THE EFFECTS OF ANACRUSIS AND FOOT SIZE ON PRENUCLEAR PITCH ACCENTS IN NORTHERN IRISH ENGLISH (DERRY CITY)

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ABSTRACT

Nuclear rises (L*H) are well documented in declaratives in northern Irish English, but H* has been more commonly attested in prenuclear accents (PNs). This paper presents some results from a study of 11 adult speakers (6F, 5M) from Derry City. 385 utterances were analysed in which the number of syllables in anacrusis and PN foot size varied systematically. PNs were judged auditorily and visually for each utterance, and timing of f_0 maxima and minima was measured. Phonological analysis of pitch accents suggests that PN type is strongly conditioned both by anacrusis and foot size. Tonal alignment analysis indicates that both anacrusis and foot size affect peak alignment, with a minor effect of foot size on L tone alignment.

Results suggest H targets are prioritised over L, and reduced syllabic material motivates phonological deletion of L targets, with H* potentially a phonological replacement for L*H, which is preferred otherwise.

Keywords: intonation, alignment, northern Irish English, Derry City, prenuclear accents

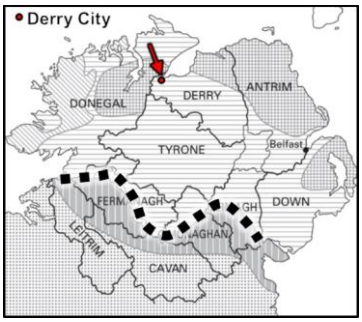
1 INTRODUCTION

Northern Irish English (nIE) describes northern varieties of Irish English spoken in areas which lie north of a line running roughly from Donegal Bay in the west to Carlingford Lough in the East (Figure 1). This includes most of Northern Ireland as well as areas in the Republic of Ireland such as Donegal. This paper focuses on Derry City English. Derry City is the second largest urban area in Northern Ireland after Belfast [1] and is located in the North West corner of Northern Ireland on the border with Donegal. Thus, while geographically close to Donegal, it shares a political and educational infrastructure with Belfast.

It has long been recognised that rises (L*H) dominate nuclear pitch accents across sentence modes in nIE [2]–[6]. However, differences in the inventories of pre-nuclear accents (PNs) in nIE have been noted in Autosegmental Metrical intonational studies. Specifically, Belfast English speakers appear to prefer H* [6] while Donegal English speakers prefer L*H [7], [8]. This could be a true varietal distinction, or it could be an effect of different interpretations of PN peaks; i.e. the late H target in PNs may be interpreted as either the delayed peak of an H* or as the trailing tone of an L*H accent.

Anacrusis—unstressed syllables before the first stressed syllable in an utterance [9]—has been shown to affect the alignment (i.e. relative timing of tonal targets) of PN peaks in Donegal and Belfast varieties of nIE [7], [10]. It appears to cause earlier peak alignment in Belfast English but peak delay in Donegal English. Anacrusis has also been found to affect the timing of valleys in nuclear accents in Belfast English [11]. Furthermore, foot size seems to affect peak alignment in nuclear L*H accents of Donegal English [7]. Peak variability in general has been observed in English and other languages [7], [12]–[14].

Figure 1: Location of Derry City. Dotted line shows southern boundary of nIE. ([15], adapted).



This paper investigates PNs in Derry City English. The hypothesis examined is that H* in Derry City English is a phonologized form of L*H which occurs due to reduced syllabic content in the foot and in anacrusis. This is akin to the phonological replacement strategy observed in Dutch and German which occurs due to phonetic pressure from reduced segmental material [16], although in the current case, it might be considered a deletion more than a replacement. H* accents were not observed in the nuclear accent alignment data, which were exclusively L*H % or L*H L%, and so are not considered further here.

2 MATERIALS AND METHODS

Two analyses were conducted to test the hypothesis: a phonological analysis assessed the effect of anacrusis and foot size on the frequency of occurrences of different pitch accent types, and a phonetic analysis measured their effects on tonal alignment of L and H.

2.1 Materials

Target phrases were created in which foot size and anacrusis varied systematically across four different syllable conditions, as shown in Table 1 and Table 2. It should be noted that ana-0 (no anacrusis) is the same as syl-4 (four-syllable foot), so the other anacrusis conditions reflect the addition of anacrusis to the syl-4 condition. The phrases were contextualised by embedding them in short dialogues with headings to provide extra context (e.g., "talking about work").

Table 1: Target phrases for foot size (unstressed syllables).

foot size	target phrase
1-syl	**Val's** valuables.
2-syl	**Val's is** valid.
3-syl	**Val's is in**valid.
4-syl	**Lally's is in**valid

Table 2: Target phrases for anacrusis (syllables).

