Sub-dialect variation in the intonation of Donegal Irish

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Declaration

I hereby declare that this thesis, submitted in candidature for the degree of Doctor of Philosophy at Trinity College Dublin, has not been previously submitted for a degree at this, or any other, university.

This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration, except where specifically indicated in the text.

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Amelie Dorn

Amelie Dorn, December 2014

Summary

The topic of this thesis is the analysis of sub-dialect variation in the intonation of Donegal (Ulster) Irish. The four local Donegal Irish varieties investigated are Rann na Feirste (RF), Baile na Finne (BF), Gleann Cholm Cille (GCC) and Ros Goill (RG). Donegal Irish is particularly interesting in terms of its intonation. An earlier study of Gaoth Dobhair Irish showed it to have overall default rising tunes in statements and also in questions, something which would be considered atypical. The predominance of nuclear rises in Donegal Irish makes it also strikingly different from the southern Irish dialects, which have most typically falling tunes. However, rising tunes have also been noted in Belfast English and in the so-called UNB (Urban Northern British) English varieties, such as Glasgow, where a possible Irish origin of this tune has been suggested.

The main research goal is to illuminate the structure and detailed phonetic realisation of intonation of Donegal Irish in a way that takes potential sub-dialect variation into account. Specific related research questions are posed. Other questions potentially arise, concerning the relationship of Donegal Irish (and any sub-dialects found) to northern Irish English and to the UNB varieties of English for which rising nuclei have been described, something which in the past has been viewed as a possible influence of Irish. It is expected that the results of this study may provide a basis for such considerations.

The investigation in this study concerned the prosodic analysis of tunes and their phonetic features, encompassing four different aspects: question/statement distinction, alignment of tonal targets relative to the segmental string, effects of focus on f_0 and duration and the analysis of some rhythmic features, using the PVI (Pairwise Variability Index) suite of measures.

As regards the distribution of tunes for different sentence mode distinctions, findings show sub-dialect differences between the RG variety and the remaining three varieties. Where RG shows a preference for nuclear rises with low boundaries across the three sentence modes, the other three varieties predominantly use the nuclear rise with zero boundary, as was previously observed for Gaoth Dobhair Irish. Although the distribution of tunes for different sentence modes varies, it is clear that similar tunes can be used for all sentence types. However, regardless of tune preferences, the same phonetic markers are used by all four varieties in

distinguishing questions (WHQ, YNQ) from statements (ST). WHQ are characterised by raising the pre-nuclear area, whereas in YNQ it is the nuclear part that gets raised.

The second analytic study looked at the alignment of L and H tones of the rise as a function of tail length and anacrusis size in absolute and proportional terms relative to the accented syllable. Results showed that in the nuclear accents the low elbow aligns towards the end of the accented vowel at a rather constant distance from the syllable onset in absolute terms, whereas the trailing peak H spreads over the foot if following material is available, so that the duration of the rise (LH interval) increases. Anacrusis size does not appear to affect the timing of tonal targets: they both appear to be relatively constant relative to syllable onset (and rise time rather constant). Sub-dialect differences again showed up in tune preference and in the precise timing of L and H targets in the RG variety, where an overall earlier alignment was observed for the older than for the younger informants.

The third part of analysis, concerning the effects of focus on f_0 and duration, showed that, regardless of tune differences, all varieties exhibit the same phonetic effects of focus across narrow and contrastive focal conditions. This involves a boosting of the focal accent, the possibility of some reduction of the pre-focal accents, but deaccentuation of post-focal material. No differences between narrow and contrastive focus renditions emerged. The focal accent is realised as a rise in all conditions across the varieties with the exception of the RG variety, where a greater number of falls occurred when focus was elicited phrase-initially. As to duration, focal items are also on average longer than the neutral equivalent. No lengthening effect was observed when focus occurred phrase-finally.

And as to the rhythmic metrics, the PVI measures were calculated for vocalic and inter-vocalic intervals as well as for syllables and rhythmic feet. Findings showed that all four varieties group with traditionally classified 'stress-timed' languages in terms of the vocalic, consonantal and rhythmic foot metrics. However, they showed a tendency towards more regular timing in terms of syllables, veering towards an intermediate position on the 'stress-timed'/'syllable-timed' continuum with regard to the syllable PVI, something which may differentiate them from the southern Irish dialects.

Sub-dialect differences emerged for the RG variety in terms of tunes, tonal alignment characteristics and phrase-initial focal accents. Results suggest that we are dealing with a distinct sub-dialect of Donegal Irish. Neverthless, the four varieties emerge as distinctly "northern" varieties, with overall rising nuclear accents, that are strikingly different to the falling tunes of the southern varieties for which we have descriptions to-date.

To my parents

Things should be as simple as possible. But not simpler.

- A. Einstein

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1 Introduction

This thesis discusses sub-dialect variation in the intonation of Donegal Irish, a northern variety of Irish (Gaelic). The emphasis in this work is placed on the analysis of both coarse-grained prosodic characteristics (tonal patterns) as well as fine-detailed phonetic features (sentence mode differentiation, tonal alignment characteristics, effects of focus on f_0 and certain rhythmic characteristics) with a view to providing insights into regional variation in the prosody of Donegal Irish. It should be noted, that Irish is an endangered minority language and that the numbers of native speakers in some of the localities chosen for study here are rapidly diminishing. This lends urgency to the work at hand.

The present work is based on the analysis of a corpus of read speech of Irish, collected in four Irish speaking Gaeltacht locations of Donegal (Rann na Feirste, Baile na Finne, Gleann Cholm Cille and Ros Goill). Donegal Irish is of particular interest for intonational analysis as it has distinctive prosodic features which are considered 'atypical' in terms of typology: rising tonal patterns are the default tune type in pre-nuclear (phrase-initial and phrase-medial) and nuclear (phrase-final) pitch accents for 'neutral' declaratives. These findings were reported by Dalton (2008), who analysed the speech of informants from the Gaoth Dobhair area, in North-west Donegal.

In the literature, rising tunes in intonation have been associated with a number of functions, i.e. question marking (phrase-final rises in questions), turn-taking (rising pitch associated with speaker/hearer consolidation) or socio-phonetic associations (phrase-final rising tunes associated with certain social classes) (Cruttenden, 1981, 1997; Gussenhoven, 2004; Ladd, 1996, 2008). For these reasons, it is considered 'atypical' for languages or dialects to have rises as a 'default' tune in 'neutral' phrases (declaratives) as is the case in Donegal (Gaoth Dobhair) Irish (Dalton, 2008). As mentioned, the Donegal (Gaoth Dobhair) dialect differed greatly from the southern dialects (Connemara, Mayo and Kerry) studied by Dalton (2008), whose default declarative tunes were overall falling. The question arises therefore, whether all the Donegal Irish regions share the Gaoth Dobhair patterns. For example, the question has been posed as to whether more southerly varieties of Donegal might have a tendency towards the falling tunes typical of southern dialects. Quiggin (1906, p.156), for example, included a brief comment on tunes of the Irish spoken in Meenawannia (Na Gleannta (Glenties)) in south Co. Donegal in his monograph, which appear to suggest falling tunes.

The present work casts a wider net than the previous study of Donegal Irish, dealing with the prosody of a number of other Gaeltacht areas of Donegal. The study looks also in greater depth at the tunes and at the number of further prosody related phonetic features covering four different aspects: question/statement distinction (sentence mode), alignment of tonal targets relative to the segmental string (alignment), effects of focus on f_0 and duration (focus) and it includes a preliminary small-scale study of certain rhythmic features (the PVI measures). In providing additional insights into the prosodic characteristics of Donegal Irish varieties, a major goal is to extend our understanding of the intonational typology of Irish, contributing to a growing number of studies on Irish intonation, in line with a previous project on the Prosody of Irish Dialects (Ní Chasaide, 2003-2006).

In covering these four aspects of intonation looked at here, this study provides comparative analysis in line with recent studies in intonation (i.e. Dalton & Ní Chasaide, 2007a; Grabe, 2002; Haan, 2002; Kalaldeh, 2011; Ladd, Schepman, White, Quarmby, & Stackhouse, 2009; F. Nolan & Asu, 2009; Xu & Xu, 2005) which have employed the same or similar analysis methods. The four specified diagnostics (sentence mode, alignment, focus and rhythmic features) used here to test for sub-dialect variation in Donegal Irish, were chosen for a number of reasons: first, this thesis aims to facilitate comparison with previous studies on dialect variation in intonation. Studies have shown that varieties of the same language can differ greatly in terms of basic statement/question tune distinction, for example varieties of English in the British Isles (Grabe, 2004; Grabe, Kochanski, & Coleman, 2005). Dialectal variation, however, has also successfully been revealed by more fine-detailed diagnostics, such as tonal alignment features for, e.g. British English (Southern British English (RP) and Scottish Standard English (SSE)) (Ladd et al., 2009) or Connemara Irish (Cois Fharraige and Inis Oírr Irish varieties) (Dalton & Ní Chasaide, 2007a). Similarly, differences in rhythmic characteristics between varieties of the same language (British and Singapore English) have also been presented by means of the more fine-detailed diagnostic tool, the PVI measure (Low, Grabe, & Nolan, 2000).

This chapter first gives a general background to the present work and explains the motivations behind the research. The linguistic landscape in Ulster is provided as a context for this study, along with a general description of the other varieties of Irish and of Irish English. Although the analysis in this thesis is concerned exclusively with Irish, a description of studies on Irish English and British English varieties is also provided in this chapter and in the literature review (Chapter 2), given the large number of comparable studies, the geographical proximity of these two languages, and particularly the fact that the rising tonal pattern of Donegal Irish begs comparison not only with varieties of English for which an Irish influence has been posited. Urban Northern British (UNB) varieties are characterised by rising nuclei in statements, and there has been considerable discussion in the literature as to whether these rising nuclei represent an influence of Irish (see Cruttenden, 1986; Knowles, 1984). Finally, the outline for each chapter of this thesis is presented.

1.1 Aims and research questions

The main goals of the thesis are outlined in this section, and the background to the questions raised is elaborated on in some detail in section 1.2. The principle aim of this study is to provide a detailed account of prosodic characteristics of a number of varieties of Donegal Irish (DI). DI is a dialect which, in a general typological sense stands out by its 'default' rising tunes, in both declarative and question sentences. An analysis of the speech of informants drawn from four locations in the Irish speaking regions (Gaeltachtaí) in Donegal allow us to get a fuller picture of this dialect (and potential sub-dialects, which hereafter will be referred to as 'variety' or 'varieties'). The term 'varieties' is used in this thesis in a neutral way as at the outset it is unclear to what extent differences will emerge. There is a possibility that some of these varieties might differ from each other or from the previously described account of Gaoth Dobhair Irish. If there is a large divergence, such varieties might warrant being treated as sub-dialects (in the case that they share many features) or indeed as distinct dialects (in the case that they exhibit major differences). By looking at the tonal patterns in different sentence modes as well as the more fine-grained measures of tonal alignment, realisation of focus and certain rhythmic characteristics, one hopes not only to illuminate the prosodic structure of this particular intonational system, but to contribute to the wider understanding of intonational typology, and to the growing body of knowledge on dialect variation in intonation.

The thesis also aims to answer a number of specific research questions. The specific questions include the following:

Q1: Is Donegal Irish homogenous in terms of intonation (tunes)?

Donegal Irish is characterised by specific intonation features, i.e. 'default' rising nuclear tunes. The rising pitch pattern is the dominant tune in declaratives (statements) and mostly also in questions (wh-questions, yes/no questions) (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2007b). In that respect this northern dialect of Irish stands out from the remaining southern Irish dialects, which more typically have falling nuclear tunes (Dalton, 2008; Dalton & Ní Chasaide, 2003). In the early literature these rising tunes also found in varieties of British English, predominantly in Belfast English, have been referred to as the "Irish falls" (Knowles, 1984, p. 239), which suggests that the rises are an influence of Irish on English, and are in fact falls brought about by a shift in tonal targets over the course of time. It is not the aim of this thesis, however, to give a diachronic account of possible sound change as it would be highly unlikely to provide any satisfactory answer to such an issue at this time. The emphasis in this work lies firmly in examining the prosodic properties as they are at present. In particular, it asks if the rising tune is the overall dominant tune in Irish spoken in the Donegal Gaeltacht today, or whether there might be regional differences, with some varieties being more similar to the southern 'falling' Irish dialects or even some being more similar to the Urban Northern British (UNB) rising varieties. In his monograph on Irish spoken in Meenawannia, Na Gleannta (Glenties) in Co. Donegal, Quiggin (1906, p.156) included a brief comment on tunes, stating that "*Donegal intonation does not differ very widely from that of English and German. The most strongly stressed syllables frequently have the highest pitch and the tone falls towards the end of the statement*."

Q2: Are there sub-dialect differences?

A corollary of the first question, is the question of the extent and nature of sub-dialect differences (if such emerge). Recent work in intonation has seen a growing number of studies addressing the issue of within-language differences (Dalton, 2008; Grabe, 2004; Grabe et al., 2005; Peters, 2004; Sullivan, 2006, 2011). It has been established that Irish dialects (northern and southern) are very different in terms of tunes (Dalton, 2008; Dalton & Ní Chasaide, 2003). Additionally, it was shown, that within what one might expect to be a single dialect (a southern variety, Connemara) there was micro-dialect variation with regard to tonal alignment features (Dalton & Ní Chasaide, 2005a, 2007a). So even if the tune inventories turn out to be broadly the same, it is of interest to investigate if fine-grained sub-dialect differences might also occur in Donegal Irish. If this is indeed the case, we are hopeful that the set of prosodic features chosen for this study would reveal such micro-dialect variation (sentence mode differentiation (tune types; statements (ST) vs questions (WHQ / YNQ)), tonal alignment features, focus marking or rhythmic features). Hence this issue is addressed in the course of the prosodic analysis of these four main aspects in this thesis.

In each of the individual analytic chapters, a set of more specific questions is discussed. These more detailed questions are relevant to the respective diagnostics and also to the three main research questions set out at the beginning of this thesis. Results will add to the growing body of studies on within-language differences (Dalton, 2008; Grabe, 2004; Peters, 2004; Sullivan, 2011) and the analysis of the specified prosodic features is in line with recent studies in intonation (Grabe & Low, 2002; Haan, 2002; Kalaldeh, 2011; F. Nolan & Asu, 2009; Xu & Xu, 2005).

Q3: Are Donegal Irish rising tunes like Urban Northern British (UNB) English tunes?

One of the questions addressed in intonation research that still remains unanswered to-date is the origin of the dominant rising tune found in Ulster Irish, Ulster English and in the so called Urban Northern British (UNB) English varieties (Belfast, Glasgow) (Cruttenden, 1995, 1997). Studies of other Northern English varieties in which rising tunes are found also include Tyneside English (Pellowe & Jones, 1978), the Fife variety of Scottish English (Aufterbeck, 1999), Newcastle English (Grabe, 2004) and Liverpool (Scouse) English (Knowles, 1975, 1984). We therefore wondered whether the Donegal Irish varieties might show similarities to features reported for the UNB rises given their geographical proximity and the hypothesis of an "Irish origin" of these tunes mentioned in the literature (Cruttenden, 1986; Knowles, 1984). This question, however, is not the main focus of this work, but findings from thesis will shed light on possible similarities and differences between the Irish and UNB varieties and we will return to this question at the end of the present work.

1.2 Motivations

To explain more fully the motivation for the present study, we discuss here in greater detail some of the previously mentioned issues.

1.2.1 Rising intonation as a signature of Donegal and Ulster Irish

One of the motivations behind this study on the intonation of Donegal Irish is its characteristic intonation system. It has been shown for the Gaoth Dobhair variety of DI, that rising intonation tunes are also common in question (wh-questions and yes/no questions) (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2007b). It is therefore of interest to investigate if this finding pertains widely in Donegal. If so, it is further of interest to see whether interrogativity might be expressed by more fine-detailed phonetic parameters, of the type we examine here, or if a statement/question distinction is achieved in Irish by syntactic marking alone.

The rising tune is common to Irish and Irish English varieties in the north of Ireland. Note that by north we mean the northern linguistic area whose border, according to Barry (1981), runs from Dundalk in the east to Bundoran in the west of the country (see section 1.3, and Figure 1.1. below). (It should be pointed out that the divide by Barry (1981) was originally proposed in relation to Irish English. In the present context of intonation studies, we are effectively proposing that this north-south divide pertains also to Irish.) The northern area is in a way linguistically cut off from the southern area, where varieties of both Irish and Irish English more typically have falling tunes (see for example Kalaldeh's (2011) discussion in her study of Drogheda English). Results from Kalaldeh's (2011) study show that the English spoken in Drogheda, which lies south of the northern linguistic border, is typically northern in terms of its segmental properties, but is a typically southern variety of Irish English in terms of its prosodic characteristics, with statements (ST) as well as questions (WHQ, YNQ and DECQ) all having falling nuclear tunes. As mentioned before, the possibility has been raised in discussions on Donegal Irish, that varieties of Donegal Irish, located in the south of Gaoth Dobhair, could conceivably approximate more to the southern pattern of falling tunes.

1.2.2 Intra-language variation in intonation

Another motivation behind this study of the local varieties of Donegal Irish comes from the wider context of intonational analysis: by addressing sub-dialect variation, this study adds to the growing body of work on cross-dialect studies in intonation. In recent years a number of papers have addressed the issue of dialect variation in several languages including English (The IViE (Intonational Variation in English) Project) (Grabe, 2004; Grabe, Post, Nolan, & Farrar, 2000), standard varieties of German (Peters, 2004; Peters, Gilles, Auer, & Selting, 2002), regional dialects in Swiss German (Leemann & Siebenhaar, 2010; Leemann & Zuberbühler, 2010), varieties of Spanish (Prieto & Roseano, 2010) and Portuguese (Frota et al., in press) and also varieties of Irish (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2007b). In this wider context the analysis of sub-dialect variation in Donegal Irish intonation is particularly interesting since alignment differences in what was believed to be one dialect were found in a southern variety of Irish (Connemara) (Dalton & Ní Chasaide, 2007a). For this reason it was of interest to investigate if such sub-dialect differences might also emerge in Donegal Irish.

1.2.3 Rising intonation patterns in English – functions, forms and hypotheses concerning their origin

The rising intonation patterns of Irish are likely to be of particular relevance and interest to linguists studying the rising patterns that have been attested in varieties of English. In Ireland there is a general north/south divide between varieties of Irish and Irish English, where differences in the respective intonation systems (rising vs falling nuclear tunes) are one of the distinguishing features between the northern (Ulster) and southern dialects.

Rising nuclear intonation patterns are also found in several varieties of British English. However, they tend to have rather different functions: rising nuclei in varieties of Urban Northern British (UNB) English, e.g. Belfast and Glasgow, constitute standard declarative patterns. The high-rising nuclear tones or high-rising terminals (HRT) in varieties of Australian and New Zealand English declaratives have been described as more of a socio-phonetic phenomenon (Britain, 1992; Fletcher, Grabe, & Warren, 2004; Guy & Vonwiller, 1989), being indicative of the speaker's social class.

It is therefore helpful to distinguish between the different functions of the various rising tunes that have been reported in the literature on English varieties and the possible origins that have been suggested for these tunes.

The following possible functions have been attributed to rising tunes in English varieties:

1.2.3.1 Functions

- question intonation marker

In intonation, rising tunes have been associated with specific functions. Broadly speaking, in the majority of English varieties, nuclear rising tunes are typically associated with signalling question intonation, while neutral declaratives are characteristically falling (c.f. Ohala, 1994, for example). Bolinger (1964) was among the first to comment on this form-function relation between pitch and sentence mode in intonation across languages. Later, Ohala's (1994) proposed 'Frequency Code' proposed a possible explanation for such linkage between the use of pitch and meaning in human communication. Drawing on examples from animal communication, where low or falling pitch signals dominance and confidence, high or rising pitch universally signals subordination and dependence, the Frequency Code suggests that rising tones are needed in questions as the speaker is dependent on the listener's attention and cooperation. In connection to Ohala's (1994) ethological account, Gussenhoven (2004) further proposes three biological codes (Ohala's (1994) Frequency Code, the Effort Code and Production Code) which argue for a relation between specific efforts in the speech production process and the resulting variation in frequency.

Nuclear rising patterns are a typical feature of question intonation, for example declarative questions or yes/no questions, in several languages worldwide, e.g. Dutch (Haan, 2002), English (Hirst & Di Cristo, 1998) or Estonian (Asu, 2002). Studies in recent years, however, have shown that phrase-final rises are not necessarily a universal prosodic marker for questions (c.f. Grabe, 2004; Grabe et al., 2005; Kalaldeh, 2011; Gordon, 1999). In Chickasaw, for example, Gordon (1999) reports a nuclear falling pitch trajectory for wh- and yes/no questions with a final low boundary tone (L%). Drogheda English, a variety of Irish English, has overall falling pitch accents (H* L-L%) in wh- and yes/no questions as shown by

Kalaldeh (2011). As regards varieties of English spoken in the British Isles, Grabe (2004) found that in London, Cambridge, Bradford, Leeds, Newcastle and Dublin English wh-questions were overall produced with falls (H*L %), but a bigger number of falls than rises in yes/no questions were only observed in Dublin English.

- turn-taking function in discourse

Apart from specific form-meaning correlations, phrase-final rising pitch also has a prominent function in spoken discourse. Studies in Conversation Analysis showed that in English (and in other languages) rising f_0 patterns may be used as a response seeking device on the part of the speaker and as a turn-yielding signal (Gravano, Benus, & Hirschberg, 2007). A study on the phonological and phonetic features of turn-taking in English dialects, including that of Ulster English, suggested that, prosodically, in Ulster English the turn-delimitative contour ends relatively high in the speaker's pitch range (Wells & Peppé, 1996, p. 125).

- socio-phonetic phenomenon: the High Rising Tone/Terminal (HRT)

Rising tunes are not only found in UNB varieties (Belfast, Glasgow, Birmingham, Liverpool and Newcastle) and northern varieties of Irish (e.g., Gaoth Dobhair variety), but also in Australian and New Zealand English (cf. Britain, 1992; Fletcher et al., 2004; Warren, 2005; Warren & Britain, 2000) as well as in North American varieties of English (Cruttenden, 1995). Cruttenden (1995) refers to these English varieties (Australia, New Zealand, California and Canada) as the *Pacific Rim.* Unlike the UNB rises, the so called 'High Rising Tones' (HRT) in Australian and New Zealand English are a relatively new phenomenon and are reported to be *socio-phonetic* or a *conceptual-stylistic* difference (Cruttenden, 1995; Guy & Vonwiller, 1989; Britain, 1992). In Australian English, the HRT is typically found among younger speakers (Fletcher et al., 2004), both male and female and are associated with lower prestige varieties (Fletcher et al., 2004). In New Zealand English (NZE), HRTs are associated with narratives, as a device for speaker-hearer consolidation and are said to be more frequent among women and speakers of Maori ethnicity (Britain, 1992).

