Intonational Variation in the British Isles

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Abstract

Models of intonation are typically based on one dialect and one style and do not account for inter- or intra-speaker variability. Speech data from the IViE corpus, however, demonstrate considerable variation in English intonation that occurs both across and within dialects (IViE = Intonational Variation in English, UK ESRC award R000237145, http://www.phon.ox.ac.k/~esther/ivyweb). In this paper, we introduce the IViE corpus and present a selection of findings. Concentrating on nuclear accents, we provide evidence for (1) variation in the production of nuclear accent types and (2) variation in the phonetic realisation of nuclear accents. We discuss data from seven dialects. The results show that intonational differences between dialects of one language can be greater than intonational differences between dialects of two different languages. They also show that there is considerable intra-dialectal variation.

1. Introduction

In the British Isles, segmental phonetic differences between dialects have been investigated extensively [e.g. 1]. Dialectal variation in intonation has received much less attention. Prior investigations have been mono-dialectal and most provide comparisons only with Southern Standard British English. [e.g. 2-12].

There are at least two reasons why we need descriptive data on intonational variation within languages. Firstly, the data are required for work on prosodic typology. This topic is becoming increasingly central in research on prosody [13-17]. Ideally, prosodic typologies are based on quantifiable data on variation across and within languages.

Secondly, there is a need for quantifiable data on intonational variation in speech technology. At present, statistical data on variation are scarce. Consequently, the lack of quantitative modelling of intonational variation is widely recognised as a serious gap in speech technology. The provision of appropriate, statistical models of intonation is expected to yield significant improvements in synthesis and recognition.

2. Background

2.1. Previous studies of intonation in the British Isles

A number of English dialects have been investigated previously, including Belfast [2,8,10], Tyneside [3,11], Liverpool [4], Welsh English [5-7], London Jamaican [9], Glasgow [11] and Manchester [12]. The studies on Belfast, in particular, show that the level of variation between intonation systems in the British Isles is considerable. Southern British English speakers produce declaratives with falling intonation and questions without morphosyntactic markers with final rises. Belfast speakers do not appear to make this distinction; both sentence types are produced with rising intonation [8, 19]. Until recently, comparable speech data from other varieties of English have not been available. Consequently, in the IViE project, our aims were (1) to collect comparable speech samples from several English dialects in a range of speaking styles, (2) to make the data available in the public domain, and (3) to provide prosodic annotations and linguistic analyses for a subsection of the data.

2.2. The need for directly comparable data

The methodology employed in the IViE project was taken from previous comparative work on intonation. Grabe [21] showed that apparently conflicting claims about similarities and differences in the intonation systems of the standard varieties of English and German could be resolved if the analysis was based on directly comparable data from near-homogenous speaker groups. These were controlled for dialect, speaking style, age and gender. Grabe showed that her English and German speakers used equivalent sets of intonational building blocks but combined them in different ways. Additionally, cross-linguistic differences emerged in the acoustic-phonetic realisation of intonation. Findings like these can be produced only if comparable data are available: a phonological pattern can be specific to a particular speaking style. In the IViE corpus, high rising terminals [22] occur in free conversation in Cambridge English but not in read speech [18]. Phonetic implementation effects can be dialect-specific also [23] and they can be gender-specific [cf. 24]. Therefore, as a first step, we adopted a controlled approach. We carried out an investigation of intonational variation within one language on the basis of directly comparable data elicited in a range of dialects and speaking styles.

3. The IViE corpus

The corpus contains 36 hours of speech data. The dialects in the corpus are 'modern' or 'mainstream' dialects [25]. Traditional research on dialectology has focussed on speech from older, usually male speakers from rural areas. We recorded adolescent speakers from urban areas. Near-homogeneous groups (six male, six female speakers) were recorded in secondary schools in nine locations: Belfast, Cardiff, Cambridge, Dublin, Leeds, Liverpool, Newcastle, Bradford (British Punjabi English) and London (speakers of West Indian descent). Five speaking styles were recorded:
  - 22 phonetically controlled sentences with a range of grammatical structures,
  - a read text, the fairy tale Cinderella,
  - a retold version of the text, assisted by a set of pictures,
  - a Map task (single sex pairs),
  - a discussion on a given topic (smoking).

A CD-ROM version of the complete corpus was released in June 2001 [18]. An on-line version of the data-base has been

available on the internet since August [26]. A range of cross-dialectal analyses using the data have been published in [13,27,28].

3.1. Prosodic annotations

A subsection of the data in the corpus are accompanied by a range of machine-readable prosodic annotations. Many machine-readable intonation systems are modelled on ToBI [29] and the IViE system is no exception; H and L symbols are associated with stressed syllables and intonation phrase (IP) boundaries. But unlike ToBI, which is intended for the transcription of standard varieties of English, IViE was developed for inter-dialectal comparisons. Labellers choose transcription symbols for all dialects from a pool of options based on work on British English [21,30]. This approach ensures comparability of transcriptions across dialects. Phonological classifications are based on a range of comparisons of different utterances; intonation patterns produced in identical or comparable contexts are compared within and across dialects [21]. The resulting two-tone phonological transcriptions have the status of hypotheses and they allow for the quantification of particular observations. These hypotheses can be turned into hard evidence through acoustic experimentation and through measurement. Without quantifiable phonological transcriptions, hypotheses are less likely to provide results which are empirically valid.

