Alignment of the trailing L tone in Scottish H*+L nuclei

Margit Aufterbeck
University of Cambridge, United Kingdom
E-mail: ma247@cam.ac.uk

ABSTRACT

In their analyses of British English, [1] and [2] introduce phonological adjustment rules that apply to the basic accents H*+L and L*+H. Thus, partial linking [1] and DISPLACEMENT [2] produce a prenuclear fall (H*+_L) where the trailing L is not reached on the postaccentual syllable but only later on a subsequent one. In both analyses, this phonological adjustment rule only applies to prenuclear, not to nuclear pitch accents, and this observation is taken as an argument for intonation phrases being internally structured into prenuclear and nuclear domains which underlie different constraints. Evidence from one variety of Scottish English, that of Anstruther in Fife, shows that partial linking, or DISPLACEMENT, can indeed apply to nuclear accents: the trailing tone of a nuclear H*+L in Anstruther Scottish English is consistently delayed until the vicinity of the IP final boundary. The present paper reports an experiment that was designed to investigate both read and spontaneous speech of younger and older speakers of Anstruther Scottish English (ASE). Statistical analyses show that speakers of ASE align the nuclear H*+L fall significantly later than speakers of Southern British English (SBE) do. Furthermore, the measurements suggest these adjustments are gradient rather than categorical in nature. Finally, the experiment shows that late nuclear alignment shows the classic distribution of sociolinguistic variables: ASE speakers manifest the feature to a much greater extent when they speak spontaneously than when they read, and younger speakers of ASE tend to show displacement to a lesser extent than older ones. The conclusions drawn from this experiment are that first, constraints on alignment are not only language but also variety specific, second, that these constraints can no longer hold as a sufficient argument for ASE nuclear pitch accents being structurally different from prenuclear ones, and third, that this dialect specific constraint is subject to sociolinguistic variation within the ASE variety.

1. INTRODUCTION

The present paper investigates temporal alignment of the trailing L tone of nuclear H*+L falls in Anstruther Scottish English (ASE), a variety spoken on the East coast of Fife. By temporal alignment, we mean the timing of pitch events in relation with the segmental string [3]. The term 'nuclear' is employed to define the pitch pattern on the last accented syllable in an intonation phrase (IP). The default nuclear intonation pattern for declarative statements in ASE is the fall, transcribed in autosegmental metrical theory (e.g. [4]) as H*+L. The ASE fall is commonly followed by an unspecified boundary tone which AM systems for British English [1, 4], which only know one level of intonational phrasing, transcribe as 0%. The falling pitch movement on these nuclear accents in ASE shows a gradually falling slope towards the end of the IP, and it is this gradual slope that differs distinctively from the nuclear slope we know from, say, Southern British English (SBE), which shows a rather sharp fall to the specific floor level of a speaker, from where the pitch movement levels out and remains flat up until the boundary tone. Figure 1 juxtaposes the two patterns in SBE (A) and ASE (B). Figure 2 below shows stylised contours of the two patterns.

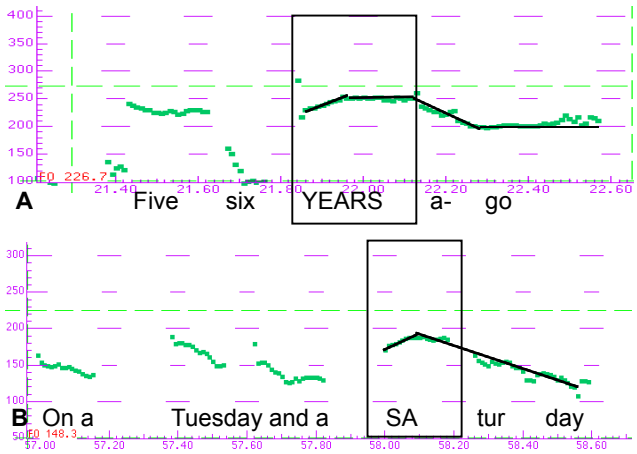

Figure 1: Nuclear fall in SBE (A) and ASE (B), showing later alignment of fall in ASE

Earlier studies on intonational variation have shown that varieties within one language can vary with respect to the alignment of pitch accents. Thus, [5] observed late alignment of prenuclear rises in speakers of Edinburgh Scottish English, and more evidence of within language variation in alignment of prenuclear rises was given by [6] for German.