- dominant declarative intonation pattern in Urban Northern British (UNB) English

Unlike the previously described use of rising f_0, rising pitch patterns can also be a firm part of the intonation typology of other varieties of English. In Urban Northern British (UNB) English, they are part of the language's phonological tonal inventory. These varieties include Belfast English (Grabe, 2004; Grabe, Nolan, & Post, 1997-2002; Jarman & Cruttenden, 1976) and Glasgow English (Cruttenden, 2007; Mayo, Aylett, & Ladd, 1997; Vizcaino Ortega, 2002), where rises are the overall default nuclear tune in neutral declaratives as well as in question tunes. Such rising tunes have also been reported, although to a small degree, in the English spoken in Newcastle and Birmingham (Cruttenden 1995), Liverpool (Scouse) (Knowles, 1975, 1984), Tyneside (Pellowe & Jones, 1978) and Fife (Scotland) (Aufterbeck, 1999, 2003).

1.2.3.2 Forms

The rising tune in Donegal Irish (Gaoth Dobhair variety) has been described as a rise-plateau (Dalton, 2008), starting low on the accented syllable with a trailing high tone levelling off towards the phrase boundary. In addition, Belfast English rises can also show a characteristic rise-plateau slump, where the rise ends with a perceivable dip in f_0 towards the middle of the speakers pitch range at the end of the phrase (Cruttenden, 1997; Grabe, 2004). Glasgow English, on the other hand, has been described as having rises (Cruttenden, 1997), rise-plateau slumps (Ladd, 2008) or rise-falls (Sullivan, 2011). As to the form of the HRT, it typically shows a rising movement which rises extra high towards the phrase-final boundary. In this respect, it differs noticeably from the UNB rises and also those described for the Irish varieties.

1.2.3.3 Hypotheses about the origin of Urban Northern British (UNB) rises

- *Irish origin hypothesis*

The rising nuclear tonal patterns occurring frequently in certain northern urban varieties of English in the British Isles (Newcastle, Liverpool, Glasgow, Birmingham, but also Belfast), have been attributed in the literature to a possible Irish influence (Cruttenden, 1986; Knowles, 1984) as the English cities in question were subject to influx of Irish immigrants. As to the origin of the rising tunes in Scouse (a variety of Liverpool English), Knowles (1984) even refers to them as 'Irish falls' (pp.232-240). It is worth bearing in mind, however, that claims concerning an Irish influence were made despite the fact that there were at the time virtually no formal descriptions of Irish intonation. This point has also been made by Rahilly (1997). Only in relatively recent years has it been shown that nuclear rises are a prevalent feature in Donegal (Gaoth Dobhair) Irish (Dalton, 2008; Dalton & Ní Chasaide, 2007b), and that they are not a feature of the southern dialects. Although these findings lend substance to the 'Irish influence' hypothesis, it also complicates it, insofar as one would need to demonstrate that the influx of Irish immigrants to these cities came from Ulster, rather than from the more southern regions.

- *Nordic prosody hypothesis*

This hypothesis is based on the assumption that rising intonation could be a remnance of the Viking population in the northern areas of Ireland and Scotland. The Vikings reached Ireland via Scotland in the 10th century when the country was subject to severe Viking raids. This topic has been commented on by, for example Hirst (1998, 2008), who remarks in Hirst (2008, pp.73/74) that *"It has been suggested that the British pattern is of Celtic origin which would explain some of the distribution in the West of the British Isles. This would not however explain why the pattern is far less common in Eire than in Northern Ireland, nor why it is to be found in the Newcastle area. An intriguing possibility would be that this pattern is in fact a trace of the Viking occupation of Britain – similar pattterns have been described for East Norwegian (Fretheim and Nilsen 1989) and West Swedish (Garding this volume."*

Further, it has been suggested that Vikings did not only raid Ireland, but also integrated into the Irish society and adopted their language and habits (Britain & Clift, 2003, p. 72). Similarly, Sommerfelt (1975, p. 73) notes that Scandinavians who traded and settled in Ireland and Scotland, were for the majority Norwegians, as was shown by historical sources but also by the language they had brought with them.

Suggestions of historic cross-language influences are highly speculative. Nevertheless, these potential influences of Irish on the intonation of English varieties has been commented on in the literature, and this study could potentially offer some interesting insights to this issue.

1.3 Background to the linguistic landscape in Ulster

Having so far discussed the phenomenon of rising tunes in intonation from various perspectives, we will now briefly look at the linguistic landscape in Ulster to provide a context for the Donegal Irish varieties. Note that by Ulster we are referring to the historical province of Ulster, which includes the geographical territory greater than the political entity usually referred to as Northern Ireland. The former corresponds more closely to the northern linguistic area, which is delimited from southern counties by a linguistic border proposed originally for Irish English by Barry (1981), see Figure 1.1.

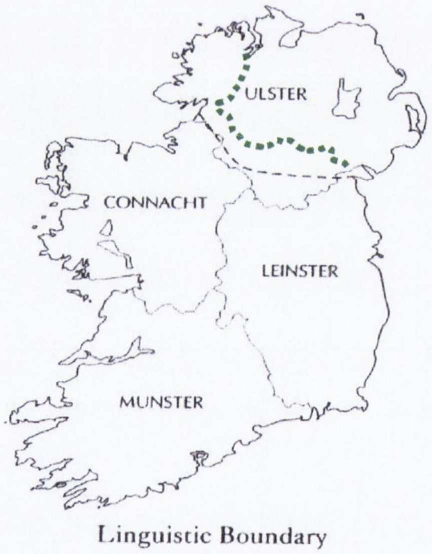


Figure 1.1.: Barry's (1981) delimitation of the northern and southern linguistic areas in Ireland, originally proposed for Irish English (separated by the black dashed line), and the political border of Northern Ireland (shown by the green dashed line) (image reproduced from Todd (1999, p. 81)).

This section will thus provide an overview of studies on English, Scots and Irish, which are spoken in Ulster today. While this thesis is concerned with the intonation of Donegal Irish, it makes sense to present the reader with some information on Ulster English and Ulster Scots to provide a picture of current and historical linguistic context of Irish in Ulster. This is also relevant to the third research question posed in section 1.1 above, and to the more general question concerning the origins of the rising tunes in northern varieties of Irish and English.

As mentioned earlier, in Ireland there is a general north/south divide between varieties of Irish and English according to their linguistic properties, including the overall use of nuclear rises in the northern (Ulster) varieties, but falls in most southern varieties. A linguistic transition zone between the north-south boundary that delimits Ulster English from southern varieties of English runs along an area between Bundoran to Dundalk and from Drogheda to Sligo. Barry (1981) comments on this north/south divide, proposed for Irish English, by pointing out that "*One of the most important contrasts in Hiberno-English speech is that between the Northern and Southern type. This division is probably ancient and shows some similarities with other major dialect boundaries such as that between N [Northern] English and S [Southern] Scotland (Glauser, 1974)*" (Barry, 1981). The term Hiberno-English (HE), coined by Bliss (e.g.Bliss, 1984), is often used in studies referring to the variety of English spoken in Ireland and two main varieties can generally be distinguished: Southern Hiberno-English (SHE) which is spoken in the provinces of Leinster, Munster and Connacht. Northern Hiberno-English (NHE), also often referred to as 'Northern Irish English', is the variety of English spoken in the historical province of Ulster (Harris, 1984). A similar linguistic division between Scots and English boundaries in Britain has also been commented on by Harris (1984, p. 116).

Numerous studies have discussed the historical context that gave rise to the linguistic diversity of Ulster today, where English, Irish and Ulster Scots are spoken (cf. 1958; Adams, Barry, Tilling, & Ulster Folk and Transport Museum., 1986; Barry & Tilling, 1986; 2007; McCafferty, 2007).

In fact, this linguistic diversity can only be appreciated by understanding its historical context. The Ulster 'plantations', the settlements of English immigrants, followed the defeat and exile of the Gaelic chieftains in the 17th century. It involved the confiscation of arable land from the Irish speaking indigenous population, and their replacement with immigrants from southern Scotland (Scots speaking) and northern English (English speaking) who would be more loyal subjects to the British crown. The Irish speaking population, though initially banished, eventually returned as labourers, and so in the following centuries, English, Irish and Scots were spoken in Ulster. The current situation is as follows:

1.3.1 Ulster English

Ulster English has further been divided into Mid- and South Ulster English (Harris, 1984), where the former is spoken in most areas (see Figure 1.2). Adams (1977) and Barry (1981) offer a detailed account of the segmental characteristics that distinguish the Northern dialects from Southern ones and describe features of the boundary zone.

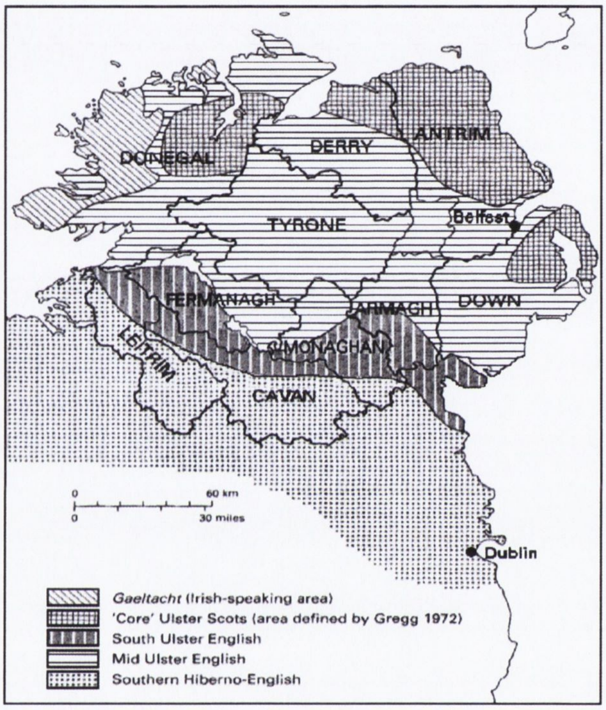


Figure 1.2: Overview of English, Irish and Scots speaking areas in Ulster. Map reproduced from Harris (1984, p.117).

There is a wide range of studies on segmental properties and the lexis of Ulster English varieties and dialectal variation (Adams, 1958, 1977; Barry & Tilling, 1986; Harris, 1984; Hickey, 2004, 2007; Traynor, 1953) including South Donegal (Adams, 1950, 1986). Adams (1986) provides an overview of the vowel system and consonantal characteristic of the English spoken in what he refers to as the Rural District of Donegal (including the villages Mountcharles, Frosses, Inver and Dunkineely) which he derived from casual impressionistic observation rather than from the speech of individual speakers. He remarks (Adams, 1986, p.98) that in northern parts of the Donegal Gaeltacht, many of the older Irish speakers had a Scottish colouring to their speech, as a result of seasonal migration to the Scottish lowlands, which was absent in the Irish spoken by inhabitants of the southern parts of the Gaeltacht. In an earlier study, Adams (1977) describes the complex dialectal situation in Ulster English and highlights the influence of Scots phonological features in Ulster English vowels as well as the influence of other English dialects brought to Ulster by immigrants from Scotland and England. In addition to the numerous studies on lexical or segmental features, there is also a wide range of different studies on Ulster English intonation, most of which are concerned with Belfast English (e.g. Jarman & Cruttenden, 1976; Rahilly, 1997; Lowry, 2002a, 2002b; Douglas-Cowie, Cowie & Rahilly, 1995; Grabe, Nolan & Post, 1997-2002; Sullivan, 2006,2007), but also with English spoken in Derry (McElholm, 1986) and Dungloe (Dorn, 2006). These studies are discussed in detail in Chapter 2, section 2.5.

1.3.2 Ulster Scots

Ulster Scots, an Ulster development of the Lowland Scots brought by the Scottish plantation settlers of the 17th century is today mainly found in the northern peripheries of Ulster, in coastal parts of the northern counties Antrim, Down, Derry and Donegal (see Figure 1.3). There have been a number of studies examining the segmental properties and historical development of Ulster Scots in Ireland (Gregg, 1985; Kingsmore, 1995; Robinson, 2003).

To our knowledge, no experimental instrumental analyses on the intonation of Ulster Scots have been carried out to-date.

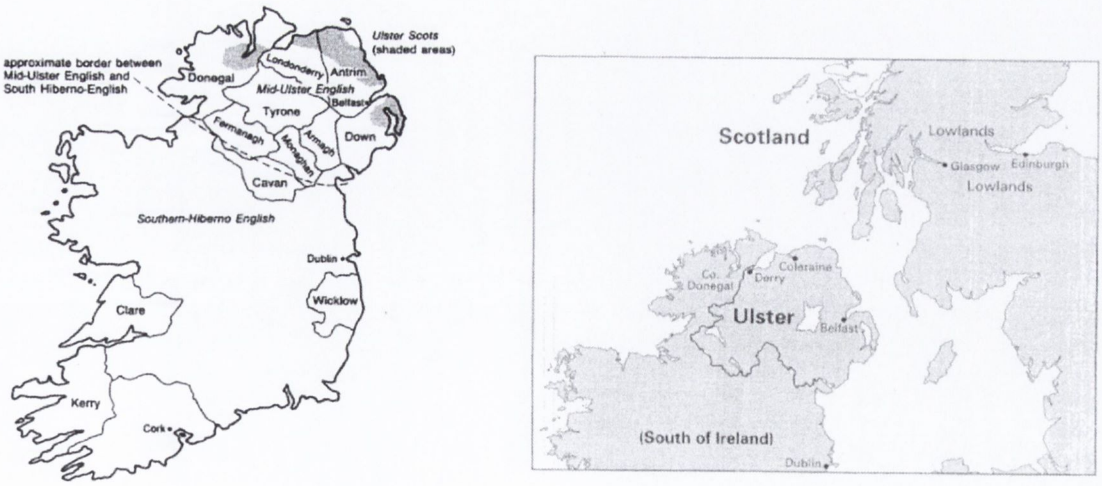


Figure 1.3: Map of Ireland (left, reproduced from Cramley & Patzold (2004, p. 323) showing the boundary of North/South dialects (dashed line). Shaded areas show where Ulster Scots may be spoken today. The map in the right panel shows the areas in Scotland from which there was emigration to Ulster in the 17th century (reproduced from Hickey (2007, p.441)).

1.3.3 Ulster Irish

Although there were pockets of Irish speaking populations in numerous locations across Ulster until relatively recently (see Wagner's atlas (1969)), today Irish is mainly found in the west of County Donegal. There are, however, also pockets of Irish speaking communities arising through language revitalisation in Belfast as well as in south Derry. Irish is together with English one of the two official languages in the Republic of Ireland. Today, Irish is spoken mostly in language pockets, the so called *Gaeltachtaí* which mainly stretch along the western sea coast of the country (see Figure 1.4) and there are three main dialects, which we will refer to as: Munster, Connaught and Ulster Irish. As will be further discussed in Chapter 2.3 and Chapter 3.2.1, the numbers of native Irish speakers, even in the designated Gaeltacht areas, are very limited today, and language attrition can be observed. This also had implications for the process of informant selection for this study as will be discussed in Chapter 3.2.1.

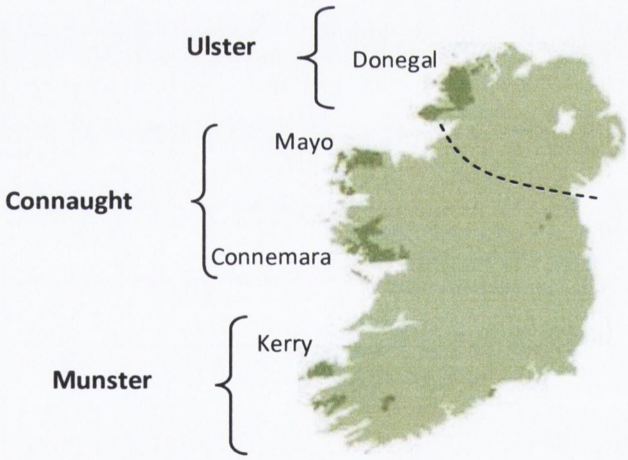


Figure 1.4: The Gaeltacht areas (dark green) in Ireland (map reproduced from Udaras na Gaeltachta) The dashed line indicates the linguistic border as proposed for Irish English by Barry (1981).

As previously pointed out at the beginning of section 1.3, the linguistic north/south divide in Irish English also applies to the Irish dialects. A continuum of variation between the north and south has generally been accepted, with differences between northern and southern varieties arising at many linguistic levels, not only at the phonological and phonetic levels of their prosodic and segmental properties (Ó Siadhail, 1999). Nonetheless, in terms of prosody, insofar as we can tell from the previous study of the Gaoth Dobhair variety, there appears to be a sharp discontinuity, with rising tunes characterising the northern varieties, and falling tunes characterising the southern ones. By looking at further varieties, and specifically more southerly varieties in Donegal, we hope to clarify this issue further.

A number of studies have investigated regional grammatical and lexical features (Hickey, 2011; Ó Dochartaigh, 1979, 1982, 1987; H. Wagner, 1958-69, 1969). As regards dialectal variation in the Irish spoken in the West Donegal Gaeltacht, Ó Dochartaigh (1987) comments on the places covered in the Wagner Atlas (1969), noting the big number of dialect clusterings in this area. Studies have also been carried out on the linguistic features of specific places in the Donegal Gaeltacht, such as Tory (Hamilton, 1974), Ros Goill (Lucas, 1979), Teelin (H. Wagner, 1959), Meenawannia, Na Gleanta (Glenties) (Quiggin, 1906) and the Blue Stack area (Ó hEochaidh & Wagner 1963).

1.3.3.1 The Donegal Gaeltacht – choice of locations of the present study

In this thesis, sub-dialect variation in the intonation of Donegal Irish is investigated and four specific places were chosen for informant selection and to collect the data for analysis. Four places in different geographical locations within the Donegal Gaeltacht were selected based on previous accounts of strong-holds of the Irish language in Donegal (H. Wagner, 1969; H. Wagner & Ó Baoill, 1969) and also with the help of local Irish speakers, working in language institutions in the Donegal Gaeltacht. The selected four locations are: *Gleann Cholm Cille* (Glencolmcille), *Rann na Feirste* (Rannafast), *Baile na Finne* (Fintown) and *Ros Goill* (Rosguill), see Figure 1.5. It was decided to choose one location in the north (Ros Goill), south (Gleann Cholm Cille), middle (*Gaeltacht lár*) (Baile na Finne) and west (Rann na Feirste), in order to get a good sampling of the geographical distribution. Although Gaoth Dobhair (see Figure 1.5), neighbouring to Rann na Feirste, is considered one of the locations in Donegal with most Irish speakers nowadays, it was not chosen in this study, since Gaoth Dobhair Irish intonation has been investigated before by Dalton (2008) and is also part of a current study on cross-dialect variation in Irish (O'Reilly, forthcoming). It was also considered to include Toraigh (Tory) Irish (see Figure 1.5) as one of the possible local varieties since it had been described as one of the strongholds of the Irish language in Donegal in the Wagner Atlas (Wagner, 1969). Due to time, financial and also weather constraints, which can make this island lying off the north-west coast of Donegal rather inaccessible, it was not possible to collect sufficient data from this particular location and as a result it was not included in the study.

Figure 1.5: Map showing locations (dark green) covered in this study in Co. Donegal.

1.4 Thesis outline

This section now presents an overview of the eight individual chapters in this thesis, including the specific research questions addressed in the four data chapters.

Chapter 1 introduces the present work and states the specific motivations behind the study. The main research questions and research aims are formulated and the contribution this work aims to make to the body of dialectal intonation studies is explained. Additionally, information on the broad and complex linguistic landscape in Ulster today is provided, including Ulster English, Ulster Scots and Ulster Irish, as a context for what follows. Finally, a synopsis of each chapter is presented.

Chapter 2 contains the review of the most important studies relevant for this thesis. The theoretical AM-framework for intonational analysis is explained as is the IViE labelling system used in this study and the ToBI labelling system on which IViE is based. Then, an overview of the basic linguistic features of Irish is given, including the grammatical structure and also more specifically, the sound system of Donegal Irish. The sections that follow review the body of studies on the prosody of Irish dialects and some related issues in the intonation of Irish English. Subsequently, the most relevant literature for each of the four analytic chapters of this thesis (4-7), to include the literature on sentence mode differentiation, tonal alignment, the marking of focus and measures of rhythmic properties are reviewed.

Chapter 3 contains information on the recorded subjects, the data collection procedure and the more detailed research questions in the following analytic chapters. First, it explains the process of informant selection for each local variety along with the recording procedure. Subsequently, the predicted and unpredicted challenges that emerged during the recording procedure and data collection are described. In addition, the more specific research questions addressed in each of the data chapters (chapters 4-7) are outlined here as a link to the following chapters.

Chapter 4 is the first analytic chapter and discusses sentence mode differentiation in the four Donegal Irish varieties. The analysis covers tunes (representative of the phonological level) and more fine-detailed prosodic features (phonetic level) for the distinction between statements (ST) and two question types (wh-questions (WHQ) and yes/no questions (YNQ)). Findings show that sentence modality, although grammatically marked by question particles, can also be discernible from the intonation, carried sometimes by change to the tune and/or by phonetic adjustments as measured by our parameters. WHQ is distinguished from ST by a boosting (i.e. raising) of the initial pre-nuclear accent, resulting in a raising of both L and H targets in rises (L*+H) which may yield a high pitch accent (H*). In YNQ the nuclear element of the phrase is relatively boosted, which results in a raising of both L and H targets of the phrase final rise (L*+H 0%), where the H peak is raised more strikingly. Some sub-dialect differences did emerge, with the Ros Goill variety standing out as having different nuclear boundary tone (L%) in the overall majority of cases, yielding a nuclear rise-falling of the phrase L*+H L% across ST, WHQ and YNQ sentences. There were also differences in the distribution of tunes across the three sentence modes. The typical prosodic markers of sentence modality, however, are used in the same way by all varieties. We conclude that the Ros Goill variety emerges as the one most different (in its nuclear tune) from the four varieties. Although it shows a preference for rise-falling tunes across the sentence modes, the four varieties share features that clearly identify them as Donegal varieties that are different from the southern Irish dialects.

Chapter 5 discusses tonal alignment as a function of tail length and anacrusis size. The accented syllable serves as a point of reference. Up to two unstressed syllables were added before the phrase-initial pre-nuclear accent (PN), and, in a separate data set, up to two syllables after the nucleus (N). The precise timing of the low elbow, associated with the accented syllable, and the end of the rise (the trailing peak) in the bi-tonal rising accent (L*+H) were analysed and discussed both in absolute terms (actual timing relative to the accented syllable) and as a percentage of the duration of the accented syllable. Results show that overall the rise L*+H is the most common tonal pattern in pre-nuclear and nuclear accents across the four varieties, however, it is not the only option. Sub-dialect differences emerged in this analysis, affecting the RG variety. For the three other dialects results were very similar. Speaking in absolute terms, the L elbow appears at a rather constant average delay distance from the onset of the accented syllable, being slightly earlier in pre-nuclear and nuclear accents. The trailing tone H is not, and is allowed to spread over the foot with the increase in following material. As a consequence the LH distance is quite variable. As the accented syllable shortens with increasing tail length, the location of L elbow is proportionally later in the accented syllable as the tail increases. In PN, results showed little effect of anacrusis size, but findings suggest that the right hand context may be the more influential factor in the melodic timing of f_0. Sub-dialect differences also emerged for the Ros Goill variety in terms of the precise timing of f_0 targets. These differences pertained to the nuclear L*+H L% tune mentioned above, where the older group of speakers aligned the low elbow and the H peak relatively early, whereas the younger group of speakers aligned more similarly to the other three varieties.