Anacrusis	target phrase
ana-0	Lally's is invalid
ana-1	**The** valley's by the river.
ana-2	**There's a** valley with a river.
ana-3	**There was a** valley with a river.

The data analysed here are taken from the recordings of 11 Derry City English speakers (Female=6, Male=5) aged between 35 and 60 (M=48, SD= 9.5). Speakers were coded with a number and an M or F prefix indicating gender.

Recordings were conducted at a recording studio in the city centre using a Röde 1100 microphone. Speakers were recorded in pairs with a local friend as interlocutor to minimise accommodation effects. Speakers had time to practise each dialogue before recording 5-8 repetitions (including production errors).

After recording and production errors were excluded from the data, the first 5 valid utterances per target phrase per speaker were selected for analysis. This left 385 utterances for analysis (5 repetitions x 7 target phrases x 11 speakers).

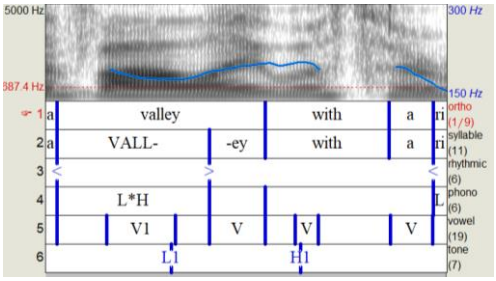
2.2 Annotation and tabulation of data

Annotation was carried out in Praat [17] (Figure 2). It included a syllabic tier, a rhythmic prominence tier, phonological annotation tier, a tier to mark onset and offset of accented vowels, and a tier for tonal targets.

Pitch accents were assessed both auditorily and via visual inspection of the f_0 contour by the author and checked by another trained phonetician. H* was preferred over L*H in cases of peak delay lacking any clear visual or auditory percept of an L target. IViE conventions [18] were used for phonological analysis.

Peaks and valleys were marked at absolute f_0 maxima and minima (Figure 2). Alignment was measured in milliseconds from the onset of the stressed vowel to the L and H tonal target. Finally, a script was written to tabulate the annotation data for analysis.

Figure 2: Example of PN annotation in Praat.



3 RESULTS

3.1 Distribution of prenuclear accents (PNs)

Three PN types were observed in foot-size conditions: L*, H*, and L*H. Table 3 shows percentage occurrences of PN types as a function of foot size across all valid tokens. In one-syllable feet (1-syl), L*H occurs in only 9% of utterances, but this increases to 44% and 47% as foot size increases to three and four syllables (3-syl and 4-syl respectively). Despite a slight rise in H* occurrences from 60% in 1-syl to 65% in 2-syl, there is an overall downtrend to 47% in 4-syl. Across the PN data set, L* occurs only 8 times, 7 of which come from one speaker (F17). It is also noteworthy that in 1-syl there is a high rate of deaccentuation (22%), which decreases dramatically with the introduction of even one unstressed syllable.

Table 3: Percentage of PN occurrences per foot-size condition across all speakers (220 utterances).

PN	1-syl	2-syl	3-syl	4-syl
L*H	9%	24%	44%	47%
H*	60%	65%	55%	47%
L*	9%	5%	0%	0%
no PN	22%	5%	2%	5%

Table 4: Percentage of PN occurrences per anacrusis condition across all speakers (220 utterances).

PN	ana-0	ana-1	ana-2	ana-3
L*H	47%	53%	84%	82%
H*	47%	47%	16%	18%
no PN	5%	0%	0%	0%

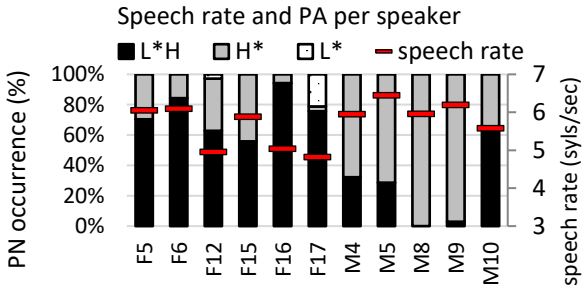
Two PN types occurred in anacrusis conditions: H*, and L*H. Occurrence of PNs across anacrusis

conditions is presented in Table 4. As with foot size, occurrences of L*H increase as anacrusis increases while occurrences of H* decrease. It should also be noted that rates of PN occurrence in two and three syllables of anacrusis (ana-2 and ana-3) are almost the same. This would suggest that the effect of anacrusis stops at ana-2. Deaccentuation is only evident when there is no anacrusis (ana-0), and never occurs in conditions where there is anacrusis.