2. EXPERIMENT DESIGN

An experiment was designed that allowed the phenomenon of late nuclear alignment in both read speech and spontaneous speech to be observed and quantified. For read speech data, speakers were asked to read out a passage of a story. Embedded in the passage were sentences expected to be realized on a fall in nuclear position. The controlled nature of the read speech data made it possible to observe the nuclear fall in well-controlled semantic and segmental

ISBN 1-876346-48-5

environments. As for the syllabic environment, the post nuclear composition of the tail was controlled. Thus, sentences were chosen that involved zero to three unstressed postnuclear syllables.

Twenty speakers of two age groups participated in the experiment, ten speakers each of ASE and SBE. All speakers were born and bred in Anstruther and Cambridge respectively and had lived in their particular towns for practically all their lives. Five speakers of each group were 16-18 years old, the other five 60-80 years old. Recordings of the younger speakers were carried out in secluded rooms in local schools. The corpus of younger speakers of SBE was in fact taken from the IViE corpus by kind permission of the project 'English Intonation in the British Isles' [7]. The older Cambridge speakers were recorded in a quiet room at a local lunch club and the older Anstruther speakers in their private homes. Recordings were made using a portable Sony TCD-D3 DAT recorder and a dynamic microphone with cardioid frequency response (AKG D 190). They were digitized at a sampling rate of 16 kHz and processed using the ESPS/xwaves™ (Entropics) software package. During post processing, a number of utterances had to be discarded from the corpus, either due to speaker specific characteristics that impeded measurements, such as creaky voice, or due to deviations in realization such as nuclear downstep or continuation rise. At the end of this procedure, the corpus consisted of 160 utterances of read speech. As for spontaneous speech, the data set consisted of 239 sentence final statement utterances of the same speakers, produced during map tasks and free conversation that followed the reading tasks. Special care was taken to exclude statement utterances that were realized with intonational floor holding devices such as falls that do not reach the final floor pitch, [1]'s 'half completion', or continuation rises. Similarly, any other types of rising nuclei, such as high rising terminals, were discarded.

3. MEASUREMENTS

In order to represent the pitch pattern accurately, measurements were taken of the time and frequency values of not only the H and L peaks and valleys in the nuclear fall, but of the turning points where the pitch changed direction. Figure 2 illustrates these measured turning points, 'p' denoting the nuclear H* peak, 'tp1' referring to the point where the pitch commences the actual fall towards the low target after, in some cases, having remained on a plateau peak level; 'tp2' represents the point where the pitch reaches the floor level at the end of that fall, and 'end' corresponds to the end of the pitch pattern at the IP boundary, coinciding with the last voiced element of segmental material in the IP. Furthermore, the time values of the syllable boundaries were taken to allow for the measurement points to be expressed relative to the foot. Note that Figure 2 anticipates the estimated results of the present experiment in that all four measurement points are shown to be later for ASE speech than for SBE speech. The dotted line up to the peak (p) refers to the glide up to the peak, which was shown to be significantly wider in ASE [8] and for which the term 'scoop' was introduced. Further than that, no claims are being made as far as frequency spans are concerned.

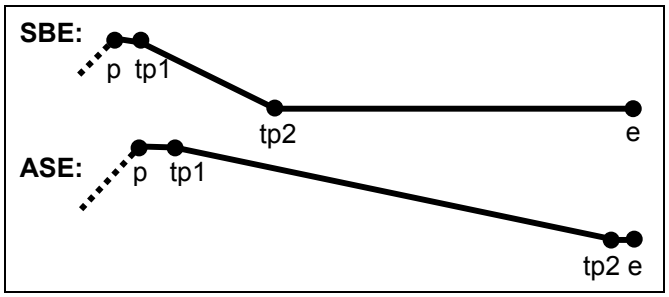

Figure 2: Stylised contour of nuclear H*+L with measurement points

4. RESULTS

4.1. READ SPEECH DATA

The corpus of read speech consisted of 160 utterances produced by 20 speakers performing 8 test sentences imbedded in the passage. In order to neutralize variation in speaking rate amongst speakers, time values were expressed as a percentage of the foot. Note that the foot in this set up with no stressed postnuclear syllables corresponds to the domain encompassing the nuclear syllable and the tail, thus reflecting IP internal structuring following the British Tradition [e.g. 9]. Figure 3 displays the alignment results. Superimposed are the corresponding stylised pitch traces. Note that no claims are being made here as far as frequencies and spans are concerned, since this experiment only focuses on temporal alignment.