Chapter 6 is the third data chapter and covers the analysis of the phonetic effects of focus on f_0 and duration in the four varieties. Focus is understood here as "*[...] a grammatical category that determines which part of the sentence contributes new, non-derivable or contrastive information.*" (Halliday, 1967, p.206). Findings show that focus is signalled by the same means in all varieties. The focal accent was the rise (L*+H) in all varieties and all focus positions in the phrase in three varieties (RF, GCC and BF). Phrase-initial focus in the RG variety, however, was realised with a falling tune rather than the more typical rise observed in the other varieties. In terms of pitch effects, focus marking includes an expanded $f0$ excursion on the focal item and post-focal de-accentuation. As to duration, focal syllables and focal feet were overall longer, except in phrase-final position in the proximity of a phrase boundary. No systematic differences between narrow and contrastive focus renditions emerged.

Chapter 7 is the last data chapter and presents a small-scale study of the rhythmic features across the four varieties of Donegal Irish, using the PVI (Pairwise Variability Index) measure. The PVI is calculated for vocalic (nVPVI) and inter-vocalic (rCPVI) intervals as well as for syllables (nSPVI) and rhythmic feet (nFPVI). Findings suggest that in terms the nVPVI, rCPVI, and nFPVI the four varieties are essentially ‘stressed-timed’, grouping with traditionally classified stress-timed languages, such as English, German or Dutch. In terms of, the (nSPVI), however, the values for the four Donegal varieties did fall at a more intermediate place in the continuum, showing less variability in syllable duration relative to the southern dialects (and to English).

Chapter 8 summarises all the main findings that emerged from the analysis in the four data chapters in a summarised form. The main research questions posed at the beginning of this thesis are reviewed again in the light of the findings of this study. Subsequently, similarities and differences to some of the UNB rising varieties are discussed and the possible limitations of this study are pointed out. Finally, possible future directions following from this work are discussed.

Findings of this thesis contribute to the literature in a number of ways. First, the detailed analysis of Donegal Irish adds to the detailed description of Irish prosody and to the description of Irish typology in general. Secondly, prosodic variation of varieties of the same language has been the topic of numerous studies in recent years and this thesis contributes to the growing number of such studies. By covering four specific diagnostic tools (analysis of sentence mode, tonal alignment, prosodic focus and one particular rhythm metric (PVI)), this thesis also contributes to more specific areas in intonation analysis.

2 Literature Review

2.1 Introduction

This chapter reviews the most relevant literature referred to throughout this thesis. First, a brief outline of the Autosegmental-Metrical (AM) framework of intonational analysis is given, as this is the currently most widely used approach to intonational analysis, and is also the framework applied here. The labelling system used in this study, the IViE system, is then discussed and its similarities and differences to the widely used ToBI system are pointed out. The IViE labelling system is an adaptation of ToBI, developed by Grabe (2001) and her colleagues for the description and comparison of varieties of British English in the IViE project (Grabe, 2004; Grabe, Nolan, & Farrar, 1998; Grabe et al., 1997-2002; Grabe, Post, & Nolan, 2001). It was demonstrated to be applicable to Irish, and useful for the description and comparison of intonation in Irish dialects in a number of studies (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2005a, 2005b, 2007a, 2007b; Ní Chasaide & Dalton, 2006). The decision to adopt IViE was prompted largely by the consideration that the analytic results would be easily compared to the findings in those earlier studies.

It has been mentioned in Chapter 1 that the intonation of Ulster English and of specific varieties of Urban Northern British (UNB) English, though tangential to this study, are potentially of interest, as possible influences of Irish have been proposed in the past to explain the origin of their rising nuclei which characterise them (see discussion in Chapter 1, section 1.2.3). Belfast English, and a number of these UNB English varieties were analysed in the IViE project (Grabe, 2004; Grabe et al., 1998; 2001; 1997-2002; Grabe, 2001), and the common labelling system is also useful when considering possible similarities and differences with the Donegal Irish varieties.

As a general background, an overview of the basic linguistic structure of Irish, and in particular, Donegal Irish, is given in section 2.3. A more elaborate account of past studies of the intonation of Irish dialects is presented in section 2.4, and provides the background for the present work. Given the potential interest in comparisons with Ulster English and more broadly with varieties of Irish English in general, the intonation of Irish English is discussed in section 2.5. A brief description of the (possibly influenced) UNB English varieties is also included in section 2.6. The following sections of this chapter provide a brief literature review of the topics investigated in the present study: sentence mode differentiation (section 2.7); tonal alignment (section 2.8); focus (section 2.9); and some basic measures of rhythmic features, in terms of PVI (section 2.10). Note that the reviews focus particularly on studies which cover analysis methods similar to those applied in this thesis, as outlined in Chapter 1.

2.2 Intonation analysis – frameworks and approaches

This section gives an overview of some of the theoretical frameworks which have been proposed for analysing and annotating intonation. Intonation has been described as "*a continuous - and continuously varying - pitch pattern*" (Fox, 2000, p. 274) or as "*the rise and fall of pitch of voice in spoken language*" (Tench, 1996, p. 1). For acoustic analysis, the principal correlate of intonation is the fundamental frequency (f_0) which we perceive as pitch. In combination with features such as amplitude, stress, duration and voice quality, intonation is a central part of the prosody of speech, which contributes to conveying the linguistic and paralinguistic meaning of an utterance. Intonation analysis has a long standing tradition, and there are two different schools of thought on which current analytic approaches are originally based:

The British school of thought views intonation as consisting of sequences of tonal 'contours' and works by O'Connor & Arnold (1973) and Palmer (1922) lie at the heart of this approach. Sequences of tone movements are labelled, from one accented to the next accented syllable in the basic unit of description, which is the Intonation Phrase (IP). A contour or tone-group consists of different parts which are differentiated according to their function (for an example see Figure 2.1): the pre-head is that part of the intonation contour preceding the first accent; the head is that part of the intonation contour from the first accent until the nucleus; the nucleus is the stressed syllable of the last accented word and the tail refers to all unstressed material following the nucleus. The foot describes the interval from one stressed syllable to the following.

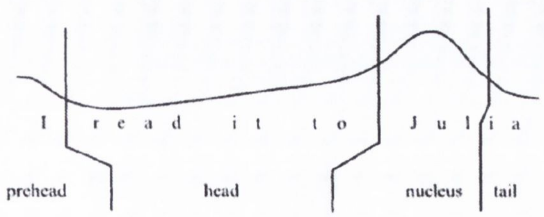


Figure 2.1: Example of the division of an intonational phrase (IP) into its distinctive units pre-head, head, nucleus and tail (Ladd, 1996, p. 210).

A distinction is made between stressed and accented syllables, where stressed syllables are rhythmically prominent and accented syllables are associated with a change in pitch movement in addition to their rhythmic prominence. The last accented syllable in an intonation phrase, if it contains more than one accent, is referred to as the *nucleus*. The nucleus is the only 'obligatory' part of the intonation phrase, is deemed the most prominent accent in the utterance and, as a default, it coincides with the final accent in the intonation phrase. Accented syllables before the nucleus are termed pre-nuclear accents. Note that while the differentiation of the nucleus and other accents is helpful in the description of many varieties of English, this is not necessarily something that holds for all varieties (see, for example, Currie (1980) on Edinburgh English), or for all languages. The distinction between nuclear and pre-nuclear accents has proven useful in past research on Irish dialects (see for example Dalton (2008); Dalton & Ní Chasaide 2005a, 2005b, 2007b).

O'Connor & Arnold (1973) differentiate between ten tone groups in British English, which are described in terms of rise, fall, rise-fall, fall-rise etc. These tone groups tend to correspond to the main sentence types of declaratives, questions, interjections and commands, and are also claimed to differentiate paralinguistic nuances.

The second school of thought in intonational analysis is the American approach to intonation and is based on works by, for example, Pike (1945) and Trager & Smith (1951). In this approach, intonation is considered to be made up of pitch 'levels' and 'terminals', which determine the meaning of an utterance. Originally, four pitch levels were suggested, and numbered from lower to higher pitch. Later, however, these levels were modified and reduced to three by assigning letters rather than numbers for low (L), mid (M) and high (H) pitch (Goldsmith, 1976). Later this was further modified to just a binary system. The two levels are for high (H) and low (L) pitch events (Pierrehumbert, 1980).

Currently, this school of thought in intonation serves as the basis for and is implemented in the ToBI labelling system (Beckman & Ayers, 2004; Beckman, Hirschberg, & Shattuck-Hufnagel, 2005; Silverman et al., 1992), which is nowadays widely used for intonational labelling and analysis. The IViE labelling system, used in the present study (Grabe, 2001; Grabe, Nolan, & Farrar, 1998) is largely an adaption of ToBI, but differs in a number of respects and incorporates some of the insights of the British school, discussed above.

2.2.1 The Autosegmental-Metrical (AM) Framework

The analysis of the intonation of the Irish varieties in this study is carried out within the Autosegmental-Metrical (AM) framework, a term coined by Ladd (1996). Originally, it is based on two frameworks: autosegmental analysis (Goldsmith, 1976) and metrical analysis (Liberman, 1975) and is nowadays most typically associated with the works of Pierrehumbert (1980) and Ladd (1996, 2008), and used widely in the field. The AM Model is based on the principle that intonation is phonologically structured (Ladd, 1996), and that tones and segments are organised on separate tiers. The intonation contour is taken as consisting of a series of two level tones, high (H) and low (L). These tones can be associated with stressed and unstressed syllables and also with phrase edges. When associated with stressed syllables, tone labels carry an additional asterisk (*) and syllables that are associated with such starred tones are termed pitch accents. Pitch accents can be mono-tonal (L*) or bi-tonal (L*+H). Tones associated with unstressed syllables following the pitch accent are referred to as 'trailing tones', and tones associated with unstressed syllables preceding the tone are termed 'leading tones'. The basic domain of description for such tone labels is the Intonation Phrase or IP. The IP most closely corresponds to the tone unit in the British tradition of intonational analysis (Crystal, 1969) and can coincide with breath groups. In English, a typical IP is a sequence of prosodic words, ranging from a single word up to an entire phrase, with the nucleus placed on the last word. Tones associated with IP beginnings and ends are termed boundary tones and are marked with the percentage sign (%). Final IP boundaries do not only simply mark the end of an intonation phrase, but can also signal important linguistic information. For example, high final boundaries (H%) may be used to indicate questions (as opposed to declaratives) in some languages; they may also be used to signal paralinguistic information (e.g. diffidence, tentativeness), and they may also serve in regulating discourse (e.g., in the signalling of turn-taking).

2.2.2 Labelling systems

Within the AM-framework of intonational analysis, the most widely used standard labelling system is ToBI (Beckman & Hirschberg, 1994; Beckman et al., 2005; Silverman et al., 1992). The IViE system (Grabe, 2001; Grabe et al., 1998) used in this study is an adaptation of ToBI and these are both outlined briefly here.

2.2.2.1 The ToBI labelling system

ToBI stands for '**To**ne and **B**reak **I**ndices' and it is the current standard tool for labelling intonation. It was originally formulated in the early 90's for labelling intonation in spoken Mainstream American English (Beckman & Ayers, 2004; Beckman et al., 2005; Silverman et al., 1992). Today ToBI refers to the framework of the resulting labelling system which has been adapted for numerous languages worldwide. It is most typically associated with the work of Pierrehumbert (1980) which proposes to analyse intonation in terms of a series of tonal targets and phrase accents. For annotation, usually four different tiers are proposed (see Table 2.1)

Table 2.1: Original ToBI transcription tiers from (Beckman et al, 2005)

1. Orthographic Tier	orthographic transcription of a spoken utterance
2. Tone Tier	analysis of the intonation pattern of an utterance
3. Break Index Tier	degree of coherence between words
4. Miscellaneous Tier	comments and background noises, e.g. laughter

ToBI divides phrasing into two levels: the intonational phrase and the intermediate phrase, which follows Beckman & Pierrehumbert's (1996) approach to the AM model. Phrase accents are placed after the last pitch accent in the intermediate phrase and are marked as either H- or L-. Additionally, boundary tones are employed to mark the beginning (%H, %L) or the end (L%, H%) of an intonation phrase. Thus, intonation phrases are marked with a phrase accent followed by a boundary tone, while intermediate phrases are marked by a phrase accent only. These labels are applied on the Tone Tier where pitch accents, phrase accents and boundary tones are assigned. Pitch accents can occur once or more in an intermediate phrase and can be associated with any prominent syllable in the phrase. The labeller can choose from five different pitch accents (Table 2.2):

Table 2.2: Original pitch accent inventory proposed in ToBI

H*	high
L*	low
L+H*	rising
L*+H	late rising
H+!H*	downstepped accent

As in this labelling system then, it is intended that "*the intonation contour can be represented linearly by an autosegmental string of tones, whereas the metrical hierarchy of intonational phrases [...] should be presented hierarchically, for example by a numerical break index value for perceived degree of disjuncture between any two words.*"(Beckman et al., 2005, p. 14). Such numerical break index values are labelled on the Break Index Tier. Here the different degrees of juncture between words, varying between 0 and 4, depending on the degree of word juncture are assigned (see Table 2.3. The terminology in Table 2.3 is largely reproduced from Beckman & Hirschberg (1994)). A typical example of a phrase annotated in ToBI is shown in Figure 2.2.

Table 2.3: Break indices and their distinctions proposed in the ToBI Annotation Conventions (Beckman & Hirschberg (1994)).

0	clear phonetic markers of clitic groups; e.g. the medial affricate in contractions of 'did you' or a flap as in 'got it'
1	most phrase-medial word boundaries
2	a strong disjuncture marked by a pause or virtual pause, but with no tonal marks; i.e. a well-formed tune continues across the juncture. OR a disjuncture that is weaker than expected at what is tonally a clear intermediate or full intonation phrase boundary.
3	intermediate intonation phrase boundary, i.e. marked by a final boundary tone after the last phrase tone.
4	full intonation phrase boundary; i.e. marked by a final boundary tone after the last phrase tone.

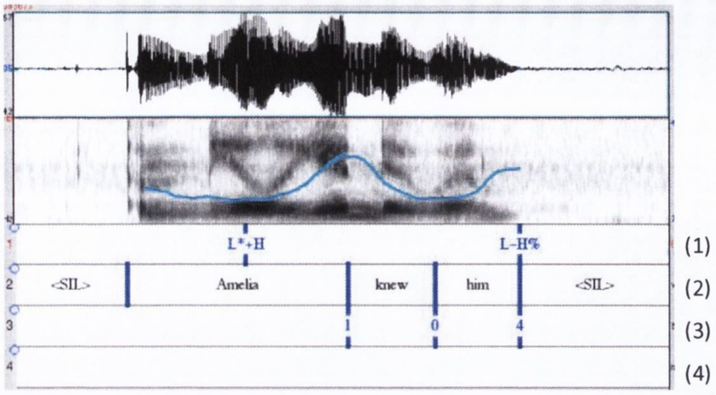


Figure 2.2: Example of a ToBI annotation of the phrase "Amelia knew him." Annotation of tone levels, intermediate-phrases and boundaries (panel 1), word segmentation and marking of silences (<SIL>) (panel 2), annotation of break indices (panel 3), miscellaneous tier (panel 4). (Example retrieved from MIT Open Courseware: *Transcribing Prosodic Structure of Spoken Utterances with ToBI*, chapter 2.5, http://ocw.mit.edu/)

During recent years, ToBI has now also been modified to annotate a variety of different languages other than American English. Language specific adaptations pertain to pitch accent and phrase accent inventories as well as to variation in the number of labelling tiers. ToBI has been adapted for numerous languages including German (**G**erman **ToBI** (**GToBI**)) (Baumann, Grice, & Benzmüller, 2001), Dutch (**T**ranscription **o**f **D**utch **I**ntonation (**ToDI**)) (Gussenhoven, 2005), Japanese (**J**apanese **ToBI** (**J_ToBI**)(Venditti, 2005), Glasgow English (**Gla**sgow **ToBI** (GlaToBI)) (Mayo et al., 1997), Greek (**Gr**eek **ToBI** (**GrToBI**) (Arvaniti & Baltazani, 2000) and Korean (**K**orean **ToBI** (**K-ToBI**)) (Beckman & Jun, 1996).

2.2.2.2 The IViE project and labelling system

The labelling system applied in earlier analyses of Irish intonation and adopted in the present study is the IViE system, which is an adaptation of ToBI. IViE stands for '**I**ntonational **V**ariation **i**n **E**nglish' and is the name of the labelling system created as part of a research project at the University of Cambridge (1997-2000) investigating intonational variation in British English (Grabe, 2001, 2004; Grabe et al., 1998; Grabe & Post, 2002b). Unlike ToBI, which had originally been designed for the analysis of Mainstream American English (MAE ToBI) (Beckman et al., 2005), and was initially, applied to so-called "standard" varieties of languages, IViE was specifically designed for prosodic annotation of varieties (dialects) of British English, and later also for dialects of other languages (e.g. Irish). It offers the possibility of distinguishing in detail between underlying phonological structures and *de facto* phonetic realisations of intonation patterns, which was pointed out as remaining less clear in ToBI (F. Nolan & Grabe, 1997). It should, however, be noted that ToBI has in more recent years been exploited also for the description of within-language, cross-dialect variation (e.g.,Chahal & Hellmuth, 2014; Prieto & Roseano, 2010), and some of the differences between the two systems may be lessening (see more below).

Data collected for the IViE project included nine varieties of English in the British Isles (Figure 2.3): Cambridge, London, Liverpool, Cardiff, Leeds, Bradford, Newcastle, Belfast and Dublin. Read speech, semi-spontaneous and free speech were collected. Materials ranged from different utterance types (statements, wh-questions, yes/no questions, declarative questions) to a read passage (the Cinderella story), semi-spontaneous speech in the form of the retelling of the Cinderella story, a map task and some minutes of free conversation.

Figure 2.3: Map showing the nine locations recorded in the IViE corpus. Figure reproduced from Grabe (2004, p.13)

IViE labelling is based on work by Grabe (1998) and Gussenhoven (1984), and, as mentioned above, it incorporates some of the perspectives of the British school, viewing intonation as a sequence of ‘contours’ rather than ‘targets’. Following Gussenhoven’s (1984) approach to the AM model, in IViE starred tones (*) are associated with accented syllables. Unstarred or trailing tones are then associated with unstressed syllables from the end of one accented syllable to the beginning of the following one (relating thus to the foot). Utterance finally, the trailing tone captures pitch movements of unstressed syllables following the nucleus, up until the boundary tone. In IViE, a distinction is made between (pitch) accented syllables and rhythmically stressed syllables, where the syllable is prominent, but has no noticeable pitch protrusion.

According to *the IViE labelling guide* (Grabe, 2001), IViE draws on the labelling tiers proposed in ToBI, with some modifications (see Figure 2.4) and offers a total of five tiers, with possible prosodic annotations on three of them.

Comment tier
Phonological tier
Auditory phonetic tier
Rhythmic tier
} Prosody
Orthographic tier

Figure 2.4: Available labelling tiers in IViE reproduced from Grabe et al. (1998)

Labels of phonological tonal categories are annotated on the Phonological Tier, using combinations of high (H) and low (L) labels which is in line with the AM framework. The starred tonal element (*) is associated with the stressed syllable, trailing tones describe the tonal movement on the following unstressed material. Note, that in this respect IViE differs from ToBI in that all bi-tonal accents are always left-headed. This means that the prominent syllable is marked with a starred tone (L* or H*), which occurs always to the left if it is part of a bi-tonal accent. The unit of description for the realisation of pitch accents is called the Implementation Domain (ID), comprising the accented syllable, as well as the following syllables up to the next accented one (see Grabe, 2001). An overview of the originally proposed tone labels is shown in Table 2.4.

Table 2.4: Label inventory of phonological tones in the IViE transcription, reproduced from Grabe (2001).

Labels	
H*L	High target on prominent syllable followed by low target in the same ID, e.g. H-l, mH-l or mHl
H*	High target, common in initial position in so-called flat hats, e.g. lH-h
!H*L	Downstepped high target, low target, e.g. hM-l
L*HL	IP internal or IP final rise-fall: low target on the prominent syllable, high target on next syllable followed by low target, e.g.lLh-l
L*H	Low target on prominent syllable followed by high target, e.g. mLh-h, mL-h or lL-h
L*	Low target
H*LH	IP internal or IP final fall-rise: high target on strong syllable, low, high, e.g. mHl-h

In addition to tone labels, a set of tone modifiers has also been proposed (Grabe et al., 1998). These are listed and explained in Table 2.5. According to Grabe et al. (1998, p.3) "*The tone modifiers '^' and '!' modify the location of tones in the speaker's register. '_' and '+' modify the location of tones in the time domain, and allow us to capture similarities as well as differences between related patterns. [...] '+' indicates that tones function as a phonological unit, e.g. H*+L can transcribe a falling nuclear accent [...].*"

Transcribers, however, vary in the use of these originally proposed tone modifiers when applying them to tone labels and can assign transcriber-specific or language-specific meanings to the modified tone labels to better account for a language or dialect-specific representation of tone movements.

Table 2.5: Tone modifiers in the IViE system (Grabe et al., 1998)

^	upstep of a tone in the speaker's register
!	downstep of a tone in the speaker's register
_	precedes tone and indicates displacement of a tone to the right, e.g. H*_L
+	connects tones functioning as phonological unit in a particular variety, e.g. H*+L

On the Auditory phonetic tier pitch movements around the rhythmically prominent syllables are marked (H, M and L on the prominent syllables; l, m, and h on those following or preceding). And on the Rhythmic tier, rhythmically prominent (stressed) syllables are marked (P).

As regards boundary tones, apart from a final high (H%) or low boundary tone (L%), it is also possible in IViE to mark '*no change*' in the IP-final f_0 contour from the previous tone movement (0% or %), see Figure 2.5.