While the results in Table 3 and Table 4 represent the distribution of PNs across all speakers, it was clear that speakers had different distributions of PN type, so this was also analysed. The rate of PN occurrences per speaker can be seen in Figure 3. Overall L*H is preferred; however, there appears to be a gender-based distinction, with H* more common among males and L*H among females. In fact, a chi-squared test of independence analysing the distribution of PNs by gender shows this to be the case, with significant interaction between the two, χ^2 (2) = 103.10, p<.001.

Auditory analysis also suggested that H* occurs more frequently in rapid speech. A Pearson correlation test of speakers' average speech rates (syllables/second) against rates of H* occurrence found a positive correlation, r(9) = 0.61, p = 0.043; however, this too may be partially associated with gender, as can be seen from F12, F16, and F17 in Figure 3.

Figure 3: Distribution of accent types by speaker compared with average speech rate.



3.2 Alignment of PN Tonal Targets

The data for tonal alignment were not normally distributed, so the results are presented in terms of median alignment with error bars showing the 1st and 3rd quartiles to offer a truer representation of the results than mean values would. The effects of foot size on tonal alignment are summarised in Figure 4. Alignment data for L* is not presented due to the paucity of tokens (only 3 in 2-syl, for example).

Increased foot size appears to lead to earlier alignment of L targets in L*H, from median 120 ms after vowel onset in 1-syl to 90 ms in 3-syl; however, the overlapping interquartile ranges (IQR) across conditions suggest it is a weak trend. For the alignment of H targets in L*H, the addition of one unstressed syllable to the foot (i.e., in 2-syl) leads to noticeably later median peak alignment (from 280 ms to 342 ms), although the effect declines as the number of unstressed syllables increases, and the median shifts leftward again (to 268 ms in 4-syl). The relatively large IQR in syl-2 and syl-3 suggests this effect is quite variable.

For H*, peaks are aligned noticeably earlier than in L*H, as one might expect. However, as more unstressed syllables are added to the foot, the median peak drifts rightward, from 142 ms in 2-syl to 173 ms in 4-syl. The fact that there is very little negative error (i.e., the lower whisker is short) demonstrates that this is indeed a trend to the right.

Figure 4: Effect of foot size on tonal alignment per accent type; markers and table show median alignment, whiskers show interquartile range.

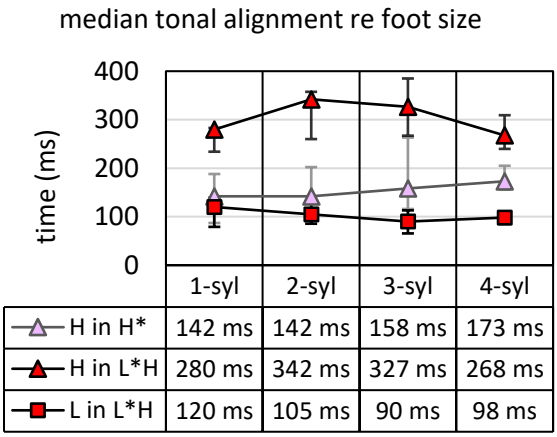
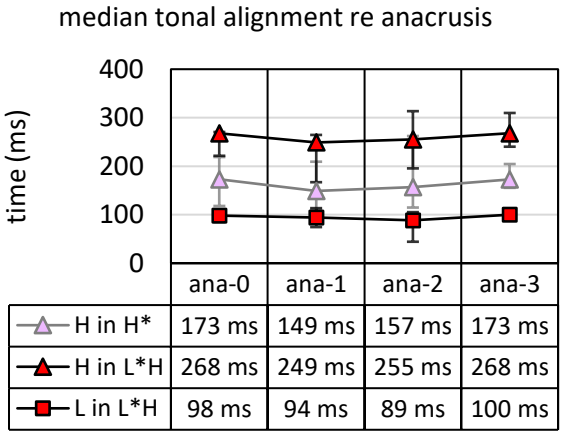


Figure 5: Effect of anacrusis on tonal alignment per accent type; markers and table show median alignment, whiskers show interquartile range.



The effect of anacrusis on tonal alignment can be seen in Figure 5. In L*H accents, anacrusis causes L targets to be aligned slightly earlier, from median 98 ms in ana-0 to 89 ms in ana-2; however, there is a rightward shift to 100 ms in ana-3. Overall, the effect on L targets is small, and the L target is generally anchored between 90 and 100 ms across anacrusis conditions. The effect of anacrusis on peaks in L*H accents is, however, slightly more pronounced. The

addition of a single syllable of anacrusis (from ana-0 to ana-1) causes the median peak to shift leftward from 268 to 249 ms, while the addition of further syllables of anacrusis causes the median peak to drift gradually rightward again to 268 ms in ana-3. The high IQR, especially in ana-2, shows that this effect is variable.