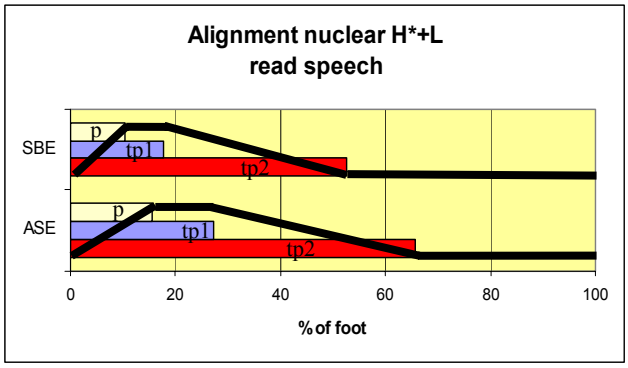

Figure 3: Results on nuclear alignment, resulting stylized pitch traces superimposed

The results confirm the observation that all three measurement points are aligned later in ASE than in SBE. To substantiate this claim statistically, three mixed, two-way ANOVAs were carried out. The independent repeated measures variable was 'Word' with 6 levels (averaging over doublets), the independent between-speakers variable was 'Variety', with two levels, ASE and SBE. The dependent variables were p for the first, tp1 for the second and tp2 for the third ANOVA. All ANOVAs showed Variety (ASE vs. SBE) to be significant (p:

$F_{(1,16)}$=5.703, p<0.05; tp1: $F_{(1,16)}$=7.863, p<0.05; tp2: $F_{(1,16)}$= 13.916, p<0.05). The repeated measures variable 'Word' also showed significant results (p: $F_{(5,80)}$=11.936, p<0.01; tp1: $F_{(5,80)}$=10.990, p<0.01; tp2: $F_{(5,80)}$=15.764, p<0.01). The significance of the factor 'Word' was expected due to the varying segmental composition of the test words. Despite the positive outcome of the experiment on read speech, the differences between the two varieties in Figure 3 are not nearly as distinct as we assumed them to be in Figure 2. We will see below that this rather weak if significant result can be explained by stylistic variation.

4.2. SPONTANEOUS SPEECH DATA

The spontaneous speech data was processed by analogy to the read speech data. Figure 4 illustrates the results accordingly, superimposing stylised pitch traces on the diagram that displays the quantitative results.

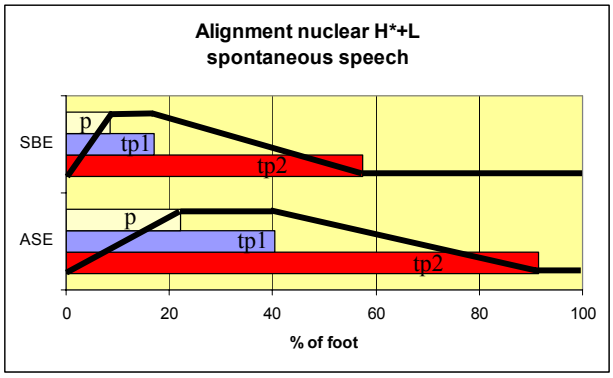

Figure 4: Results on nuclear alignment, resulting stylized pitch traces superimposed