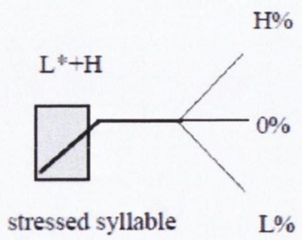


Figure 2.5: IViE boundary options for annotation of Belfast English. Reproduced from Grabe et al. (1998)

This third boundary option (0% or %) was specifically integrated into IViE for marking the typical nuclear rise-plateau pattern in Belfast English (L*+H 0%). It is also important for the analysis of the Donegal varieties of this study: Gaoth Dobhair Irish was shown to have overall nuclear rise-plateaux (L*+H 0%) (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2007b), and we would expect the other Donegal Irish varieties to have similar nuclear patterns. The zero boundary (0%) then indicates that there is no change in tone at the boundary from the preceding tone. The rise, or high-rise (L*+H H%), on the other hand, transcribes the f_0 movement which peaks at the boundary, and L*+H L% is the label applied to rises with a phrase-final pitch drop at the boundary.

Unlike IViE in the initial formulation of the ToBI system, there was an emphasis on binarity of tones (H and L), and adhering to this made it more difficult to capture the kinds of contrasts referred to above: phrase boundaries needed to be specified with either H% or L% even if there was no phrase-final pitch drop or rise. The problematic aspect of ToBI was pointed out by Nolan & Grabe (1997) and also by Cruttenden (2001) in his analysis of similar patterns in Mancunian (Manchester English) intonation. Note, however, that more recently, a mechanism for marking a zero boundary option in ToBI has been proposed by Prieto & Roseano (2010).

An example of an annotated phrase in IViE including all originally proposed annotation levels (Grabe, 2001) is shown below in Figure 2.6.

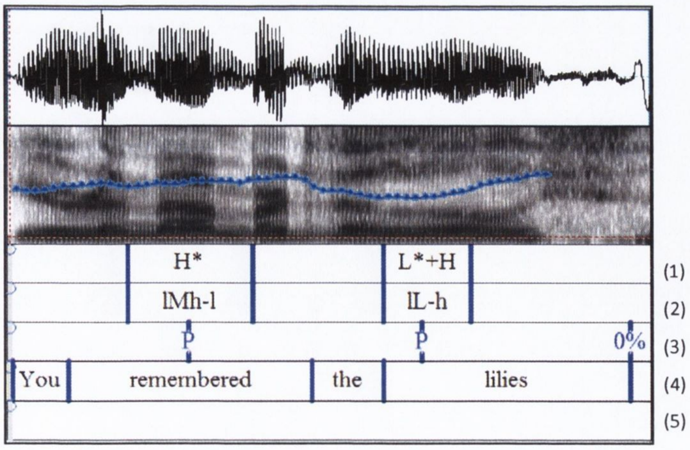


Figure 2.6: An example of original IViE labelling of the declarative 'You remembered the lilies' from the annotated IViE corpus (Grabe, 2001; Grabe & Post, 2002b). The example is a declarative from the Belfast English variety. Annotation levels include: transcription of phonological tone labels (tier 1), annotation of phonetic level (tier 2), marking of stressed syllables and phrase boundaries (tier 3), orthographic transcription (tier 4), miscellaneous tier (tier 5).

The ToBI and IViE labelling systems then differ in a number of ways. ToBI allows for both left-and right-headed bi-tonal accents, whereas in IViE they are always left headed. Note that in IViE, the tonal accent or the bi-tonal accent thus relates to the portion of the pitch contour delimited by the foot. IViE also follows more closely the British tradition in that intonation is seen as involving pitch contours, rather than a series of tone 'levels'.

IViE is chosen as the labelling system in this thesis, because as mentioned earlier, it has been shown in earlier studies to be suited to and effective in the description of Irish dialects (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2005a, 2005b, 2007a, 2007b; Ní Chasaide & Dalton, 2006) and has successfully been exploited to highlight dialect-specific differences in tunes. Since these studies offer a point of departure for the present work, it made sense to use the same analysis and labelling methodology, ensuring that the results here would be directly comparable to those of the earlier studies.

2.2.3 The IViE labels used in this study

This section gives an overview of the IViE labels applied to the four Donegal Irish varieties (Rann na Feirste (RF), Baile na Finne (BF), Gleann Cholm Cille (GCC) and Ros Goill (RG)) in this study. The inventory of labels comprises tone labels, tone modifiers and boundary tones for both pre-nuclear (PN) and nuclear (N) tone movements. PN contour labels describe the pitch movements from the first (or subsequent) pre-nuclear accented syllable in the IP up to the following accented syllable. N labels describe the tone movements from the final accented syllable of the phrase up until the end of the phrase or until the boundary tone.

Table 2.6 summarises the labels used in the annotation of the varieties of Donegal Irish investigated in this study. Table 2.7 illustrates with stylised contours the nuclear (N) tunes comprising the nuclear tone and the boundary tone. Stylised contours of pre-nuclear (PN) tunes are shown together with their corresponding labels in Table 2.8 below. In the latter two tables, squares with dashed lines indicate the accented syllable relative to the tonal movement.

Table 2.6: Overview of pre-nuclear (PN) and nuclear (N) tunes and IViE labels used in this study. Note, that the bracketed labels refer to variants.

pre-nuclear (PN)	nuclear (N)
L*+H / (L*H)	L*+H %
H* / (H*^)	L*+H^ %
!H*	L*+H L%
H*+L	L* %
%H H*	H*+L %

In this thesis the nuclear contours L*+H % and L*+H^ % are both used to transcribe 'rise-plateaux', which typically has the low tone L* associated with accented syllable and a trailing peak H (see Table 2.7). The L*+H^ % label more specifically transcribes a rise-plateau where the trailing peak is audibly raised (upstepped) in the speaker's register (H^). Although there may be a slight drop in f_0 visible at the phrase end, it is not audible as a falling pitch and so the zero boundary is used (Note that for the zero boundary, the labels 0% and % are interchangeable. L*+H L% is the label used to transcribe a rise-plateaux with an audible pitch drop towards the phrase boundary. L* % transcribes low tones associated with the accented syllables that remain low until the end of the phrase. The fall H*+L % is the label applied to tonal movements where the pitch peak (H*) is aligned with the accented syllable and tunes show a falling pitch trajectory until the end of the phrase.

Table 2.7: Overview of nuclear (N) tunes and IViE labels in this study.

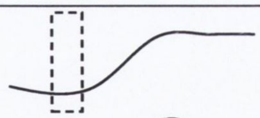
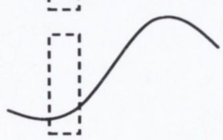
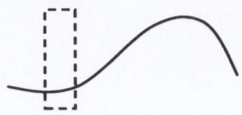
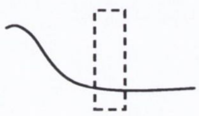
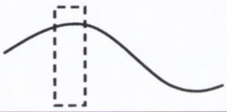
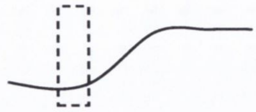
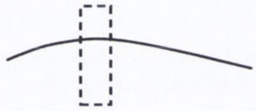
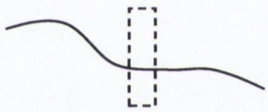
(N) labels	taxonomy	stylised contours
L*+H %	rise plateau	
L*+H^ %	rise plateau with an upstepped high trailing tone	
L*+H L%	rise plateau with an audibly low boundary tone	
L* %	low	
H*+L %	fall	

Table 2.8 illustrates with stylised contours the pre-nuclear (PN) tunes. The rise or rise-plateau (L*+H) is the label applied to tunes which start low on the accented syllable (L*) with the trailing peak H realised on the following material. A variant of L*+H, namely L*H, which we simply term 'early rise', was added as a label in this thesis to mark cases where the association with the accented syllable differed from the typical L*+H. In these cases, either the L tone immediately precedes the accented syllable and the H tone immediately follows it, or, the rise begins at the very beginning of the accented syllable and the peak is reached towards its end. We borrow this label from Mayo et al (1997), where it was used to transcribe a similar phenomenon in Glasgow English. The L*H label was found for some of the IP initial accents in YNQ of the RF variety (Chapter 4), and in some IP initial broad focus utterances in the RG variety (Chapter 6), and they will be discussed more fully in relation to the analytic studies of those chapters. Note for now, that in these cases, we believe that we are dealing with timing differences of what is essentially a rise (L*+H), rather than with a separate tonal category. For clarity in the present study, however, it was decided to tabulate such variants separately, as systematic differences in realisation might well be of interest in differentiating among the varieties we are investigating. High peaks aligned with the accented syllable are labelled H*. A variant of H*, H*^ transcribes high pitch accents which are audibly upstepped in the speaker's register. Although we believe that H* and H*^ most likely belong to the same category, they were, again, tabulated separately for the same reasons. Phrase-initial peaks with high onsets where labelled as H% H*. Down-stepped high targets, occurring in phrase-medial position, are transcribed as !H*. Falling tunes, or falls in phrase-initial position were transcribed as H*+L.

Table 2.8: Overview of pre-nuclear (PN) tunes and IViE labels used in this study. Note, that the bracketed labels refer to variants.

(PN) labels	taxonomy	stylised contours
L*+H	rise/rise-plateau	
(L*H)	early rise (where the onset of the rise (L) typically precedes and the peak (H) typically occurs just after the accented syllable)	
H*	high	
(H*^)	upstepped high	
!H*	down-stepped high	
H*+L	fall	
%H H*	high tone with high onset	

In this thesis, data is annotated following the above named IViE annotation tiers with adapted annotation levels. A typical example of annotated data (from Chapter 4: Sentence mode) in this thesis is shown in Figure 2.7 for the utterance:

Bhuail	mé	le	Gráinne	sa	bhialann
met	*I*	*with*	*Grainne*	*at the*	*restaurant*
/'wialʲ	mʲə	lʲə	'gɾˠænʲə	sˠə	'vʲialˠənˠ/

'I met Grainne at the restaurant.'

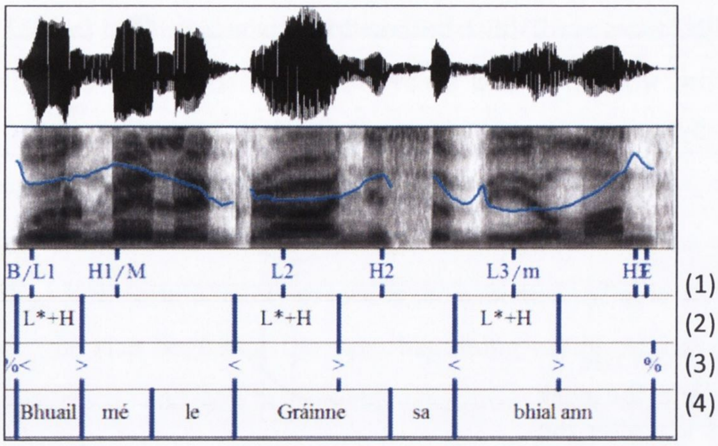


Figure 2.7: Example of data annotation in this thesis using IViE labelling and adapted annotation tiers: annotation of specific f_0 measurement points (tier 1, phonetic tier: beginning (B) and end (E) of the utterance, absolute low (L) and high (H) pitch targets of the first (L1, H), second (L2, H2) and third (L3,H3) accent group as well as overall f_0 maximum (M) and minimum (m) of the utterance), annotation of tone labels (tier 2, phonological tier), marking of stressed syllables and boundary tones (tier 3, rhythmic tier: marking of rhythmic properties, beginning (<) and end (>) of stressed syllables and boundary tones), orthographic transcription of the utterance (tier 4). (Soundfile: DI-BF-ANM-D3C1-5)

2.3 Overview of the structure of Irish

This section gives as brief introduction to the Irish language. Accounts of the structure of Irish are presented in Ó Siadhail (1999), Ó Baoill (2012), Stenson (1981), Ó Dochartaigh (1992) and Ó Huallacháin & Ó Murchú (1976). Subsequently, the basic linguistic properties of the Irish dialects and more specifically Donegal Irish are outlined.

Irish, an Indo-European language, belongs to the Goidelic branch of Celtic, together with Scottish Gaelic and Manx (G. Price, 2000). It was the main language of the Irish people for most of their recorded history. With the increasing reach of English rule in Ireland, the English language became increasingly the language of the ruling classes, of law and commerce. Irish, along with other manifestations of Gaelic culture, was often viewed with disfavour, and associated with the disenfranchised indigenous population. The 'Plantations' of the seventeenth century (confiscation of lands and their redistribution to English or Scottish settlers) had inevitable consequences for the spread of English in Ireland. There was thus also considerable and growing contact between Irish and English in Ireland, particularly since the arrival of larger numbers of English speakers with the plantations in the 17th century.

The language suffered a further decline due to the 'Great Famine' in the mid 19th century, where in the space of a few years, the country lost almost a quarter of its population due to death or emigration. The famine triggered a large and long lasting wave of emigration, which not only further greatly reduced the population, particularly in the poorer, Irish speaking parts of the country, but also led to a perceived need for English in those same parts of the country. These factors at least partially explain the very rapid decline in the Irish native speaker population in the second half of the nineteenth century.

Today, Irish is an endangered language (Moseley (Ed.), 2010) spoken on a daily basis by relatively small numbers of the population (CSO, 2011). The geographical areas where Irish is still spoken in the community on a daily basis (Gaeltacht areas), are located mainly along the west coast (see Figure 2.8). There is also a small Gaeltacht in Co. Meath (in the East of the country), artificially formed by the Irish state, when in the 1930's land was allotted to people taken from Gaeltacht regions in the West, and another small Gaeltacht is located in Co. Waterford in the south-east of the country. Note that virtually all speakers of Irish are now bilingual (Irish/English speaking) and there few, if any mono-lingual Irish speakers left. Estimated numbers of native speakers all over the country vary: in the 2011 Census (CSO, 2011) numbers of native speakers aged 3 and over who use the language outside of the education system on a daily basis were reported to be around 77,185 (or 1.8% of the population). Even in the Gaeltacht areas the language is in rapid decline. Out of those who live in the Gaeltacht areas, the numbers of Irish speakers who use the language on a daily basis outside of the education system, have been estimated to be as low as 23,175 (or 24% of the population). This had implications for the selection of informants in this study. Given the task at hand it, was crucial to find native speakers, who use the language in the home as a first language, and who are representative of the specific Gaeltacht locality being targeted. There were some consequences for the selection of informants, and this is discussed in Chapter 3.2.2.

Outside of the Gaeltacht areas, there is a considerable and growing number Irish speakers, particularly in Dublin and other urban areas, with an active and vibrant cultural community. This is also reflected in and fostered by the growing number of Irish-medium schools (Gaelscoileanna) being established through local initiatives. In the North, there have also been pockets of language re-vitalisation around Belfast and Derry. As pointed out by

McCloskey (2001), the growth and vibrancy of the non-Gaeltacht communities have to some extent offset the decline of speakers in the Gaeltacht, and overall, Irish enjoys a level of cultural activity unique among endangered languages.

Irish is the first official language in Ireland, with English being the other official language. It has also, since 2007, been recognised as an official working language of the European Union. In Northern Ireland it also has the status of a recognised minority language (ECRML, 1992). In its modern form Irish can be divided into three main dialects (cf. O'Rahilly, 1932): Ulster, Connaught and Munster Irish. The three dialects differ in terms of their basic phonological, syntactic, semantic and lexical features. Although there is no spoken standard (all dialects are considered equally acceptable) there is a written official 'standard' form of the language, *An Caighdeán Oifigiúil* 'The Official Standard', first introduced in the 1950s and 60s and revised in 2012.

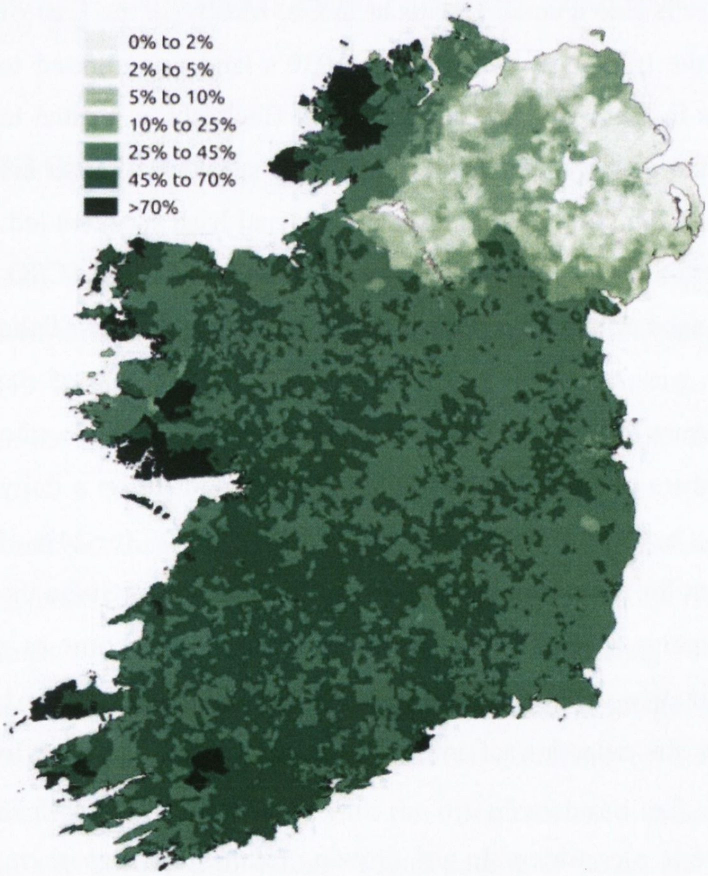


Figure 2.8: Map of Ireland showing the proportions (%) of the number of respondents aged 3+ who said they could speak Irish in the Ireland census 2011 or the Northern Ireland census 2011. The irish speaking (Gaeltacht) areas are shown in dark green shading.
Source: www.wikipedia.org/wiki/Irish_language

2.3.1 The grammatical structure of Irish

Along with the other Celtic languages, Irish exhibits a number of typologically unusual features. It is a VSO (verb-subject-object) language, where the verb and subject are obligatory, but other constituents, i.e. adverbial and/or prepositional phrases, are optional. In the example sentence below in Figure 2.9, the prepositional phrase is referred to as 'extension'.

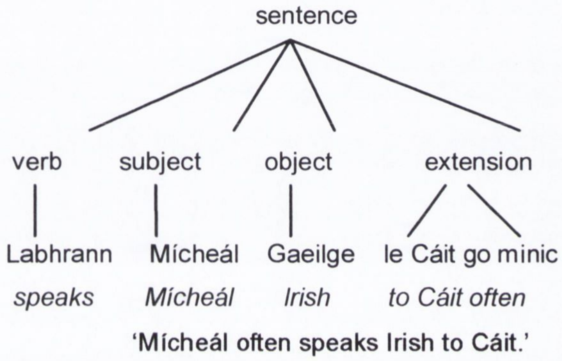


Figure 2.9: Example of basic word order in Irish (Ó Siadhail, 1999, p. 205).

There are two forms for the verb *to be*: the first of these, the copula, relates to permanent characteristics or the identity of a person, as opposed to more temporary aspects. Irish has further been described as having two types of verbal forms, traditionally referred to as analytic and synthetic. The analytic verbs are inflected forms, which encode person and number information as well as tense and mood. The synthetic forms carry information only about tense and mood. In Irish unlike in some other languages such as Polish, personal pronouns cannot occur with the synthetic forms. The predominance of synthetic vs analytic forms varies from dialect to dialect. In the Munster dialect, synthetic forms are widely used. In the Connemara dialect synthetic forms are used, but only in limited contexts (see Bondaruk, 2001). In the Donegal dialect, the use of synthetic forms is quite rare. The phenomenon of dropping the personal pronoun is termed 'pro-drop, and is less prevalent in Irish than in other pro-drop languages such as Polish (Bondaruk, 2001).

Nouns are inflected in Irish, and there are three cases, common, genitive and vocative. A striking feature of the morpho-phonology of Irish (and generally of Celtic languages), is the system of initial mutations, whereby initial consonants (of verbs, nouns and adjectives) undergo systematic changes that can express important grammatical relationships. One such mutation involves a process of spirantisation, whereby stops change to fricatives. For example, spirantisation of initial stops in verbal forms signals past tense, as is illustrated in the alternation of [k] and [x] in the following: ['kanˠ] *'sing'* (imperative) vs ['xanˠ] *'sang'* (past tense). Further, initial mutations in Irish can involve the transformation of voiced stops to homorganic nasals, or the transformation of voiceless stops to voiced ones.

SYNTACTIC MARKING OF QUESTIONS

Note, that in Irish there are two main question types: wh-questions and yes/no questions (see examples below). Unlike the case of other languages, such as English or German, for example, declarative questions are not found in Irish. Questions are marked by specific morpho-syntactic markers, indicating the question type. In English wh-questions begin with words such as 'who, what, when, where, how'. Irish has equivalent forms, e.g. *céard* (what), *cé* (who). The wh-word must always be fronted and it is ungrammatical to have more than one wh-word in an utterance. The prosodic aspects pertaining to the differentiation of statements and different types of questions is the topic dealt with in Chapter 4.

Cár	bhuail	tú	le	Dónall?
where	*met*	*you*	*with*	*Dónall*
/ kaɾˠ	'wialʲ	tˠu	lʲə	'dˠonˠəlˠ /

'Where did you meet Dónall?'

Yes/no questions are formed with a clause-initial particle e.g. *an*, *ar, nach*.

Ar	bhuail	tú	le	Dónall?
Q-part	*met*	*you*	*with*	*Dónall*
/ əɾʲ	'wialʲ	tˠu	lʲə	'dˠonˠəlˠ /

'Did you meet Dónall?'

INFORMATION STRUCTURE

The prosodic marking of focus in the Donegal dialects is examined in Chapter 6. Prosodic focus is one of the ways in which information structure is signalled, and as background to the prosodic aspects looked at in this thesis, I review briefly here the broader question of inromation structure in Irish. Further, details on prosodic focus, in Irish and in different languages is presented in Section 2.9.

Information structure pertains to how information in an utterance or in discourse can be packaged into meaningful units (Chafe, 1976) and particularly how the attention of the listener is drawn to a particular part of an utterance. This serves, for example, to highlight new information, or contrast new with given information in a certain context. Information structure is a key requirement for successful communication between speaker and hearer.

The 'information packaging' can be achieved in a number of ways, e.g., through grammatical, morphological or prosodic devices. As one would expect, languages vary in the extent to which the different grammatical means are used for focus marking and a trade-off between these means can be expected (Cruttenden, 1997). In Irish focus can be realised in a variety of ways which include syntactic clefting, morphological marking of focus by means of emphatic or marked versions of pronouns and intonational marking of focus by prosodic prominence on the focal element.

Syntactic marking of focus in Irish can be achieved by means of copula cleft sentences. This construction serves to isolate new and given information. The element to be focussed is placed immediately after the copula verb and carries the focus, being associated with new or important information. In cases where the copula precedes a noun phrase (NP), the copula must be separated from the NP by a pronoun that agrees with the NP in gender and number, (see example below from Nolan (cf. B. Nolan, 2012, p. 193).

