northern Ireland community. In Trudgill, P. (ed.) *Sociolinguistic patterns in British English*. London: Edward Arnold, 37-51.

[21] Cowie, R., Sawey. M. and Douglas-Cowie, E.1995. A new speech analysis system: ASSESS (Automatic Statistical Summary of Elementary Speech Structures). In Elenius, K. and Branderud, P. (eds.), *Proceedings of X111th International Congress of Phonetic Sciences*, 3, 278-281. Stockholm:KTH and Stockholm University.

[22] McGilloway, S., Cowie, R., and Douglas-Cowie, E.1995. Prosodic signs of emotion in speech: preliminary results from a new technique for automatic statistical analysis. In Elenius, K. and Branderud, P. (eds.), *Proceedings of X111th International Congress of Phonetic Sciences*, 1, 250-253. Stockholm:KTH and Stockholm University.