Figure 4 shows that spontaneous data reflects the observed characteristic of ASE speech in comparison to SBE much more clearly than Figure 3 did above. Once more, three ANOVAs were carried out on the data, this time however excluding the factor 'Word', since the segmental position was not controlled in this part of the experiment. Thus the design was that of a one-way between subjects ANOVA, on the independent variable 'Variety' (ASE and SBE) and the dependent ones p, tp1 and tp2 in each process. For each measurement point, the statistics show a significant difference between ASE and SBE speakers (p: $F_{(1,16)}$=16.728, p<0.01; tp1: $F_{(1,16)}$=25.653, p<0.01; tp2: $F_{(1,16)}$=44.860, p<0.01). If we compare Figure 3 to figure 4, we see that it is the ASE speakers who diverge most between speaking styles. Comparing read and spontaneous speech for tp2 reveals only a little shift in SBE data (52.48% to 57.45% of the foot), while tp2 in ASE is shifted significantly more, from 67.24% to 91.59%. This means that while tp2 remains to be reached fairly consistently in the middle of the foot in SBE, it is reached clearly at the end of it in ASE data and thus in the vicinity of the IP boundary. Similar shifts apply to the peak and tp1, but it is the reaching of the speaker's floor value sharply by SBE speakers that is the most salient trait. We can summarise that nuclear displacement is a feature of ASE that surfaces most characteristically in spontaneous speech.

4.3. SOCIOLINGUISTIC PATTERNING

To examine the sociolinguistic realisation of nuclear displacement further, the experiment set-up permits an apparent time study by comparing younger to older speakers of each variety. Results of this analysis of spontaneous speech are illustrated in Figure 5. Displacement of nuclear H*+L appears to be not only subject to stylistic variation; its dynamics within the speech community is also reflected in a pattern resembling language change in progress. The most extreme variants of the variables are used by the elderly speakers of both varieties, with the SBE women using the earliest alignment strategy and the ASE women using the latest one. The younger ASE speakers show a tendency towards the SBE, early pattern of alignment. However, the overall picture is still a binary one of the floor being reached earlier in SBE and near the final IP boundary in ASE. It is this presence (SBE) or absence (ASE) of an IP final stretch of floor pitch level that determines the characteristic intonational difference between the two varieties.

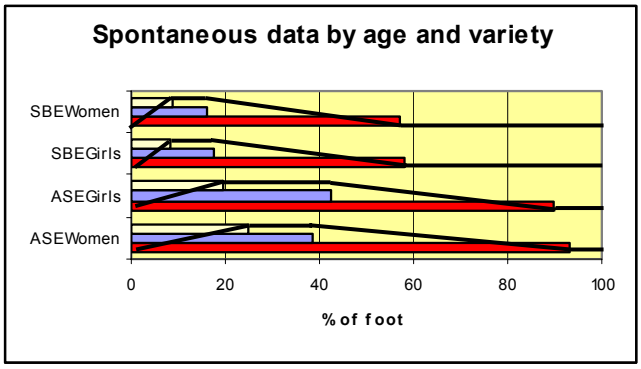

Figure 5: Age differences in the late displacement pattern

With a distribution such as the one we have found in the data above, the results nicely lend themselves to interpretation in terms of an overall sociolinguistic levelling. Figure 6 describes the gradual shift in nuclear alignment from the SBE 'standard' to the ASE 'vernacular'.

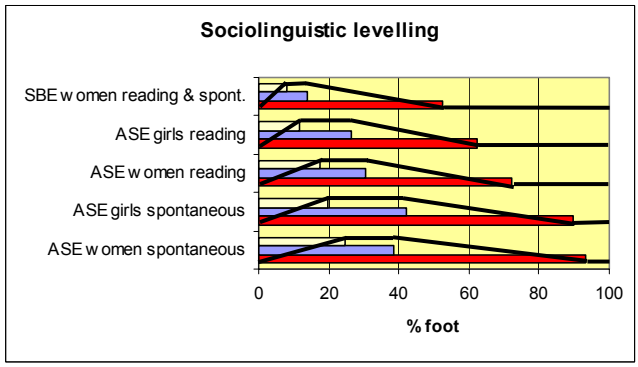

Figure 6: Late nuclear alignment analysed as a sociolinguistic variable, ranking over age and style

Figure 6 shows that we can treat late peak placement as a sociolinguistic variable in several respects, so we can rank it over the variables age and style. Tp2 in particular is

ISBN 1-876346-48-5

consistently shifted later when we trace it from SBE women's reading and speaking style via ASE girls' and women's reading styles up to ASE women's speaking style, the ASE girls consistently showing a slightly milder realization of the feature. It is when they speak spontaneously that they differ only very little from the elder members of the speech community.