Ghlan Aifric an chistin.
'Cleaned Aifric the kitchen'

Focal Question:	Who cleaned the kitchen?					
Given:	Ghlan [SOMEONE] an chistin.					
New:	Is	í	***Aifric***	a ghlan	an	chistin.
	COP	3SG.F.ACC	Aifric	cleaned	the	kitchen.
Lit:	It is her Aifric that cleaned the kitchen.					
	'It is (her) Aifric that cleaned the kitchen.'					

Nolan (2012) also points out that the notion of '*answer to a question*' is important to the identification of the predicate of a copula where the answer (i.e. the predicate) provides *new* information and focus. An example from Nolan (2012, p.207-208) is shown below.

'Who is the doctor?'

Is	é	Séan	an	dochtúir.
COP	*3SG.M.ACC*	*Séan*	*the*	*doctor*

Lit: It is he Séan the doctor.

'Séan is the doctor.'

Another way of highlighting information in Irish, is done by morphological marking. For example, there are morphologically marked emphatic versions of pronouns, e.g., *míse* 'me' (emphatic) vs *mé* 'me'. Emphatic suffixes can also attach, for example to nouns (*a theach* 'his house' vs *a theach**san*** '**his** house'), to personal pronouns (*agam* 'by me' vs. *agam**sa*** 'by **me**') or to synthetic verb forms (*tuigim* 'I understand' vs. *tuigim**se*** '**I** understand').

In Irish, along with these grammatical and morphological devices, there is also prosodic marking of focus. As illustrated in O'Reilly, Dorn & Ní Chasaide (2010) this involves the prosodic highlighting of specific constituents of an utterance through heightened pitch prominence with de-accentuation of post-focal material, and there can be some reduction in the scaling of pre-focal accents. Chapter 6 examines the prosodic realisation of focus in the four varieties of Donegal Irish which are the subject of this study. For further discussion on focus see section 2.9.

2.3.2 The sound system of Donegal Irish

There is a long history of descriptive phonetic studies on the sound system of Irish, encompassing a number of dialects, including Donegal Irish (Hamilton, 1974; Ní Chasaide, 1979; Quiggin, 1906; Sommerfelt, 1922), Connemara Irish (de Bhaldraithe, 1966) Mayo Irish (de Búrca, 1970), Muskerry (Cork) Irish (Ó Cuiv, 1968) and Kerry Irish (Ó Sé, 2008).

The most striking feature of the Irish sound system concerns the basic opposition of palatalised and velarised consonants. I will illustrate here with Gaoth Dobhair Irish, as this is the closest to the varieties that are being investigated in this study. Table 2.9 presents a consonantal chart from Ní Chasaide (1999, p.114) for the Gaoth Dobhair dialect, and the following description is based largely on that source. Consonants can either be palatalised, e.g., [bʲ] or velarized [bˠ], in addition to being voiced or voiceless. (The only consonant not involved in the palatalised/velarised opposition is the glottal fricative /h/). Note that the term 'palatalised' is used to cover consonants which have the secondary articulation of palatalisation, and consonants articulated in the palatal and alveolo-palatal region. Similarly, the 'velarised' consonants can have velarisation or involve primary articulation in the velar region. The palatalised/velarised distinction is phonemic: note that both these qualities are indicated on the chart below and this will be also the case for illustrative data in this thesis. Although, strictly speaking, indicating both qualities are redundant in terms of marking the phonological contrast, it was felt useful to retain this information in the present transcriptions.

This opposition of palatalised and velarised segments serves not only to differentiate lexical items, but also has certain grammatical functions, for example the marking of case and number marking in nouns, e.g., *ól* [ɔl̪ˠ] 'drink' (nom. sg.) and *óil* [ɔl̠ʲ] 'drink' (gen.sg.) (Ní Chasaide, 1999, p. 111).

Table 2.9: The consonant system of Gaoth Dobhair Irish (Ní Chasaide, 1999).

	Labial	**Dental**	**Alveolar**	**Alveolo-palatal**	**Palatal**	**Velar**	**Glottal**
Plosive	pˠ bˠ pʲ bʲ	t̪ˠ d̪ˠ		 t̠ʲ d̠ʲ	 c ɟ	k g	
Fricative/ Approximant	fˠ w fʲ vʲ		sˠ	 ɕ	 ç j	x ɣ	 h
Nasal	mˠ mʲ	n̪ˠ	 n	 n̠ʲ	 ɲ	ŋ	
Tap			ɾˠ ɾʲ				
Lateral Approximant		l̪ˠ	 l	 l̠ʲ			

The vowel system of Gaoth Dobhair Irish, as described by Ní Chasaide (1999) is shown in Figure 2.10 below. Vowels fall into long and short sets, where long and short pairs are qualitatively distinct. Vowels in stressed syllables are longer than in unstressed syllables. Long vowels (/i, e æ, ɔ, o, u/) are typically shown in orthography with an acute accent (*gé* /ɟe/) 'goose'). As regards vowel reduction, long vowels have short allophones in unstressed syllables and before /h/, and short vowels are often reduced to schwa. Note, that /ə/ occurs only in unstressed syllables. Figure 2.9 illustrates the qualities of the vowels from Ní

Chasaide (1999, p.114). Although the figures are arranged in terms of 'pure' vowels on the left, and diphthongs on the right, it should be noted that the consonantal quality exerts major influences on the quality of adjacent vowels, and that the so called 'pure' vowels have strong on/off glides when, for example, a velarised consonant abuts a front vowel, or a palatalised consonant abuts a back vowel. For example, in Donegal Irish, the vowel /i:/ may be realised as a pure high front vowel [i:] when preceded by a palatalised consonant, but essentially as a diphthong [ɤi] when preceded by a velarised consonant.

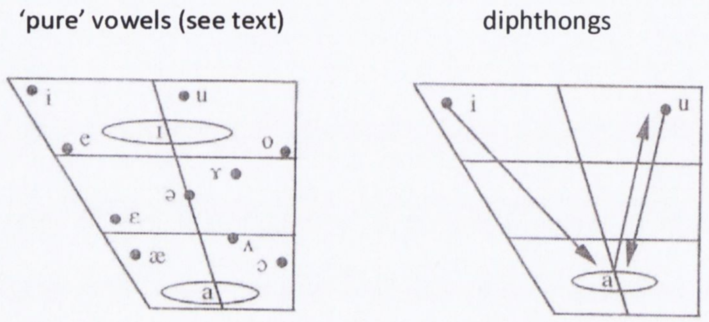


Figure 2.9: The vowels of Gaoth Dobhair Irish (Ní Chasaide, 1999).

The transcriptions used in this work will follow the charts above with the following minor amendments:

- dental sounds are not shown with dental diacritics
- alveolo-palatal sounds are not shown with the retraction diacritic
- / l̠ʲ / is replaced by / ʎ /
- / l̪ˠ / is replaced by / lˠ /
- following the vowel descriptions above, length marks are not used in the transcription

STRESS

Primary lexical stress is typically located on the first syllable of words in Irish, with relatively few exceptions. However, stress location does vary with dialect and the Munster dialect has undergone historical stress shift (Blankenhorn, 1981; O'Rahilly, 1932; Ó Sé, 1989). Although stress is normally realised on the first syllable in a word, it shifts to the second or third syllable in di-and trisyllabic words (cailín / ka'l̠ʲi:nʲ / 'girl'; taistealaí /tˠaɕtʲa'lˠi/ 'traveller'/) when the syllable in question is 'heavy'. A 'heavy' syllable is one that contains a long vowel or diphthong, or the sequence *-ach* /ax/ or *-acht* /axtˠ/ (*bealach* /bʲə'lˠax/ 'way') *beannacht*

/bʲənˠˈaxtˠ/ ‘blessing’. (cf. O Siadhail, 1999; Ó Sé, 1989) In discussing the Munster stress shift, Blankenhorn (1981, p.234) has asserted that “*Irish is, and has been throughout its history a regularly stress-initial language, and forward stress represents an aberration*”. Linguists have proposed a variety of the explanations to account for the Munster stress shift, (O’Rahilly, 1932; Blankenhorn, 1981; Ó Sé (1989). However, as regards the present study, we simply note that in Donegal Irish stress is word-initial with a very small number of exceptions.

In rhythmic terms, the Irish dialects have been described as having typically ‘stress-timed’ characteristics, with clearly identifiable pitch accents and boundary tones (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2005a, 2005b, 2007a, 2007b; Ní Chasaide & Dalton, 2006). Unstressed syllables tend to have reduced vowels and stress-clash (the succession of two stressed syllables) is generally avoided. A pilot study on rhythmic aspects of the Donegal varieties is included in Chapter 7.

SYLLABLE STRUCTURE

Syllable structure in Irish is complex (Carnie, 1994; Green, 1997; Ní Chiosáin, 1999), and syllabic sequences such as V, VC, VCC, CV, CCV, CCCV, CVCC, CCVCC, CCCVC and CCCVVCC can be found (de Búrca, 1970, p. 52). Linguists have suggested different accounts of syllabification in Irish. The majority of traditional phonetic descriptions of Irish have proposed a VC.V structure, where the inter-vocalic C is assigned to the initial (typically stressed) syllable, with the second syllable thus lacking an onset (de Bhaldraithe, 1966; de Búrca, 1970; Mhac An Fhailigh, 1968; Ó Cuiv, 1968; Ó Searcaigh, 1925). While this has been the dominant traditional view, Sjøstedt (1931) proposed a V.CV structure, as would be typologically more common, and this is the position also taken in Ní Chiosáin (2007).

A perception experiment on Connemara Irish reported by Ní Chiosáin, Welby & Espesser (2012), suggests a rather complex situation: the inter-vocalic C is often treated as ambi-syllabic, but is more likely to be treated as a coda, when V1 is short. There appears to be a gradient effect of vowel-length on syllabification. For VCCV items, listeners showed a great deal of variability in their decisions.

Re-syllabification occurs when consonant-final pro-clitics (such as the determiner *an* 'the', or the progressive aspect marker *ag*) occur before vowel-initial stems, as for example in the following examples from Donegal Irish, adapted from Hamilton (1974, pp. 28,30):

a.		/ənˠ/ + /ʲiːrʲənʲə/	*an fhírinne*
	→	/ə. nʲ # ʲiːrʲənʲə/	the truth
			'the truth'
b.		/əgʲ/ + /ʲiaskərʲart/	*ag iascaireacht*
	→	/ə. gʲ # ʲiaskərʲart/	PROG fish.NONFIN
			'fishing'

2.4 Studies on Irish intonation

The following section provides an overview of intonation studies on the Irish dialects. Until very recently, only very little information has been available on Irish intonation. Although there is a strong tradition of phonetic description of Irish dialects (e.g., Quiggin, 1906; Ó Cuív, 1968; Breatnach, 1947; de Búrca, 1970; de Bhaldraithe, 1966) entailing detailed accounts on the segmentals of the dialects, they mostly provide only brief commentaries on intonation. More recently, analysis of Connemara Irish have been carried out by Blankenhorn (1982), and Bondaruk (2004). A broad ranging analysis of the intonation of northern and southern Irish dialects is reported in Dalton (2008), Dalton & Ní Chasaide (2003, 2005a, 2005b, 2007a, 2007b) and Ní Chasaide & Dalton (2006). In these latter studies, it emerged that there is a major north/south prosodic divide, i.e., between the Donegal dialect and the southern ones. In the following, we will review these separately, and then compare them directly.

Notes on the intonation of the only other extant Goidelic language, Scottish Gaelic, which has been described as using lexical tone, have been made by, for example by Borgstrøm (1940) and MacAuley (1979). Borgstrøm (1940) notes that sentences are overall falling. MacAuley (1979), provides a descriptive account of the use of phrase-final intonation in the dialect of Berna, Lewis. He found that statements are overall falling, and rises are used for marking interrogativity.

2.4.1 The northern (Ulster) dialect of Donegal

Until recently there was virtually no information available on the intonation of Donegal (Ulster) Irish, despite detailed descriptions of the segmental system. In his major study of the Irish spoken in Meenawannia in Na Gleannta (Glenties), Quiggin (1906) provides a very tentative and brief mention of tunes, and points out that "*Donegal intonation does not differ very widely from that of English and German. The most strongly stressed syllables frequently have the highest pitch and the tone falls towards the end of the statement.*" (Quiggin, 1906, p.156). Using a musical notation he provides some examples of statements and questions. These are difficult to decipher, but could imply that a falling contour is characteristic of both statements and questions.

As Quiggin's (1906) treatment is but a fragment, offered in a very tentative way, and rather difficult to interpret, one cannot overstate the case. Nonetheless, the fact that his comments appear to point to falling contours in both statements and questions is of great interest, as it differs greatly from predominance of rising tunes recently described for the Donegal dialect (Gaoth Dobhair variety, see below). It is worth noting that the dialect Quiggin (1906) described, the dialect of Minnawannia, is essentially the same as that of the Baile na Finne (BF) variety being analysed in this thesis. Given Quiggin's comments, the possibility that this variety would pattern more with southern dialects, which tend towards falling intonation in both statements and questions (more on this below) was entertained at the outset of the present study, and this consideration motivated the choice of Baile na Finne for inclusion in the present study.

Instrumental studies within the AM framework have been carried out on the Irish of Gaoth Dobhair in Donegal, as well as on other (southern) dialects (Connemara, Kerry and Mayo) by Dalton (2008), Dalton & Ní Chasaide (2003, 2005b, 2007b). Their studies showed for the Gaoth Dobhair variety of Donegal Irish the most common intonation contour for declaratives, as well as for question contours (wh-questions and yes/no questions) is a sequence of rises with a zero boundary tone (L*+H L*+H L*+H 0%). An example of a typical declarative statement with three rising pitch accents is illustrated below in Figure 2.10.

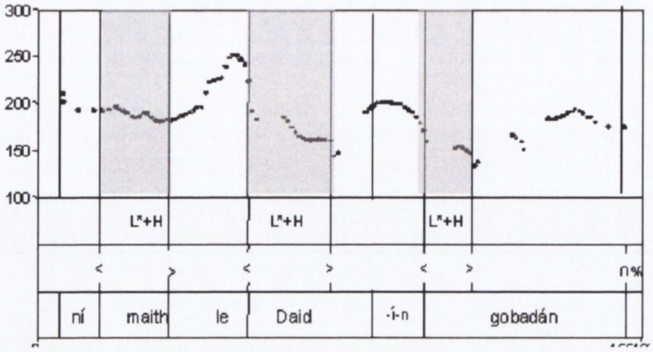


Figure 2.10: Example of a typical declarative intonation contour of Donegal (Gaoth Dobhair) Irish with three rising pitch accents (L*+H L*+H L*+H 0%) of the phrase *Ni maith le Daidí 'n gobodán* /nʲi 'mˠaç lʲə 'dʲadʲi nˠ 'gˠɔbˠədˠanˠ/ 'Daddy doesn't like the sandpiper' (Dalton, 2008). Areas shaded in grey show accented syllables.

Dalton (2008, p.75) gives a summary of the tonal inventory of Donegal (Gaoth Dobhair) Irish. She found that 76% of nuclear pitch accents are rising (L*+H), whereas high (H*) or low (L*) pitch accents only occur to a small degree. Falling accents were only found in 3% of the corpus. With regard to pre-nuclear accents, more than half (69%) are rises (L*+H), but also high (H*) (15%), low (L*) (11%) and falling (H*+L) (5%) pitch accents were found. This makes Donegal Irish stand out also from southern varieties of Irish, such as Connaught Irish, where falling tunes would be more typical and this is the case for statements as well as questions.

2.4.2 The southern dialects

The series of monographs on the southern dialects, published by the Dublin Institute of Advanced Studies, and which tend to follow a fairly similar format, provide some, though limited comments and illustrations of intonation patterns, using a simple notation of contours. In his description of the Irish of Cois Fhairrge in Connemara, de Bhaldraithe's (1966, pp.67-71) included illustration is of falling tunes in both statements and questions. Rising nuclei are shown for exclamations of surprise. Ó Cuiv (1968) provides an impressionistic account of tunes in the Irish of West Muskerry (Co. Cork). He noted overall a falling pitch contour for Cork Irish statements, but also mentions the possibility of rising tunes in less emphatic statements - which he describes as rising from the stressed syllable to the following unstressed one. Questions are described as falling until the main stress in the utterance, with phrase-final rises (pp. 71-79). For Tourmakeady (Mayo) Irish, de Búrca (1970, p.78-81) describes falling tunes for both statements and questions *"[...] the highest pitch is reached on the stressed syllable of the most significant word in the group and this syllable is on a falling tone;"* (p.79). Illustrations of tunes in the Irish of Ring (Co. Waterford) by Breatnach (1947), suggest that both questions and statements may be realised in similar ways, with either falling tunes, or with mid-level final tones (pp.89-91).

Blankenhorn (1982) provides a more elaborated study of intonation of Connemara (Carna/Cois Fharriage) dialect. Her description of the nuclear tonal contours extends considerably de Bhaldraithe's (1966) initial sketch. Her study follows an approach similar to the British school, following O'Connor & Arnold (1973), and describes the intonation contours in terms of their 'attitudinal meanings'. Her proposed inventory of tunes comprises of a set of rises (high-rise, half-rise, low-rise), falls (full-fall, half-fall, low-fall) as well as two types of rise-falls. According to Blankenhorn's (1982) description, in Connemara Irish full-falls occur in answers to questions, in wh-questions, in commands and may signal confirmation. Half-falls may be used in wh-questions and yes/no questions. Low-rises and half-rises, on the other hand, may introduce elements of doubt by the speaker. Half-rises indicate incompleteness and high-rises are used for marking emphasis. The fall-rising tunes may be associated with impatience (full-fall followed by low-rise) or indicate incompleteness (half-fall followed by half-rise). Further more recent analyses of the intonation of Connemara Irish (Rosmuc dialect) are provided by Bondaruk (1994, 2004). Bondaruk (2004) describes Irish as a pitch accent language and provides an inventory of the Rosmuc nuclear tunes using the O'Connor & Arnold (1973) model of analysis, based on read sentences and a short dialogue of one speaker. She identifies eleven nuclear tone groups and the account is rather similar to that of Blankenhorn's (1982) description (see above).

As mentioned, recent instrumental intonational analysis, within the AM framework, by Dalton (2008) and Dalton & Ní Chasaide (2003, 2005b, 2007b) looked at differences in tunes across four dialects. The southern dialects include Connemara (Cois Fharraige), Mayo and Kerry Irish. The Connemara, Kerry and Mayo dialects are described as typically southern in having nuclear 'falling' declaratives (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2007b), unlike the northern dialects such as Donegal where nuclear rises are more characteristic. The differences between the northern and southern dialects will be discussed further in the next sub-section.

A rather different aspect of Connemara intonation was investigated by Elfner (2012) who examined the relation between syntactic constituent structure and prosodic structure formation within the framework of Match Theory (Selkirk, 2009; 2011). Elfner looked at a variety of syntactic structures in both the clausal and nominal domain and examined the distribution of two tonal pitch accents, rises (L-H) and falls (H-L). Her analysis suggests that these pitch accents demarcate the edges of phonological phrases, and that L-H accents specifically target phrases which are recursive.

2.4.3 The north/south divide

As highlighted in the study by Dalton (2008) and in subsequent publications (Dalton & Ní Chasaide, 2003, 2005b, 2007b) there appears to be a clear north/south divide in the intonation structure. Donegal Irish is predominantly characterised by rising tunes, and southern dialects characterised by falling tunes. An example of a typically falling (South Connaught) and a typically rising (Donegal) declarative statement is shown in Figure 2.11.

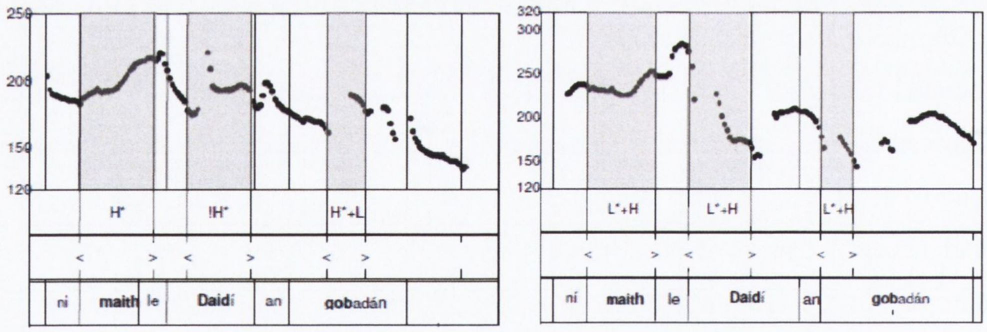


Figure 2.11: Example of a typically falling declarative (South Connaught, left panel) of a southern Irish dialect and a typically rising declarative (Donegal, right panel) of a northern Irish dialect. Accented syllables are indicated in grey. Graphs are reproduced from Dalton & Ní Chasaide (2007b).

Table 2.10 gives an overview of the most common tunes for declaratives, wh-questions and yes/no-questions in Donegal/Ulster (Gaoth Dobhair) Irish (left panel) and Connaught Irish (right panel) as shown in Dalton & Ní Chasaide (2007a). Note that these are the dominant tunes, but that other possible tunes are also noted for these sentence modes.

Table 2.10: Typical intonation contours of declarative, wh- and y/n questions in Ulster Irish (left panel) and Connaught Irish (right panel). The table is adapted from Dalton & Ní Chasaide (2007a).

	Ulster	Connaught
Declaratives	L*+H L*+H L*+H 0%	H* !H* H*+L 0%
WH-questions	L*+H L*+H L*+H 0%	H* !H* H*+L 0%
Yes/no-questions	L*+H L*+H L*+H 0%	L*+H H* H*+L 0%

Figures 2.12 and 2.13 (reproduced from Kalaldeh (2011)) below present an overview of the tonal inventories and nuclear tonal inventories between the four Irish dialects (Donegal, South Connaught, Mayo and Kerry) and are based on the data in Dalton (2008, Chapter 10). Figure 2.12 shows the overall inventories of tones for each of the dialects. The nuclear tonal inventories are shown in Figure 2.13.

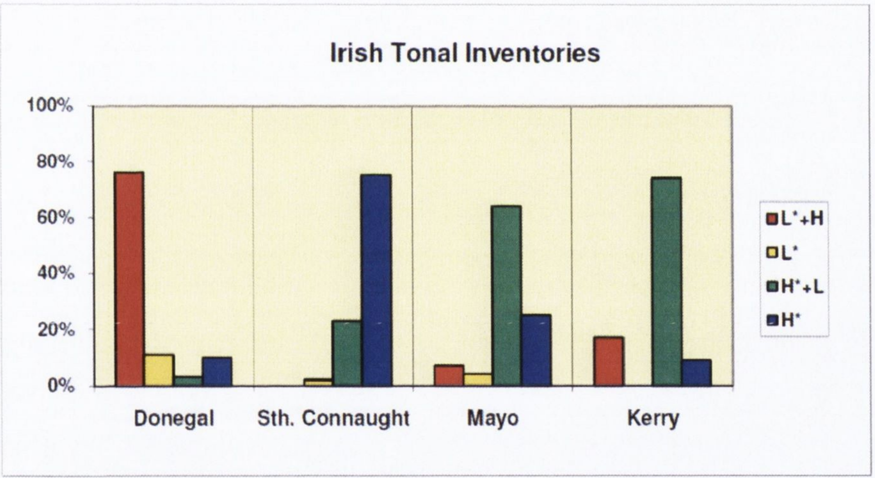


Figure 2.12: Inventory of tones across Donegal, South Connaught, Mayo and Kerry Irish based on data from Dalton (2008). Figure reproduced from Kalaldeh (2011).