The phonological transcriptions in IViE are underpinned by information on two further transcription tiers: one provides syllable-by-syllable transcriptions of f0 patterns and alignment and the other is intended for the transcription of stressed and accented syllables. A complete IViE transcription includes information on:
- the location of the words spoken in the acoustic signal,
- the location of stressed and accented syllables,
- the pitch movement surrounding accented syllables and IP-boundaries,
- and a phonological classification of intonation involving accented syllable and IP-boundaries.

A labelling guide for the IViE system is available on the internet [26].

4. Findings

Ladd [31] proposed a taxonomy of cross-linguistic differences between intonation languages:
- Semantic variation: instances where speakers use the same tune for different functions.
- Systemic variation: speakers use different tunes for the same function.
- Realisational variation: speakers use the same phonological unit, but realise that unit differently.
- Phonotactic variation: different restrictions on the way in which phonological units can be combined.

We now present evidence for systemic and realisational variation within one language. Evidence for systemic variation is based on the phonological annotations in the corpus. Evidence for realisational variation comes from the acoustic signal [13].

The data show that the level of intra-language variation in English is considerable. The variation has two sources. The first is of the type described by Ladd as variation *between* intonation languages. In different languages, we find different tunes, but in different dialects of English, we find different tunes also. The second source of variation involves the wide

range of phonological, phonetic and phonotactic options available to a speaker in a particular context [cf. 20]. Even in productions of relatively tightly controlled texts, speakers from a particular dialect make use of a relatively wide range of prosodic choices.

We illustrate these observations with two sets of findings. Following Cruttenden [32], we restrict the presentation to nuclear accents. The first set of data provides evidence for phonological variation. We examine intonation patterns in declaratives and inversion questions in seven dialects and we show that there is intra- as well as inter-dialectal variation. Then we illustrate phonetic (realisational) variation using data from four dialects.

4.1. Intonational phonological variation

The following graphs are based on the sentence data in the prosodically annotated section of the IViE corpus. The results are from six speakers from each variety. Each speaker read eight declaratives and three inversion questions. The test sentences were included in a randomised list of sentences with different grammatical structure. Figure 1 shows that in Cambridge declaratives, over 90% of nuclear accents were falls (H*L %). In Belfast, 80% were rise-plateaux (L*H %)[1]. The remaining Cambridge speakers produced fall-rises (H*L H%), and the remaining Belfast speakers produced rise-plateau-falls (L*H L%) or falls (H*L %).

Legend:
- H*L %
- H*L H%
- L*H H%
- L*H %
- L*H L%

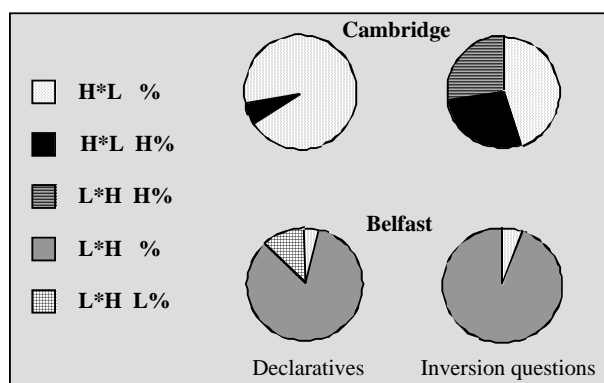Cambridge

Belfast

Declaratives — Inversion questions

Figure 1. Production of nuclear accents in Cambridge and Belfast. Results for declaratives are shown on the left (N=96) and results for inversion questions on the right (N=36).

A comparison of the declaratives in Figure 1 with inversion questions (e.g. *May I lean on the railings?*) reveals intra-dialectal as well as inter-dialectal differences. The figure shows that speakers' intonational choices can change if the grammatical function of an utterance changes, but the type of change that takes place is dialect-specific. In Cambridge, a falling nucleus dominates in declaratives, but not in inversion questions. In Belfast, we do not find a comparable difference. Rise-plateaux dominate in declaratives but they also dominate in inversion questions. In Belfast, the only difference between the two types of utterances involves the production of rise-plateau-falls (L*H L%). Belfast speakers produced them in declaratives but not in inversion questions.

In sum, the data in Figure 1 show that speakers have a range of intonational options when they produce a particular text. They also reveal cross-linguistic difference in the mapping between grammatical function and intonational phonological choice.

Figure 2 shows data from declaratives in seven dialects. In six out of seven dialects, H*L % is dominant. Urban northern rises were produced in the data from Belfast (83%), Newcastle (17%) and Dublin (4%). More information on Urban northern rises in the British Isles is given in [19,28, 31].