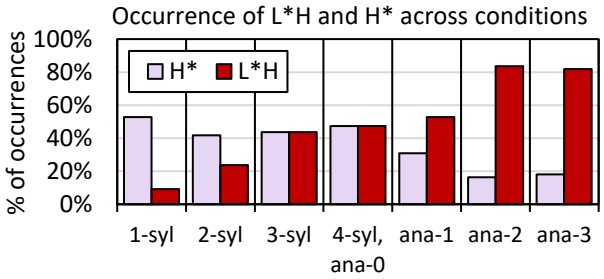
The median peak in H* is consistently aligned 95-100 ms earlier than L*H peaks and the overall effect of anacrusis on peaks in H* accents is very similar to the effect on peaks in L*H. That is, the addition of anacrusis causes a noticeable leftward shift in median peak alignment followed by a gradual rightward drift as more syllables of anacrusis are added. Finally, it is worth noting that from ana-0 to ana-2 there is an increasing overlap in the IQRs of peaks in H* and L*H accents, as can be seen from the whiskers in Figure 4. This overlap, however, disappears in ana-3.

4 DISCUSSION

4.1 PN distribution

The gradual decline in occurrences of H* as syllabic material increases and the concomitant rise in L*H occurrences clearly demonstrates that given enough syllabic content, L*H is the preferred PN (Figure 6).

Figure 6: percentage of L*H and H* occurrences across all conditions (foot-size and anacrusis) from least to most syllabic context.



The inverse relationship between L*H and H* occurrences strongly supports the hypothesis that H* is a phonologized form of L*H and occurs when there is not enough syllabic context for the speaker to realise the L of the L*H. In short, except for F17, the general trend is for the L tone to be deleted as syllabic content disappears, and the remaining H tone is reinterpreted as an H*. However, the fact that H* is not completely replaced by L*H in ana-2 and ana-3 also suggests that at least some instances of H* are not the effect of L tone deletion but a deliberate accent choice independent of syllabic context.

4.2 Alignment data in the light of PN distribution

The alignment data show that both anacrusis and foot size effect the alignment of H and L targets, with foot size having a more pronounced effect on the alignment of peaks in L*H, as expected. Peaks are also much more variable than valleys, and the peak in H* is on average aligned earlier than in L*H. However, the large amount of overlap in the alignment of peaks in ana-1 and ana-2 suggests that peak alignment in many L*H and H* PNs is similar. This overlap of peak alignment in the two types of accent supports the hypothesis that H* is often a phonologized form of L*H with a deleted L tone occurring when there is insufficient syllabic material. Furthermore, the clear separation of H* peaks from L*H peaks in ana-3 supports the possibility that at least some instances of H* are 'normal' H*s—possibly with slight peak delay—rather than phonologized versions of L*H.

It might also be noted that the effect of anacrusis on peak alignment in the data presented here reflects the seemingly contradictory results in [10] and [7]. That is, the introduction of anacrusis leads to earlier peak alignment, reflecting findings in [10] for Belfast English; however, as anacrusis increases, peaks are aligned slightly later, as per the findings in [7] for Donegal English. This is true for both L*H and H* peaks in Derry City English.

Given that L*H is the dominant nuclear accent in nIE, it is unsurprising that L*H is the preferred PN when syllable context permits. However, even though L-targets in L*H remain relatively well aligned inside the accented syllable as anacrusis and foot-size change, and even though L*H is the preferred accent, it is interesting that it is mostly the L target which is sacrificed as foot-size decreases rather than the peak. This indicates a phonological choice rather than a purely phonetic effect. This deletion could equally be construed as a phonological truncation of the L target. As such, retaining the PN peak may preserve the salience of the L-target in the upcoming nuclear L*H.

5 SUMMARY AND CONCLUSION

The data presented here suggest that L*H is the preferred PN in Derry City English given enough syllabic context (i.e., foot size and anacrusis), but that otherwise H* dominates when syllabic conditions are not favourable to L*H. Evidence was presented that the H* accent should in many cases be viewed as a phonologized form of L*H in which the L tone has been deleted; there is also evidence, however, that some instances of H* are not a result of L deletion, especially in longer anacrusis.

Closer phonetic analysis of the scaling and shape of prenuclear H* accents is required to confirm the findings presented here. Moreover, the analysis used here should be applied to Donegal and Belfast corpora to establish if the phenomena observed are widespread in nIE or limited to Derry City English.

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