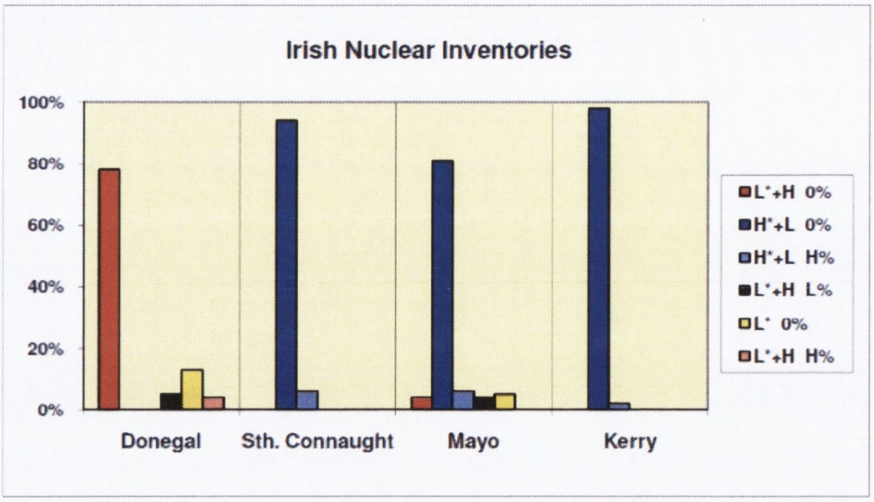


Figure 2.13: Nuclear tonal inventories for Donegal, South Connaught, Mayo and Kerry Irish based on data from Dalton (2008). Figure reproduced from Kalaldeh (2011).

Figures 2.14 and 2.15 below presents a more detailed overview of the findings from Dalton's (2008, Chapter 10) analysis of the tune differences between four Irish dialects (Donegal, South Connaught, Mayo and Kerry). The figures provide a summary of the distribution of pre-nuclear tunes (PN, in Figure 2.14) and nuclear tunes (N, in Figure 2.15) across different sentence modes in each of the above four dialects (Dalton, 2008).

Looking first at the pre-nuclear (PN) tune distribution across ST, WHQ and YNQ in Figure 2.14, we notice a variety of patterns used across the four dialects. Where Donegal Irish shows a preference for pre-nuclear rises (L*+H) across ST, WHQ and YNQ, it is overall the fall (H*+L) or high accents (H*) that are used in pre-nuclear ST, WHQ and YNQ in the other three dialects. Note, however, that these are never the only patterns. Apart from the preferred tune, there are always other secondary options for each sentence mode.

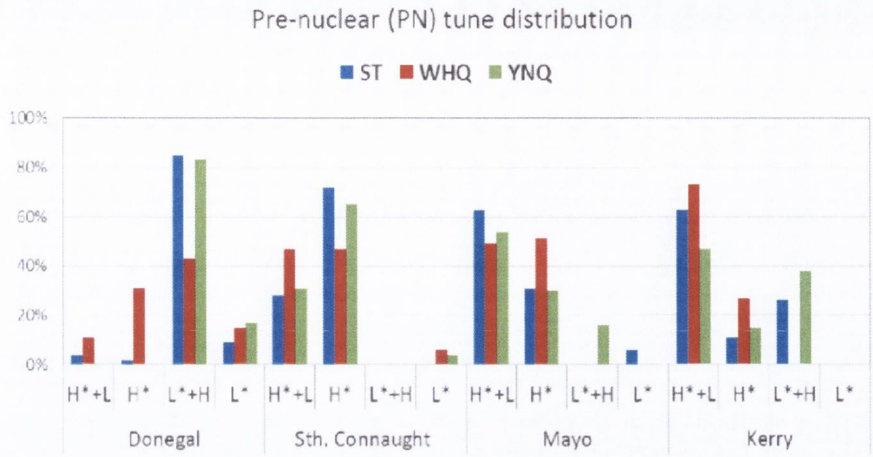


Figure 2.14: Distribution of pre-nuclear tunes across the four main Irish dialects (Donegal, South Connaught, Mayo and Kerry Irish). The tune inventory comprises of falls (H*+L), rises (L*+H), high (H*) and low (L*) tones (x-axis). The distribution of these tunes is shown in percent (%) (y-axis) across statements (ST), wh-questions (WHQ) and yes/no questions (YNQ) in each of the four dialects. The graph is reproduced and adapted from Dalton (2008, Chapter 10).

Looking next at the nuclear (N) tune distribution across ST, WHQ and YNQ a different picture presents itself (see Figure 2.15). First, we notice a lot less variability in tonal patterns across the sentence modes than in the pre-nuclear accents. In Donegal, the rise (L*+H) is again the overall preferred nuclear tune, with minor occurrences of low (L*) tunes in ST. South Connaught, Mayo and Kerry, however, overall have nuclear falls (H*+L) in each of the three sentence modes. Only some instances of nuclear low (L*) or rising tunes (L*+H) were observed in Mayo. In South Connaught and Kerry, in fact, the fall (H*+L) is the only tune used across ST, WHQ and YNQ.

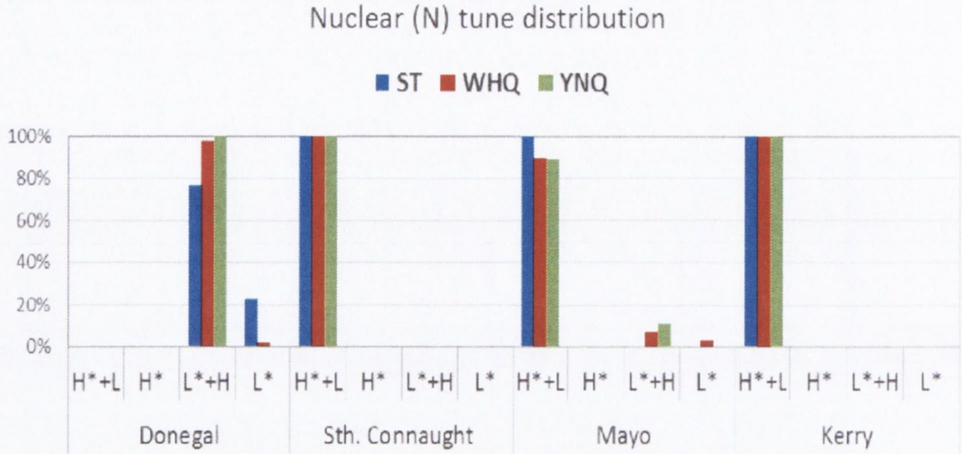


Figure 2.15: Distribution of nuclear tunes across the four main Irish dialects (Donegal, South Connaught, Mayo and Kerry Irish). The tune inventory comprises of falls (H*L), rises (L*+H), high (H*) and low (L*) tones (x-axis). The distribution of these tunes is shown in percent (%) (y-axis) across statements (ST), wh-questions (WHQ) and yes/no questions (YNQ) in each of the four dialects. The graph is reproduced and adapted from Dalton (2008, Chapter 10).

Comparing now Figure 2.14 and Figure 2.15 we can conclude from Dalton's (2008) results that, within any one dialect, nuclear tunes across the three sentence modes show a relatively uniform pattern. Pre-nuclear tunes are more variable across all sentence modes and this applies to each of the four Irish dialects.

The studies by Dalton (2008), Dalton & Ní Chasaide (2005a, 2005b, 2007a) and by Ní Chasaide & Dalton (2006) examined tonal alignment features in different dialects of Irish. As tonal alignment is a particular focus in our study, this aspect will be discussed further in section 2.8, which reviews the literature on tonal alignment.

The descriptions of the Donegal and the southern dialects sets the broader context within the present study was undertaken. In particular, they prompt the question that some varieties of Donegal Irish might differ from what has previously been found for the Gaoth Dobhair variety. Are these varieties homogenous, or might some pattern more like the southern varieties? Given comments by Quiggin (1906), a prime candidate could be the variety of Baile na Finne (BF). Or the more southern variety of Gleann Cholm Cille (GCC) could conceivable exhibit more southern features.

2.5 Some related issues in the intonation of Irish English

This section discusses the body of work on intonation studies of Irish English, providing an overview of the studies in the northern and southern varieties of Irish English to-date. Although the analysis in this thesis is concerned with Donegal Irish only, the contact between Irish and English in Ireland has been ongoing for several centuries, and existed in Ulster since the arrival of the English language at the time of the plantations in the 17th century. The resulting contact effects, particularly the influence of Irish on Irish English (Irish substratum) in terms of grammatical and phonological aspects, have been commented on by many in the literature (Bliss, 1972; Harris, 1985; Henry, 1977; Kallen, 1984, 1986; Ó Baoill, 1997). These commentaries have tended to focus however on segmental aspects.

Most studies of the intonation of Irish English have been carried out within the British tradition of intonational analysis, describing tunes and their distributions. Perhaps not surprisingly, a major North-South divide emerges.

2.5.1 Northern varieties

Northern varieties have been more extensively studied than the southern, and most of the work on northern varieties of Irish English, have dealt with Belfast English. Jarman and Cruttenden (1976) were among the first to point out that this northern variety of English is characterised by overall nuclear rising tunes, rather than the more commonly assumed falls. Their study, however, is based on solely one speaker. Rahilly (1997) examines specific intonational components of Belfast English as a case study in relation to RP English (following the British school in analysing a variety of utterances from twenty nine speakers). It is argued that using the same model of analysis as for RP English does not provide a satisfactory answer in highlighting the distinctive intonational aspects characterising Belfast English intonation. Lowry (2002a) analyses Belfast English intonation within the current AM framework. The shortcomings of the ToBI labelling system in revealing the characteristics of Belfast English rises are highlighted. Lowry (2002b), looked at different speaking styles, including read, semi-spontaneous and free speech in a study involving six male and six female speakers, all aged seventeen. The study showed that overall rising tunes are found in spontaneous speech, but the more careful the speaking style, the higher the number of nuclear falling tunes. Female speakers showed stronger tendencies in careful and semi-spontaneous speech to produce falling rather than rising patterns, but this gender difference was not found in free speech, where rising tunes were the most common tune for both groups.

A paper by Douglas-Cowie, Cowie, & Rahilly (1995) examined different tune 'families' and components of the rise in terms of social distribution. Data was elicited by a total of twenty-three Belfast English speakers (twelve male and eleven female speakers, from three broad social groups: profession, working class and intermediate). They concluded that it was possible for listeners to discriminate between gender and class differences according to which tune combinations within the phrase were used.

Belfast English intonation was also analysed as a part of the IViE project (Grabe et al., 1997-2002), investigating intonational variation in the British Isles (Grabe, 2002, 2004; Grabe & Post, 2002; Grabe, Post, Nolan & Farrar, 2000; Grabe, Kochanski & Coleman, 2005). In terms of intonation, their studies showed that Belfast English has predominantly rising accents in declaratives and also in different question types, including wh-questions, yes/no questions and declarative questions (Grabe. 2004). In this respect it is strikingly different to the southern, Dublin variety examined in the same project, and of course different from many other varieties of British English (Grabe, 2002, 2004; Grabe et al., 2000; Grabe & Post, 2002; Grabe, Kochanski & Coleman, 2005)

An account of Derry English intonation is given by McElholm (1986), who analysed the speech of two male speakers. His study shows that the dominant tune in this English variety is also the rising tune, which occurs in both questions and statements. The study provides a detailed description of the different types of rises and the environment in which they occur.

In a study of Donegal English (Dorn, 2006), I examined the speech of one speaker of the Dungloe variety. The recorded material was overall that of the IViE corpus (Grabe et al., 1997-2002), including read sentences, a read story and semi-spontaneous speech. Similar to observations made for Donegal Irish (Dalton 2008), overall the analysis showed that the rise L*+H was the most common pre-nuclear pattern and the rise-plateau L*+H 0% the most frequent nuclear tune in both statements and questions.

A more specific study of tonal alignment characteristics in three varieties of Hiberno-English has been carried out by Sullivan (2006). Her study included the analysis of one northern (Belfast) and two southern (Wexford and Dublin (Malahide)) Irish English varieties. Her study included a subset of the annotated data from the IViE corpus (Grabe & Post, 2002) for Belfast English (twelve speakers) and Dublin (Malahide) English (twelve speakers). Four speakers were recorded for the analysis of Wexford English. She examined speech from read sentences and a map task. Different factors bring about variability in the alignment of the low accent (L*), which include the segmental structure, sentence type and anacrusis size of the material as well as gender of the individual speakers (see also Sullivan (2007)).

2.5.2 Southern varieties

Southern Irish English varieties have to-date received less wide-ranging attention in terms of intonational analysis. Although the trend has turned in recent years.

Kalaldeh (2011) provides a detailed study of the intonation of a southern Irish English variety, examining segmental and intonational aspects of the English spoken in Drogheda, which lies in the north-east of the Republic of Ireland (south of the political border), on the linguistic border between the northern and southern areas. This study comprised of two parts: the first part described the segmental features of Drogheda English looking at the vocalic and consonantal features. The second part covered the intonational analysis including sentence mode differentiation and (extrinsic and intrinsic) tonal alignment in different syllable structures. Findings from Kalaldeh's study show that Drogheda English is a typically southern variety of Irish English in terms of both segmental features and also in terms of intonation, having falling tunes in both statements and also questions.

Dublin English (six male and six female speakers), more precisely the Malahide variety, was included as part of the analysis in the IViE project. Findings showed that Dublin English intonation is characterised by overall falling tunes in statements and also questions (Grabe & Post, 2002). One of the earlier studies carried out by O'Halpin (1994) examined renditions of contrastive focus in Dublin English (analysing the speech of two male speakers following the British school of analysis), whereby she concluded that this variety of Irish English had typically falling tunes.

Although falling tunes in both statements and in different types of questions appear to be frequently reported for southern varieties of Irish English, there are likely to be varieties where different trends are found, a fact suggested by two recent short studies by O'Connor

(2005) and Kostopoulou (2010), who analysed the speech of single speakers in West Cork. O'Connor (2005) analysed the intonation of one speaker from West Cork (Glengariff) and found overall falling tunes in questions and statements, but high phrase-final boundary (H%) in the majority in questions. Surprisingly, this was also an option in declaratives, though to a lesser extent. This fall-rising pattern yields H*+L H% in IViE transcription and the tune is said to be perceptibly different to the rising tune L*+H % more typically found in the northern varieties of Irish English. The study by Kostopoulou (2010), examined the phonetic realisation of narrow and contrastive focus for a speaker from West Cork (Clonakilty), looking at parameters such as pitch range, intensity and duration. Rather interestingly, narrow focus utterances were found to have rising terminals, but contrastive focus utterances falling terminals. Both studies point out, however, that these speakers were the only ones of a number of speakers recorded in locations in Cork who in fact had these realisations, and so this is not likely to be more broadly representative of Cork English, and may be confined to specific areas. Further research will be needed to establish where precisely the geographical locations of the type of patterns these studies describe, and the extent to which age, gender and factors such as speaking style affect the realisations.

Tonal alignment in three Irish English varieties including that of Dublin, Drogheda and Donegal English was investigated in one of our studies by Kalaldeh, Dorn & Ní Chasaide (2009). This study is described in detailed in section 2.8 below.

2.6 UNB (Urban Northern British) English varieties

As discussed in Chapter 1.1, there have been suggestions in the literature that the rising nuclei in some Northern Urban British varieties might have arisen through an influence of Irish (Cruttenden, 1986; Knowles, 1984). Our present description of northern varieties of Irish, characterised by rising tunes, provide an interesting point of reference, and although tangential to the present study, is relevant to the debate. For that reason I provide some information on UNB here, focussing on Glasgow English, as a number of studies have been carried out on it. Note that as Belfast English tends to be regarded as a UNB variety, the descriptions of Belfast English in section 2.5.1 above are highly relevant.

2.6.1 Glasgow English

The distinctiveness of Glasgow English intonation has frequently been commented on in the literature (Cruttenden, 1995, 1997, 2007). It has been described as a 'rise-plateau slump' (Cruttenden, 1997) in nuclear accents, where "*after the pitch has risen at the accented syllable, it remains high (or slightly declining) until very near the edge of the phrase, at which point it falls again*" (Mayo et al., 1997, p. 231). More recently, however, Sullivan (2011) argued that the 'rise-fall' describes the type of nuclear tune in her Glasgow data more aptly (p.141). Mayo, Aylett & Ladd (1997) proposed a modified ToBI annotation system especially for Glasgow English (GlaToBI). It included the L*H label to specifically mark the typical Glasgow rises, in which neither the low (L) nor the high (H) target of the rise would be aligned on the accented syllable, but both targets occur in their vicinity.
Cruttenden (2007) examined read and conversational speech of one Glaswegian speaker and came to the conclusion that a more RP (Received Pronunciation) like intonation is used when reading. In conversation, on the other hand, intonation patterns show a more typical low rise or rise-plateau slump pattern. A study by Vizcaino Ortega (2002) looked at more specific features of Glasgow intonation in a preliminary paper examining yes/no question intonation. He found, that this particular question type can display three different post-nuclear contours: rises can either end in high, low or mid pitch.

One of the research questions raised in Chapter 1.1, was whether the Donegal Irish rises would be similar to the rising nuclear tunes reported for the UNB English varieties. We will return to this question in more detail in Chapter 4 (sentence mode) and Chapter 5 (tonal alignment).

In the following sections 2.7 – 2.10, I review some of the literature that deals specifically with the four intonational topics analysed in the thesis: sentence mode, tonal alignment, prosodic realisations of focus, and some aspects of rhythm.

2.7 Sentence Mode

This section reviews some of the most relevant literature on the prosodic marking of sentence mode, i.e. prosodic differentiation of statements (ST), wh-questions (WHQ) and yes/no questions (YNQ). As outlined in section 2.3 above, wh-questions and yes/no questions are syntactically marked by specific questions particles in Irish. In Chapter 4 of this thesis, we look specifically at whether and how these different sentence modes are prosodically marked. This section reviews different ways in which languages prosodically mark the distinction between questions and statements: firstly through differences in tunes, secondly through specific phonetic markers.

2.7.1 Question intonation tunes: cross-language perspective

In the literature it has been noted that question intonation in English, as in many languages, is most typically signalled by phrase-final rises compared to statements which are mainly falling (Bolinger, 1978; Gussenhoven, 2004). However, though widely attested, phrase-final rises then are not necessarily a universal marker of question intonation. In Chickasaw, for example, wh- and yes/no questions characteristically have a phrase-final falling pitch slope, while in declaratives the pitch rises (Gordon, 1999). As mentioned above for both northern and southern dialects of Irish, although they are very different from each other in terms of tunes, they share the characteristic that statements and questions tend to be produced with the same tunes. Even varieties of the same language can differ in the marking of interrogativity in terms of tunes. As discussed above in the case of Belfast English (Grabe, 2004), both statements and questions (wh-, yes/no and declarative questions) have overall rising nuclear tunes. In Cambridge English, the IViE study showed that in the majority of statements, over 50% of wh-questions and over a third of yes/no questions had falling tunes. Rises were observed for the majority of declarative questions, but in only a third of yes/no questions, where fall-rises also occurred (Grabe, 2002, 2004). Hence, the marking of interrogativity can, but needn't be achieved through the choice of tune, and this is something that varies both across languages and across varieties of the same language.

2.7.2 Question intonation: phonetic markers

Other phonetic markers can be employed to signal interrogativity and to distinguish between different question types. In Danish, questions show a suspension or reduction of declination due to different grades of phrase-final raising in different question types (Gronnum & Tondering, 2007). In Finnish, on the other hand (Iivonen, 1998), it is the beginning of the phrase that is raised, while both statements and questions show falling tunes in the nucleus. Questions can also be realised on a higher register level in the speaker's pitch range compared to declaratives. This has been described as a commonly used feature in different languages such as in British English (Hirst, 1998; Hirst & Di Cristo, 1998), Finish (Iivonen, 1998) or Dutch (Haan, 2002). Other differences, such as differences in nuclear peak timing can also be used to distinguish statements from yes/no questions, e.g., in Neapolitan Italian (D'Imperio & House, 1997).

A number of measures have been used that allow us to capture some of the relationships between more fine-detailed prosodic features within a phrase (such as the amplitude relationships between the successive peaks of a contour) which, rather than differences in nuclear or pre-nuclear tune types, can express interrogativity as well as the difference between different types of questions.

- the excursion size of the nuclear rise/raised nuclear peak

It has been observed for languages such as Dutch (Haan, 2002), or English (Belfast and Glasgow) (Sullivan, 2011) that the nuclear accent peak is raised higher in the speaker's register in questions than it is in statements. As a consequence of raising the nuclear accent peak, questions also show wider nuclear excursion than statements. In Dutch, nuclear peaks were considerably stepped up in declarative- and yes/no questions. Sullivan (2011) also found for Belfast and Glasgow English, that such differences in nuclear peak height differentiated between statements (ST) and questions (YNQ, WHQ). Nuclear peaks in Belfast English were higher in YNQ than in WHQ, but no such difference between these two question types emerged in Glasgow English.

- the relationship between pre-nuclear and nuclear peaks

The relationship between pre-nuclear and nuclear peaks has previously been analysed for Dutch (Haan, 2002) and Drogheda English (Kalaldeh, 2011). In Dutch, nuclear peaks were higher than pre-nuclear ones in yes/no questions (YQ) and declarative questions (DQ), but less so in wh-qustions (WQ). A similar trend could be observed for declarative questions in Drogheda English (Kalaldeh, 2011).

- register span and register level

Questions are commonly realised with a wider register span than declaratives, due to the raising of either the pre-nuclear or nuclear peaks as a prosodic device for marking interrogativity. In addition, questions can also be produced on a higher register level, which makes them also perceptibly different from statements. Both register level and span were not significantly different across sentence types in Drogheda English (Kalaldeh 2011), but producing questions on higher register is a device employed in Dutch (Haan, 2002) and also in Swedish or American English (Hirst & Di Cristo, 1998)

In Chapter 4 sentence mode differences are examined for the Donegal Irish varieties in terms of potentially different tunes, as well as in terms of specific phonetic markers of sentence modality, similar to those discussed here.

2.8 Tonal alignment

The specific alignment of tonal targets in relation to certain elements in the segmental string, is a central aspect of analysis within the AM framework, and there is a wide ranging literature in this area. In the case of Irish this is particularly interesting, since the north/south divide between the Irish dialects is not only striking in terms of tunes, but also in terms of peak timing/ alignment of tonal targets as previous studies on Irish dialects have shown (Dalton, 2008; Dalton & Ní Chasaide, 2005a, 2007b; Ní Chasaide & Dalton, 2006). In addition, alignment studies have shown to be an important aspect in cross-dialect variation, for example, in the case of Swedish (Bruce & Garding, 1978; Bruce & Thelander, 2001), varieties of German (Atterer & Ladd, 2004) and also for the Irish dialects (see discussion below).