Figure 2: Nuclear accent production in declaratives.
Data from seven dialects of English (N=336).

Figure 3 shows data from inversion questions. The figure shows that in each dialect, speakers produced a wider range of patterns in inversion questions than in declaratives.
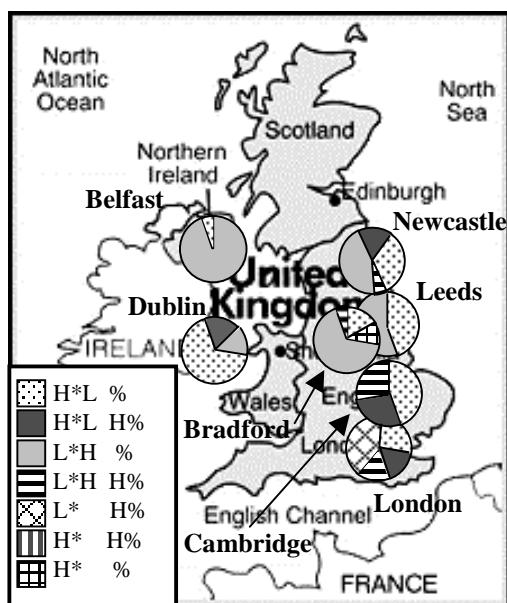

Figure 3: Nuclear accent production; modal questions.
Data from seven dialects of English (N=126).

More generally, Figure 3 shows that a falling pattern (H*L %) is dominant in inversion questions only in Dublin.

Everywhere else, rising patterns dominate. Urban northern rises are used as far down as Leeds and Bradford. In Cambridge or London, other types of rises dominate.

In sum, the data in Figures 2 and 3 reveal broad geographical differences in the distribution of nuclear accent types [cf. 5]. They also show that the picture of cross-dialectal differences changes when the grammatical function of an utterance changes. But note that a change in grammatical function can have a different effect on the production of intonation in different dialects.

4.2. Phonetic variation: truncation and compression

Grønnum and Ladd [31,33] have suggested that truncation and compression may be typological parameters in intonation. Grabe [34] showed that in Northern Standard German, on very short IP-final words, speakers truncate falling accents (H*L %). Instead of producing a very rapid fall in f0, they do not complete the pattern. In Southern British English, in an identical context, H*L % is compressed. Grabe's findings appear to corroborate the view that British English is a compressing language 'par excellence' [31]. Dialect differences in the application of truncation and compression, however, have been reported for Swedish [23] and Liverpool English may have truncation [4].

As part of the IViE project, we carried out an investigation of truncation and compression in four dialects of English: Cambridge, Leeds, Newcastle, and Belfast. Following [34], the stimuli consisted of the surnames *Mr. Sheafer*, *Mr. Sheaf* and *Mr. Shift*, embedded in identical carrier phrases. The pragmatic intent of the test utterances was cued by identical precursors. Since the surnames exhibit successively less scope for voicing, the speaker is forced either to increase the rate of f0 change from the longest to the shortest word (compression) or to complete less of the pattern (truncation). Details of experimental procedure and measurements are given in [13]. Figure 4 gives the results. Cambridge and Newcastle English compress, but Belfast and Leeds English truncate.

Figure 4: Compression and truncation in four varieties of English. C= Compression, T=Truncation.

5. Summary and Conclusion

We have provided evidence of inter- and intra-dialectal variation in English intonation. Firstly, we showed that there are broad geographical differences in the production of nuclear accents in the British Isles. These do not involve the association of a single type of nuclear accent with a particular utterance type in a particular dialect but a range of possible accent types per dialect. Then we showed that the mapping between grammatical structures and intonational form is dialect specific also. A change in grammatical function can be associated with the production of a different pattern in one dialect but not in another. Finally, we provided evidence of inter-dialect differences in phonetic realisation. In English, truncation and compression are dialect-specific.

We conclude that dialect variation is a significant variable in prosodic typology. The intonation systems of dialects of one and the same language can be as different as the intonation systems of different languages. For instance, in read speech, the phonological structure of Cambridge English intonation is closer to that of Northern Standard German than to that of Belfast English. Similarly, Leeds English has truncation, just as Northern Standard German does, but Cambridge English does not. Finally, we conclude that patterns of inter- and intra-speaker variation within and across dialects may be complex but they are not random. Rather, they present a serious challenge to prosodic typologists. We need to consider how models of intonation can accommodate this variation.

6. Notes

[1] The % sign represents an IP boundary without a tone. This approach allows for the transcription of rise-plateaux as L*H %, double-rises as L*H H% and rise-plateau-falls as L*HL%. The three options occur in Belfast English [21].

[2] Rise-plateau-falls have been described as rise-plateau-'slumps', e.g. in [19]. In our data, many 'slumps' involved drops of around 60 Hz or more in female speakers and drops of around 20 Hz in male speakers.

7. References

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