5. DISCUSSION

The results above are relevant both to intonational theory and to sociolinguistic methodology in intonational studies. As for intonational theory, the present data provides an example that weakens the claim that the application of different sets of rules to the prenuclear and nuclear pitch accent is sufficient evidence for the fact that the two accent types are inherently different. ASE can serve as a source for counter examples. However, if we were to eradicate the differentiation between prenuclear and nuclear pitch accents altogether, we would lose out on a tool that [1] introduced not only to describe intonational effects that create structural differences but also to provide an explanation for how the structures he finds come about. Thus, [1] claims that the trailing prenuclear L is displaced by means of the linking rule because it is being attracted by the upcoming next H*. Displacement in [1] is therefore comparable to a connected speech process. The observation of ASE displacement bears no such explanation but is an inherent if gradient component of ASE intonation that is realised regardless of the presence or absence of an upcoming high tone. Late alignment in ASE can be interpreted as a phonological adjustment rule that is not environment specific but variety specific and should therefore be placed in a separate category of rules. This category of rules would also contain other rules that apply to ASE and surely other varieties of British English, such as the scooping onglide to pitch accents and the mid terminal ('slump' [3]) ending identified by [10]. The sum of these ASE rules reflects an overall tendency of the ASE variety to put more significance into what happens before or on a pitch accent than to what happens after. While SBE speakers are eager to reach a well defined floor pitch level involving a sharp pitch change immediately after the nuclear syllable, ASE speakers slope gradually and 'sluggishly', as we saw above, and not always to their speaker specific floor frequency, but, as shown in [10], to a more or less arbitrary pitch level at the end of an IP / sentence.

The consequences of the present study on intonational methodology are obvious. If we attempt to gain clear and compelling results in research on intonational variation, we have to bear in mind that controlled speech will only elicit dialectal intonation features in their weakest form. Features that are very sensible to standardisation will fade out in read speech.

6. CONCLUSION

The present experiment illustrates by one variety of British English, that of Anstruther in Scotland, how intonation patterns can vary not only within one language but also with regard to sociolinguistic factors such as age and speaking style. Late alignment of nuclear H*+L in ASE was shown to apply to all speakers examined, but to different degrees: younger speakers show less displacement than older speakers do, and any speaker of ASE reduces displacement when asked to read aloud, following the well attested trend of taking up more standardised features in reading than in spontaneous speech. The fact that displacement appears in nuclear position challenges the phonological adjustment rule set out by [1] and [2], but only to the extent that the phenomenon of late attainment of the L tone can occur in nuclear position at all. As far as the notion of displacement as a continuous speech process is concerned, the present data does not undermine the motivation for the rule.

ACKNOWLEDGEMENTS

I am very much indebted to Francis Nolan for supervising, supporting and inspiring me in my work.

REFERENCES

[1] C. Gussenhoven, *On the grammar and semantics of sentence accents*, Dortrecht: Fortis, 1984.

[2] E. Grabe, *Comparative Intonational Phonology: English and German*, Nijmegen: MPI Series in Psycholinguistics 7, 1998.

[3] D.R. Ladd, *Intonational Phonology*, Cambridge: Cambridge University Press, 1996.

[4] E. Grabe, *The IViE Labelling Guide*, www.phon.ox.ac.uk/~esther/ivyweb/guide.html, 2001.

[5] D.R. Ladd, D. Faulkner, H. Faulkner and A. Schepman (1999), "Constant 'segmental anchoring' of J0 movements under changes in speech rate," JASA 106, 1543-54.

[6] M. Atterer, D.R. Ladd, "On the phonetics and phonology of 'segmental anchoring' of F0: Evidene from German," *Journal of Phonetics*, submitted

[7] E. Grabe, F. Nolan and Brechtje Post, *English Intonation in the British Isles*, ESRC Grant R000237145, 1997-2002.

[8] M. Aufterbeck, "Identifying sociolinguistic variables in intonation: The Onset Onglide in Anstruther Scottish English" in *Regional Variation in Intonation*, P. Gilles and J. Peters, eds., Tübingen: Niemeyer, in preparation.

[9] J.D. O'Connor and G.F. Arnold, *Intonation of colloquial English*. London: Longman, 1973

[10] M. Aufterbeck, *Intonation in Scottish English*. PhD Dissertation, Cambridge University, in preparation.