In the literature, many contextual factors have been shown to influence the precise timing of the tonal targets. The accented syllable has served as a reference point in several studies (cf.House, Dankovicova, & Huckvale, 1999; Knight & Nolan, 2006; Ladd & Morton, 1997; Wichmann, House, & Rietveld, 1999). The possible factors influencing the timing of tonal targets can include segmental contexts (syllable structure) (Dilley, Ladd, & Schepman, 2006; Ladd, 2008; Ladd et al., 2009), presence, absence and number of preceding and/or following unstressed syllables (Silverman & Pierrehumbert, 1990; Steele 1986; Nolan & Farrar, 1999), as well as accent composition (monotonal vs bitonal accents), prosodic contexts (pitch range) (Knight & Nolan, 2006) or speaking rate (Bruce, 1990).

Alignment characteristics may also depend on vowel quantity (phonological length). Schepman et al. (2006) examined peak alignment in Dutch, by varying the phonological length of the stressed vowel and also the rhythmic conditions after the nuclear accent. In their data, nuclear peaks were timed earlier than pre-nuclear ones and were less affected by right context effects such as that of stress clash. There was also an effect of vowel length on the precise alignment of the peak (H*), which they tentatively suggest might be independent of syllable structure.

Knight & Nolan (2006), on the other hand, examined the effect of pitch span on intonational plateaux in nuclear accents in English. Findings from their study showed that the plateau shortened in an expanded pitch range, and that the beginning and the peak of the plateau were timed later. The end of the plateau, however, appeared to be anchored. Their results were presented in proportional terms (as a percentage % of syllable duration) and in absolute duration measures and interestingly these two methods yielded different results for the same measures. Knight & Nolan (2006) argue that in their data, the proportional measure provided more accurate and stable results than the absolute measures.

Alignment differences between languages or varieties of the same language have also been addressed (Atterer & Ladd, 2004; Dalton & Ní Chasaide, 2005a, 2005b, 2007a; Sullivan, 2006, 2011). The way in which the L or H targets align to the accented syllable is something that may differ across languages or even across dialects of the same language. For example the timing of the L and H targets in pre-nuclear rising accents was examined by Atterer & Ladd (2004) in Northern and Southern German, where they found an overall later alignment of peaks compared to what had been reported for other languages, such as Dutch, English or Greek. Variety differences emerged between the Southern and Northern speakers of German, where Southern ones had, on average, later timing than the Northern ones (see illustration in Figure 2.16). These rising accents were compared in turn with the rising L*+H accents of (Gaoth Dobhair) Donegal Irish by Dalton & Ní Chasaide (2005b), and the comparison to the German and English data is illustrated also in Figure 2.16 below.

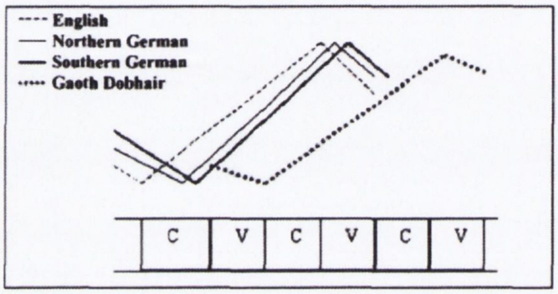


Figure 2.16: Schematic illustration of the rise (L*+H) in Gaoth Dobhair Irish, dotted line (Dalton & Ní Chasaide, 2005b) compared to rising tones in English (dashed line), Northern (thin black line) and Southern German (bold black line) as in Atterer & Ladd (2004). Figure reproduced from Dalton & Ní Chasaide (2005b, p.460).

As can be seen from this figure, the timing characteristics for the L*+H accents in this Irish dialect are very different from the other cases. Whereas in English and the two German dialects the low elbow (L) aligns relatively early, towards the beginning of the syllable, in the Gaoth Dobhair dialect of Irish, the elbow of the L occurs much later, towards the end of the vowel in the syllable. Thus the accented syllable has a low plateau, and the rise occurs in the following syllables. This is something to note for the present study. Should the other varieties of Donegal Irish being currently analysed show a dominant L*+H prenuclear tune, it is of interest to see whether its timing mirrors that of the Gaoth Dobhair variety.

In this study possible variation in alignment is examined as a function of varying the rhythmic conditions before the phrase-initial accent and following the nuclear accent. Such an approach has also been adopted in a number of studies analysing the effect of varying rhythmic conditions of anacrusis or tail length as well as the size of the rhythmic foot or preceding/following prosodic boundaries on the alignment of accentual peaks or valleys

(Knight & Nolan, 2006; Ladd, 2008; F. Nolan & Farrar, 1999; Schepman, Lickley, & Ladd, 2006; Silverman & Pierrehumbert, 1990; Sullivan, 2006).

The body of alignment studies across languages then have for a great part looked at the alignment of the high peak (H) in falling accents (H*+L) or high mono-tonal pitch accents (H*), where H* is associated with the accented syllable (cf. Ladd, Schepman, White, Quarmby, & Stackhouse, 2009; Nolan & Farrar, 1999; Schepman, Lickley, & Ladd, 2006). Few studies have dealt with the alignment of nuclear rises (L*+H) where the low target L* is associated with the accented syllable, the H peak is a trailing tone and where both targets might be subject to an influence of the preceding or following context (Dalton & Ní Chasaide, 2005b; Sullivan, 2006, 2007a). Examining both the pre-nuclear and post-nuclear contexts in this study is interesting for L*+H in particular, since we are dealing with a bi-tonal accent, where both targets may be affected by the two rhythmic environments.

The absence or presence of 'peak lag', and the degree of 'peak lag' (the alignment of f_0 peaks (H*) outside of the accented syllable, see Figure 2.17 for an example) was studied by Nolan & Farrar (1999) in phrase-initial pre-nuclear accents in different varieties of English (Cambridge, Belfast, Newcastle, Leeds).

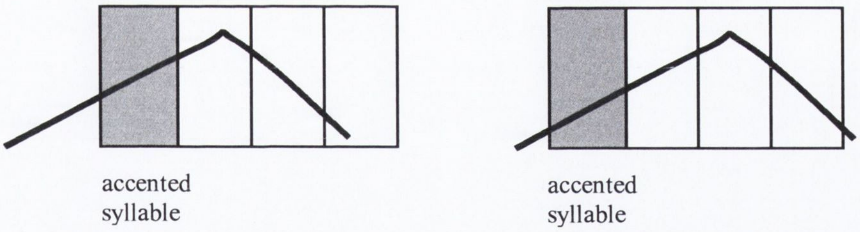


Figure 2.17: Example of peak lag (left) and extreme peak lag (right) (adapted from Nolan & Farrar (1999, p.961)). The pitch peak is displaced one syllable to the right of the accented syllable (in grey), in extreme cases two syllables to the right of the accented one.

Findings from their study showed that peaks were timed later if no anacrusis was present (no unstressed syllables occurred before the IP-initial one). With the increase in anacrusis, however, a leftward pulling effect of the accentual peak was observed. They also found that peaks align earlier in situations of "stress clash" (a stressed syllable followed immediately by another one or by an upcoming prosodic boundary), whereas "peak delay" occurred if unstressed material followed the accented syllable until the next or until an upcoming prosodic boundary. The timing of pre-nuclear high accents (H*) in English was investigated by Silverman and Pierrehumbert (1990). Different prosodic conditions included speech rate and the number of unstressed syllables following the accent. They found that the precise alignment of the peak is determined by these conditions. Similarly, peaks of nuclear accents in English increasingly drift rightwards with an increase in the number of following syllables (Steele, 1986).

Previous work on peak alignment in varieties of Irish has been carried out by Dalton & Ní Chasaide (2005a, 2005b, 2007a) and Ní Chasaide & Dalton (2006). In their studies, they examined peak timing in two Southern varieties (Cois Fharraige and Inis Oírr) of what is considered one dialect (Connaught Irish) (Dalton & Ní Chasaide, 2005a, 2007a; Ní Chasaide & Dalton, 2006). The rhythmic conditions after the nucleus and before the phrase-initial pre-nuclear accent were varied. Up to two unstressed syllables were added before the phrase-initial pre-nuclear accents, and in a separate set, up to two unstressed syllables were added after the nuclear syllable. The accented target syllable was always the same target syllable '*gob*' /ˈgˠɤbˠ/ (their study assumed that the final consonant in 'gob' is the syllable coda). Their study found that peak timing in the Cois Fharraige variety is unaffected by the number of unstressed syllables before the pre-nuclear and after the nuclear accent, but the Inis Oírr variety shows a considerable difference between the tonal alignment in both pre-nuclear and nuclear accents (see Figure 2.18), depending on the preceding or following number of syllables respectively. They pointed out that the variable peaks, characteristic of Inis Oírr Irish were rather similar to the variable peaks found in similar conditions for English (F. Nolan & Farrar, 1999; Silverman & Pierrehumbert, 1990; Steele, 1986).

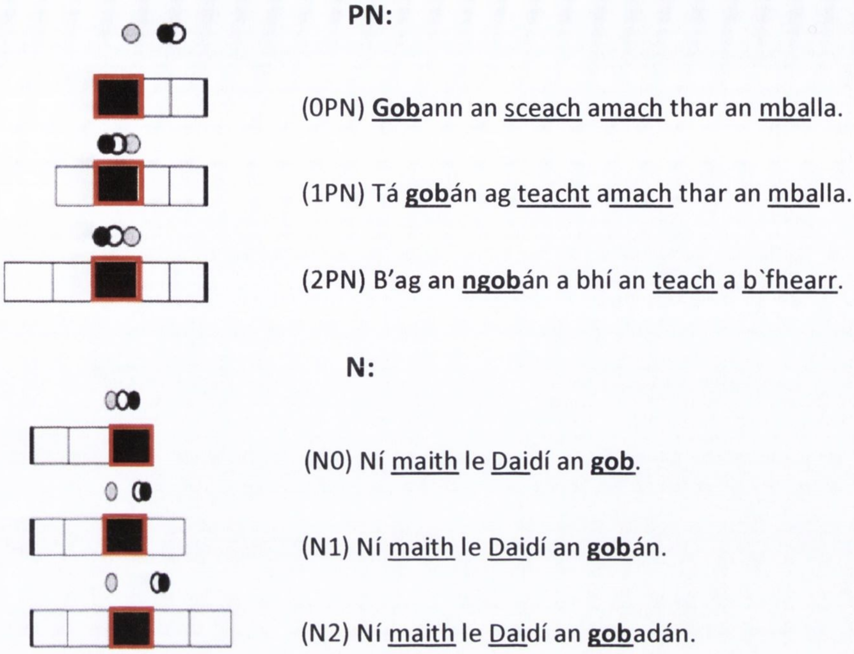


Figure 2.18: Schematic representation of cross-language differences in peak (H) locations relative to the accented syllable for pre-nuclear (PN) (upper panel) and nuclear (N) (lower panel) accents. The accented syllables are the black boxes, and the unaccented syllables are the preceding or following white boxes. Peak locations are shown for three different rhythmic nuclear and pre-nuclear conditions: in PN0 there is no anacrusis; in PN1 there is one unstressed syllable preceding the first prenuclear accent; in PN2 there are two preceding unstressed syllables. Similarly for nuclear accents, for N0 there is no postnuclear unaccented syllable; in N1 there is one postnuclear unstressed syllable; in N2 there are two. The timing of the peak (H) is indicated for English with a black circle, for Cois Fharraige Irish with a grey circle and for Inis Oírr Irish with a white circle. The target accented syllable *gob* /gˠɣbˠ/ is outlined in red. Graph has been adapted from Dalton & Ní Chasaide (2005a).

In contrast the peaks of the Cois Fharraige dialect seem to be quite fixed, anchored to a particular point in the syllable. The precise point in the syllable differs in the prenuclear and nuclear accent. In the pre-nuclear the peak occurs consistently late in the syllable, whereas in the nuclear accented syllable the peak occurs early. The locations are shown schematically in Figure 2.19 for the two dialects, where they are compared to peak locations reported for English (Nolan & Farrar, 1999; Silverman & Pierrehumbert, 1990; Steele, 1986). The concluded that languages and dialects can differ and that some have ***fixed*** alignment (Cois Fharraige in their study) and some are ***variable*** (Inis Oírr in their study, and English varieties in the earlier studies cited).

In another study (Dalton & Ní Chasaide, 2005b), potential variation in tonal alignment under similar pre-nuclear and nuclear conditions was compared for the L*+H tones of the northern (Gaoth Dobhair) Donegal dialect and the H*+L tones of the southern (Connaught, Cois

Fharraige) dialect of Irish. Although the tones of the dialects are very different, it was found that both dialects tended towards ***fixed*** alignment (in the sense described above) for both pre-nuclear and nuclear positions. In Gaoth Dobhair Irish (see Figure 2.19), the elbow (L*) is aligned relatively fixed at the right edge of the accented vowel in pre-nuclear (PN) and nuclear (N) conditions., and the peak (H) drifts increasingly rightwards with the increased amount of unstressed material after the nucleus. H occurred up to two syllables later (when such material was available). In the N0 condition (no post-nuclear unstressed syllables) the rise began earlier, with L* shifting to an earlier point within the accented vowel. However it was argued that the default is that the L* is located towards the end of the accented vowel, and that the H is two syllables later, if such are available. It has often been found in the literature (e.g.,Grice, 1995, p. 271) that trailing tones usually occur at a stipulated distance from a starred tone, that is associated with the accented syllable. On the whole, the Irish data discussed here, suggests that this is not the case for Irish, and that, on the one hand the L* has a fixed location in the accented vowel, the timing of the trailing H can vary considerably.

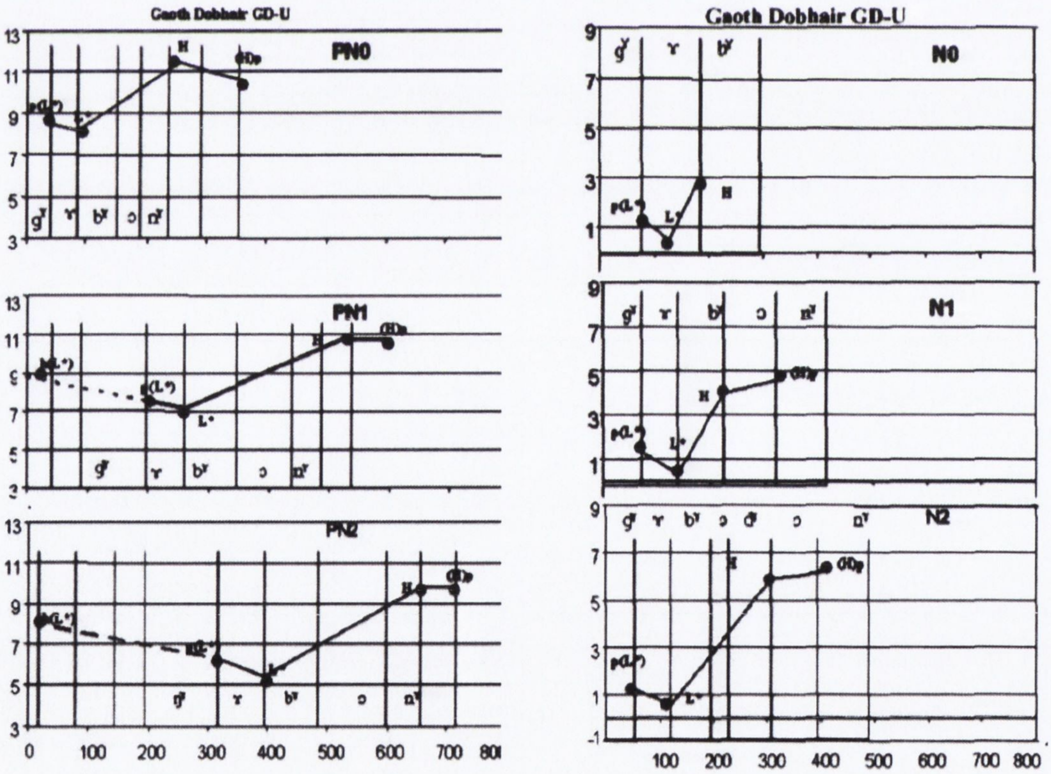


Figure 2.19: Schematic representations of L and H alignment in Goath Dobhair Irish for 3 pre-nuclear (PN) and 3 nuclear (N) conditions for the target syllable *gob* /ˈgˠɤbˠ/ 'beak'. Anacrusis size, i.e. the number of unstressed syllables before the target syllable, varied between 0-2 (0PN, 1PN, 2PN), as did tail-length, i.e. the number unstressed syllables following the last target syllable (N0, N1, N2). Graphs reproduced from Dalton & Ní Chasaide (2005b, pp.454, 457).

More recently, tonal alignment in three varieties of Irish English (Belfast, Dublin and Wexford) were investigated by Sullivan (2006), by drawing on material of the IViE corpus. Her data suggest that Dublin and Wexford English show features typical of southern varieties of Irish English, with also characteristically falling contours. As to alignment characteristics of the low turning point (L*) in nuclear rises (L*+H) in Belfast English, Sullivan examined a number of key factors which may influence the precise timing of the low elbow, e.g., the segmental structure of the accented syllable, the position of the accented syllable relative to the IP boundary, and the number of unstressed syllables preceding the accented syllable. Findings from her study showed, that the low elbow L* was always aligned within the accented syllable, and only in a very small number of cases did L* occur before the accented syllable, which is more characteristic for Glasgow English (Ladd, 1996).
Alignment in Belfast English was also investigated by Sullivan (2007a) in a study which looked at a number of factors such as gender, speech style, sentence type and segmental structure. Findings from her study suggest that these investigated factors all have an influence on the precise alignment of the low elbow L of the rising accent, which as a result shows higher variability in different conditions. Sullivan's (2011) most recent study includes the analysis of Belfast and Glasgow English alignment in short and long utterances of statements and questions.

In one of our studies, alignment in Donegal English was investigated as part of a pilot study on alignment in three varieties of Irish English (Dublin, Drogheda and Donegal English) (Kalaldeh, Dorn & Ní Chasaide (2009). Rhythmic conditions in pre-nuclear (PN) and nuclear (N) accents were varied in the same way as in the present paper. The target syllable was the syllable *man*. The results from our study showed that pitch peaks occurred proportionally later in the nuclear accented syllable than in pre-nuclear conditions for the two southern varieties, Dublin and Drogheda English, which are typically falling varieties (see Figure 2.20, mid and lower panels). Donegal English, on the other hand, uses a rising pitch pattern on accented syllables (L*+H), in both the pre-nuclear (PN) and nuclear (N) conditions, where the low target (L) is aligned approximately in the middle of the vowel of the accented syllable (see Figure 2.20, top panels). Note, however, that in their study a different point was annotated for L*, i.e. the middle of the low plateau, not the elbow. Therefore, the similarity with the Irish data is greater than would appear from a comparison of Figure 2.19. The trailing pitch peak (H) was found to drift rightwards with an increase in the number of following unstressed syllables in the N conditions. In the PN condition the right hand context was no systematically varied, and so no clear trend emerges.

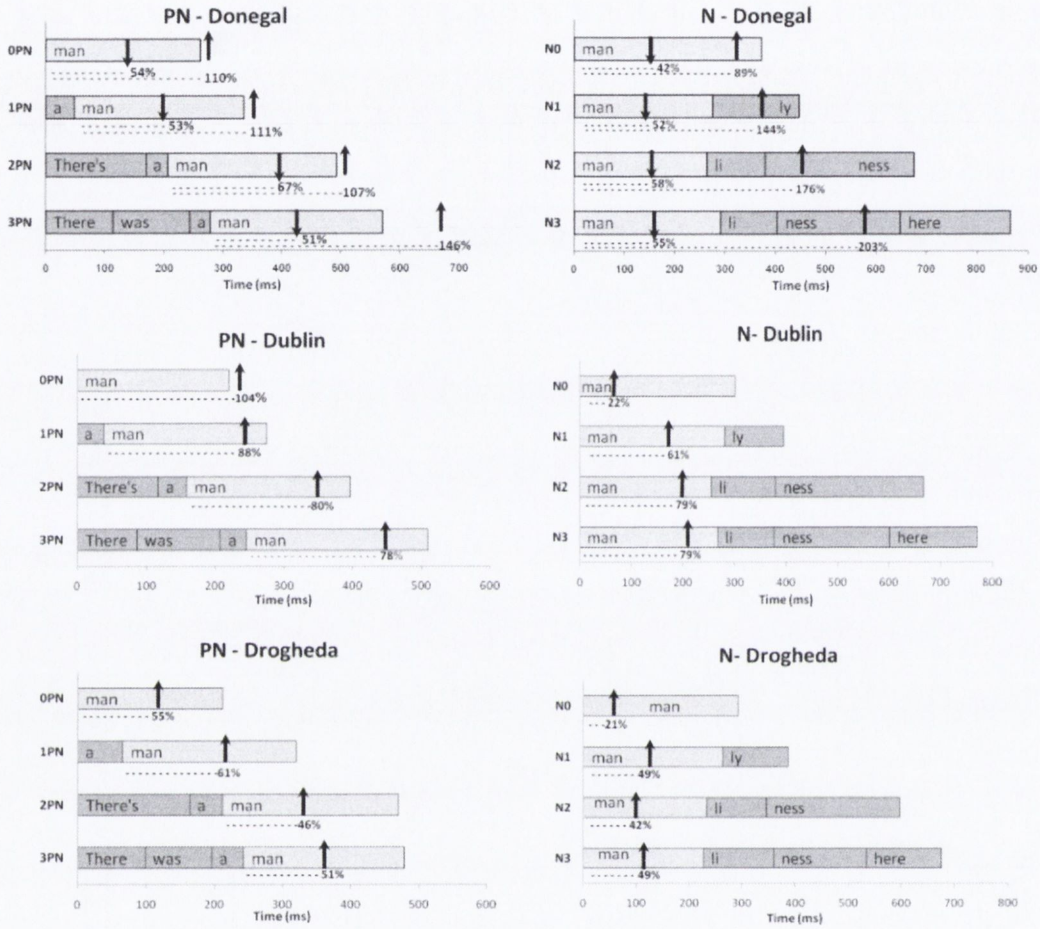


Figure 2.20: Tonal alignment in Donegal English (top panels), Dublin English (mid panels) and Drogheda English (lower panels) or pre-nuclear (PN) and nuclear (N) conditions. Down arrows denote the low target (L), up arrows denote the high target (H) of the rise L*+H). Figure reproduced from Kalaldeh, Dorn & Ní Chasaide (2009).

In Chapter 5 of this thesis, the influence of the anacrusis on pre-nuclear accent alignment is examined as well as the influence of post-nuclear unaccented syllables on the timing of the nuclear accent. Although there are no a priori expectations that the varieties being examined will differ with regard to alignment, the rather striking differences found for the sub-dialects of Connemara Irish, traditionally regarded as a single dialect (Ó Murchú, 1998) lead us to surmise that this could be a dimension where differences might emerge.

2.9 Focus

As was previously mentioned in section 2.3 above, information structure concerns the different means by which information in utterances can be packaged into meaningful units (cf. Chafe, 1976). In discourse, part of this involves highlighting, or focussing of new information in relation to already given, or background, information. In Hallidays' (1967, p. 206) words, "*Focus is a grammatical category that determines which part of the sentence contributes new, non-derivable or contrastive information.*" It is well known that languages vary in the use of different grammatical means (syntactic, morphological or prosodic markers) for focus marking. Typically, different focus types can be marked by one or more of these grammatical means, and in general a trade-off between these markers can be expected. In Spanish and Italian (Face & D'Imperio (2005)), for example, a trade-off between cues from tonal alignment and word order have been noted.

It was pointed out in section 2.3 that focus in Irish can be marked syntactically e.g. through clefting, morphologically, e.g. by using emphatic forms of pronouns, or prosodically. In this thesis, the analysis will cover exclusively the prosodic markers of focus, found to be associated with Irish in a pilot study. In chapter 6 will look at f_0 and duration correlates of three types of focus: broad, narrow and contrastive focus. Accordingly, we concentrate here on some of the literature that deals specifically with the prosodic realisation of these types of focus.

Depending on the scope of focus, i.e. the number of different units or constituents in an utterance that are focussed a distinction has been made between broad focus and narrow focus. Narrow contrastive (or narrow corrective) focus can also be given independent status (Gussenhoven, 2008). Broad focus, then is regarded as an unmarked type of focus structure, and the scope of focus usually includes more than one constituent, typically the entire phrase (see example a) below). In narrow focus (see example b)), the domain is restricted to a single constituent in the phrase. As to contrastive or corrective focus, the speaker is contradicting or correcting a constituent in the preceding utterance (see example c)). Square brackets in the examples indicate the focussed constituent.

a) broad focus: What was happening?
[Méabh was lying on the bed.]$_f$

b) narrow focus Who was lying on the bed?
[Méabh]$_f$ was lying on the bed.

c) contrastive focus Was Méabh lying on the floor?
No. Méabh was lying on the [bed]$_f$.

Note that not everyone agrees that the distinction between narrow and contrastive focus is valid: Kiss (1998) argues that they are semantically different, and Avesani & Vayra (2003) and Nespor & Guasti (2002) have pointed out that they may be differentiated in terms of prosody, at least in some languages. Other researchers such as Rooth (1996), regard them as essentially the same. In the case of Irish, this is a question we hope to shed some light on.

Differences emerge across languages in the realisation of focus, depending on a number of factors: in English or German, for example, prominence is marked by pitch, i.e. ‘nucleus placement’, where the nucleus is placed on the focal word and following material is de-accented (cf. Cruttenden, 1997; Beckman & Pierrehumbert, 1986). In English, broad focus phrases are considered to have unmarked/neutral stress patterns, whereby the most prominent accent is typically on the last accentable constituent in the phrase, narrow focus on the other hand, has marked stress on a specific constituent in the phrase. (Gussenhoven, 1984; Ladd, 1980, 1996). The focused item typically has an expanded pitch range and greater duration. As pointed out by Xu & Xu (2005), and many before him, there is de-accentuation in the post-focal part of the utterance. As a consequence, the entire prosodic structure of a phrase is affected. The pilot study by O’Reilly, Dorn & Ní Chasaide (2010) suggests that Irish is rather like English in the prosodic realisation of focus (this will be discussed more fully in Chapter 6). In Japanese, prosodic phrasing is sensitive to focus structure (Gussenhoven, 2004).
Languages may also distinguish between focus types in terms of pitch accents, where alignment differences have become gramaticalised. In European Portuguese (Frota, 2002), Neapolitan Italian (D’Imperio, 1997), Florentine Italian (Avesani & Vayra, 2003) or Spanish (Face, 2002), for example, contrastive focus is characterised by differences in pre-nuclear peak alignment compared to broad focus. These differences are categorical. In European Portuguese (Frota, 2002) this yields H*+L in contrastive focus, compared to the same constituent in broad focus (H+L*), and similarly in Neapolitan Italian (D'Imperio, 1997), contrastive focus is realised with L+H* as compared to broad focus H+L*.

Romance languages (e.g. Spanish, Italian and Portuguese) thus differ noticeably from Germanic languages (e.g. German, Dutch), where focus is marked prosodically by means of the nucleus placement together with the reduction or absence of post-focal accents, and the possible reduction or absence of pre-focal accents, rather than by differences in the type of pitch accent that cues a different focus type.

In this respect it has been argued that focus marking is language-specific (Ladd, 1996; 2008), depending on the intonational phonology of a given language. A different perspective, however, is taken by Xu & Xu (2005) who have argued for focus being rather a phonetic, and quasi-universal phenomenon. Xu & Xu (2005) investigated the phonetic effects of focus on American English declaratives and showed that focus has different effects on particular elements in the phrase. Findings from this study suggest that pre-focal accents remain largely the same as in a comparable neutral rendering of the phrase, whereas the focal pitch accent excursion is substantially increased on the focal element. Post-focal accents most typically become deaccented, which results in a suppression of pitch range. This "tri-zone pitch range adjustment" (Xu & Xu 2005, p.186) is found to be a unique feature of focus marking (Xu, Xu, & Sun, 2004). The authors point out that essentially similar, utterance level correlates show up in tonal languages, despite of the fact that these languages have constraints in that lexical tonal contrasts need to be maintained. They refer to work by Garding (1987), Shih (1988), Jin (1996), Xu (1999) and Chen (2003), which indicate that somewhat similar pitch modifications (tri-zone-pitch range adjustments) are found in languages like Mandarin. In a study of the voice source correlates of focal accentuation in Irish English, Ní Chasaide, Yanushevskaya & Gobl (2011) and Yanushevskaya, Gobl, Kane & Ní Chasaide (2010), reported utterance-wide adjustments that involved not only f_0 but also voice source parameters. These suggest that along with f_0, phonatory quality is modulated: the focally accented constituent is produced with a tenser phonatory quality, while the post focal (and sometimes the pre-focal) material exhibits a more lax/breathy phonatory quality. The authors argue, that voice modulation is an inherent dimension of prosody and that effectively accentuation and de-accentuation involve all aspects of the voice source, f_0 and phonatory quality.

As regards the temporal features of focal elements, substantial lengthening effects have been observed for focused constituents compared to the neutral rendering in Swedish (Heldner & Strangert, 2001), English (Cooper, Eady, & Mueller, 1985; Eady, Cooper, Klouda, Mueller,

& Lotts, 1986) or Dutch (Hanssen, Peters, & Gussenhoven, 2008). Similar lengthening of the focal constituent was found in a pilot study on Donegal Irish (Dorn & Ní Chasaide, 2011).

Xu et al. (2004), have further argued that durations of all elements in the phrase are affected, by focal placement: not only will the focally accented constituent be lengthened, but there will be relative shortening of the pre-focal and post-focal parts of the utterance. It has been argued for Swedish, however, that the temporal effect of focus does not affect pre-focal or post-focal elements in the phrase (Heldner & Strangert, 2001). This view is challenged by (Kügler, 2008) in a study on German, where he argues that pre-focal constituents get shortened but post-focal elements are not affected. In Korean (Jun & Lee, 1998), on the other hand, the duration of the constituents both before and after the focussed word has been found to get shorter.

Durational (lengthening) effects on focal elements, however, may depend on the position of the focused element in the phrase as has been suggested by Cooper et al. (1985). They note that the lengthening effect is reduced or less significant in phrase final position. This may be due to the already present final lengthening in IP-final position (P. J. Price, Ostendorf, Shattuck-Hufnagel, & Fong, 1991; Wightman, Shattuck-Hufnagel, Ostendorf, & Price, 1992).

In the analysis of focus in the Donegal Irish varieties in Chapter 6, the emphasis is placed on measurements of pitch and duration as markers of focus. Our initial expectation, following our pilot studies (O'Reilly, Dorn & Ní Chasaide, 2010; Dorn & Ní Chasaide, 2011), which are discussed in detail in Chapter 6.3, is that the effects of focus are manifested on f_0, scaling and duration, and are likely to be broadly realised in similar ways to English. Prompted by the above discussion on possible markers of focus, specific research questions are posed in Chapter 6, and addressed as part of the analysis.

2.10 Rhythmic features - the PVI

2.10.1 Motivation

This section reviews the literature on the metrics that have been proposed for capturing rhythmic properties of languages. As pointed out in section 2.3., Irish has been described as a language displaying features of a typically 'stress-timed' language, with reduced vowels in unstressed syllables, distinction between long and short vowels as well as the possibility of complex consonant clusters (see, for example, O Siadhail, 1999). Nonetheless, in listening to the northern and southern dialects one is struck by differences in rhythm/tempo, in addition to the strikingly different melodies. Native speakers appear to be aware of a difference. For example, there is a well known expression among Donegal speakers

> *"Bheadh na preátaí nite, bruite agus ite ag na hUltaigh san am a thógfadh sé ar na Connachtaigh fataí a rá"*
>
> *'The Ulster Folk would have the potatoes washed, boiled and eaten in the time it would take the Connaught folk to say the word potato.'*

which could be interpreted to suggest that there is an overall rhythmic or tempo difference. Southern speakers often comment on the fast rate of speech in Donegal Irish. This difference has not been investigated to date, but in informal conversations with linguists the suggestion has been made that this might not be just a difference in tempo, but perhaps more likely a difference in the rhythmic patterning, with the northern variety having a somewhat more staccato rhythm. On that basis, a tentative hypothesis was formulated that, although all dialects are undoubtedly 'stress-timed', the Donegal dialect might veer somewhat more towards 'syllable timing' than the southern dialects.

Note that although 'stress-timing' and 'syllable timing' have long been used to describe perceived rhythmic differences between languages such as English and Spanish, many studies have shown that the distinction is difficult to capture in terms of production based measures (Dauer, 1983; Grabe & Low, 2002; Low, Grabe & Nolan, 2000, Ramus, Nespor & Mehler, 1999).

Dauer (1983, 1987) argued that the impression of 'stress-' vs 'syllable-timing' arises from the combined effects of certain features of the language's phonological structure, such as whether there is an opposition of long and short vowels, whether unstressed syllables are reduced or the presence/absence of complex consonant clusters. Numerous studies (reviewed below) have measured durational aspects that correlate with some of the above features and that might differentiate among so-called 'stressed-timed' and 'syllable-timed' languages. These studies have demonstrated that this traditional classification is unlikely to be categorical, but rather that languages can be located at different points on a continuum (see for example Ramus et al., 1999; Grabe & Low, 2002; Wagner & Dellwo, 2004). Thus for example, languages such as British English or Dutch, traditionally described as 'stress-timed', tend to fall at one extreme of the continuum, while a language such as Spanish, typically viewed as 'syllable-timed', is located at the other end (Grabe & Low, 2002).

Of course, not all metrics agree in how they classify languages. Polish, for example clusters with typically 'stress-timed' languages such as English, Dutch or German when the metrics proposed by Ramus et al. (1999) are employed (the %V and ΔC measures, explained below), but it emerges rather as an 'intermediate' language, when Grabe & Low's (2002) PVI metrics are used (also explained below).

Returning to Donegal Irish, in Chapter 7, a small-scale study is presented, where materials from the varieties under investigation are analysed using a particular set of metrics (the PVI metrics (Grabe & Low, 2002; Low, 1998; F. Nolan & Asu, 2009)). This study sets out to test the hypothesis just mentioned - that Donegal Irish veers further towards the syllable timed end of the continuum than the southern varieties. As regards possible differences among the four Donegal varieties, we had no particular expectation of differences. Nonetheless, it *could* be the case that this measure would show up a cross-variety difference.

As mentioned, the study presented in Chapter 7, is quite limited in a number of ways. Limitations to the study include the small size of the corpora analysed, the numbers of subjects used, the fact that the materials analysed involve read speech (these studies usually do, but read speech may not be the optimal material to reveal the kinds of differences we are trying to capture). Furthermore it should be noted that the metrics used (PVI metrics) are but one of many sets of metrics: other metrics have been proposed as a means of capturing rhythmic differences among languages, and there is a growing literature and considerable discussion in the field as to which metrics best differentiate among those languages traditionally regarded as being rhythmically different (see for example, Arvaniti, 2012; Wiget, White, Schuppler, Grenon, Rauch & Mattys, 2010; White, Mattys, Series & Gage, 2007). In using the PVI metric here, there is no implicit claim here that it does a better job than other possible metrics.

A larger-scale analysis of the timing and rhythmic characteristics of the Irish dialects will be needed to do justice to this topic. The main trust of the present thesis is on the intonational characteristics of the Donegal varieties, and given this primary focus and the inevitable time limitations, a more extensive treatment was not feasible. Nonetheless, it was felt that even a limited analysis would be of interest, both as an initial pilot test of our hypothesis and as a way of laying some of the groundwork for a larger scale study I might undertake in the future.

2.10.2 Metrics for differentiating 'stress-' vs 'syllable-timed' languages

There is a long tradition of classifying languages impressionistically according to their rhythmic properties, as either 'stress-timed' (i.e. British English, German), 'syllable-timed' (i.e. French, Spanish) or 'mora-timed' (Japanese) (Ladefoged & Johnson, 2011). A certain rhythmic regularity due to equally distributed units of speech was assumed in these cases. The distinction between 'stress-timing' (approximately equal temporal intervals between stresses) and 'syllable-timing' (roughly equal temporal intervals between syllables) was first proposed by Pike (1945). Later it was suggested to group languages as typically 'stress-timed' (German, English) or 'syllable-timed' (Spanish, French) assuming a certain regularity between the respective units of speech. Dauer (1983, 1987) proposed that syllable structure, vowel reduction and the influence of stress on vowel reduction are influential in the grouping of languages, placing them on a continuum rather than in separate categories. Hence 'stress-timed' languages would have more syllable types, reduced vowels and exhibit a greater influence of stress on vowel duration.

The metric applied in this study is the PVI (Pairwise Variability Index) (Grabe & Low, 2002; Low, 1998; Low et al., 2000). It measures the variability in duration of successive vocalic (nPVI) and inter-vocalic (rPVI) elements: these metrics should in principle be greatly influenced by the factors pointed to by Dauer as likely to be responsible for the impression of stress vs syllable timing. (A detailed account of the PVI measures is provided below, and the details concerning how PVI is calculated are presented in Chapter 7.) Low's (1998) study and following papers with her colleagues demonstrated that this measure was successful in capturing the perceived rhythmic differences between British English and Singapore English, where the latter showed a tendency towards being more 'syllable-timed' with the first being typically 'stress-timed'.

Ramus, Nespor & Mehler (1999), measured the duration of successive vocalic and consonantal intervals of five read sentences for four speakers in each of the eight languages analysed (English, Dutch, Polish, French, Spanish, Italian, Catalan and Japanese), see Figure 2.21. Then, they calculated the proportion (%) of vocalic intervals of the utterance (%V) together with the standard deviation of the duration of consonantal intervals within each sentence (ΔC), and also the standard deviation of the duration of vocalic intervals within each sentence (ΔV). In the same study, the percentages of consonantal durations (C%) was also computed. Subsequently, results for each metric were average to obtain one value per language. The ΔV measure expressed the degree of vowel reduction and C% syllable complexity. The authors found that %V and ΔC grouped languages according to their traditional classification as stress-timed or syllable-timed. Thus 'syllable-timed' languages would be expected to exhibit greater %V and lower ΔC, while 'stress-timed' languages exhibit lower values for %V and higher values for ΔC, reflecting syllable complexity.

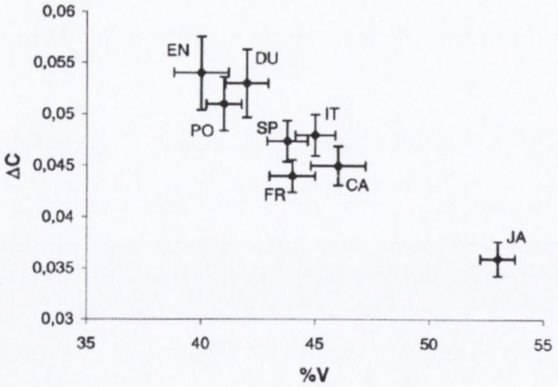


Figure 2.21: Graph reproduced from Ramus, Nespor & Mehler (1999, p.273) showing plotted rhythm metrics %V (the proportion (%) of vocalic interval duration/utterance, x-axis) and ΔC (the standard deviation of the consonantal interval duration, y-axis) for 8 languages, including error bars.

Wagner and Dellwo (2004) introduced YARD (Yet Another Rhythm Determination), which is rather similar to the PVI calculations, but uses a different calculation method for successive syllable durations, rather than the raw metrics proposed by Grabe & Low (2002). YARD is based on normalised syllable durations and does not regard vocalic and consonantal intervals separately. According to the authors, the normalised syllable durations provide stable rhythmic patterns across different speakers and moderate changes of articulation rate. In other studies by the same authors (Dellwo, 2006; Dellwo & Wagner, 2003), compared measures of rhythm in different languages (i.e. German, English, French etc), while taking variability due to speech rate into consideration. The variation coefficient of the standard deviations of vowel (VarcoV) and consonant durations (VarcoC) were applied. They found that VarcoC discriminated French better from German and English than did ΔC. At a faster speech tempo, they found that %V remains fairly constant, but ΔC is speech rate dependent.

Another study by Dellwo, Fourcin & Abberton (2007), looked, not at vocalic vs consonantal stretches, but rather at the % of voiced stretches (%VO) and the variability of the standard deviation of unvoiced parts (VarcoUV) of utterances in four language, (German, English, French and Italian taken from the Bonn-Tempo Corpus). They argue that this method is a better method for cross language analysis than the more frequent metrics based on the durational variability of vocalic and consonantal intervals.

More recently, Bertinetto & Bertini (2008) proposed a measure they call CCI (Control and Compensation Index), which is a modified, normalised version of the PVI. It showed promising results in capturing speaker specific trends and good discrimination between different tempo groups.

A number of studies have used combinations of the above measures and they have been applied also to different varieties of a single language, such as English, e.g., Pakeha and Maori English (e.g., Szakay, 2006; Warren, 1997) and varieties of British English (White & Mattys, 2007).

2.10.3 The PVI measures

The choice of PVI was attractive because in its initial formulation (Low, 1998) it aimed to capture within-language variation along the ‘stress-timed’/’syllable-timed’ continuum. It has been used to compare a large number of languages, which is useful when it comes to locating the continuum on which our own Irish data can be placed. It is also worth noting that many of the more recently proposed metrics are based on PVI.

In its ‘classic’ formulation the Pairwise Variability Index (PVI) is concerned with the temporal succession of vocalic (nVPVI) and inter-vocalic (rCPVI) interval durations and with the variability between them. It was first used to explore rhythmic cross-dialect variation in English, in a comparison of Singapore and British English (Grabe & Low, 2002; Low, 1998; Low et al., 2000). Similar calculations have been proposed for the analysis of differences between syllabic intervals (nSPVI) as well as rhythmic feet (nFPVI) (Nolan & Asu, 2009), who argued that these additional measures could pick up differences among languages that would otherwise not emerge. It should be noted that whereas the vocalic (nVPVI) and inter-vocalic (rCPVI) target features of segmental phonology which are thought to greatly influence rhythm, the more recent additions focussing on syllabic intervals (nSPVI) as well as rhythmic feet (nFPVI) directly target rhythmic regularities. Together they offer a rather comprehensive suite of measures. Note that the precise PVI calculations are outlined in Chapter 7.3.

The PVI metrics then express the level of variability in successive measurements, and it places languages on a continuum of being more ‘stress-timed’ (i.e. showing higher temporal variability in successive elements) or ‘syllable-timed’ (i.e. showing lower temporal variability). Many of the metrics suggested in recent years are based on this measure. In the first study, Singapore English (Low et al., 2000), was shown to have a lower vocalic PVI than British English. This confirmed the perceived rhythmic difference between these two English varieties, where Singapore English is heard as being more syllable-timed than British English. Another study using PVI measures to show cross-dialect differences between languages is the study by Fróta & Vigario (2001) on European and Brazilian Portuguese. Findings from their study showed that European Portuguese, which was traditionally classified as a ‘stress-timed’ language showed features of both stress-and syllable-timing, whereas Brazilian Portuguese, traditionally classified a 'syllable-timed' language patterned more closely with mora-timed languages in terms of the PVI measures.

PVI calculations were later used for cross-language comparison in studies by Low and colleagues, where using the PVI, languages traditionally grouped as stress-timed were found to have bigger vocalic PVIs than languages traditionally characterised as being syllable–timed. Grabe & Low (2002) applied the same measures to eighteen languages (Figure 2.22) and found that they grouped in ways that correlated with classifications of syllable-, stress- or mora- timing.

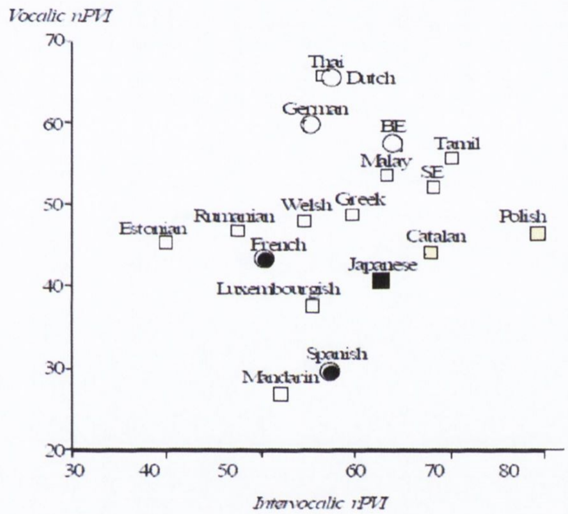


Figure 2.22: Graph reproduced from Grabe & Low (2002, p.7) showing inter-vocalic rPVI and vocalic nPVI metrics for languages classified as typically stress-timed (white circles), syllable-timed (black dots), mora-timed (black squares) or mixed/unclassified (white squares).

In a more recent study, Nolan & Asu (2009) calculated the PVI measures for rhythmic feet and syllables in Estonian, English, and two varieties of Spanish (Mexican and Castilian) (Figure 2.23). They argue that durational variations in syllables and feet should also be included, since they may support co-existing, independent rhythms (p.69). Their findings showed that English and Estonian had similar timing of feet, which were rather regular. Mexican Spanish, on the other hand, showed very regularly timed syllables and varying feet, and Castilian Spanish occupied the medial space on the scale. They concluded that looking at syllable and foot properties along with vocalic and consonantal interval durations, provides a more detail and insight into the rhythm of languages.

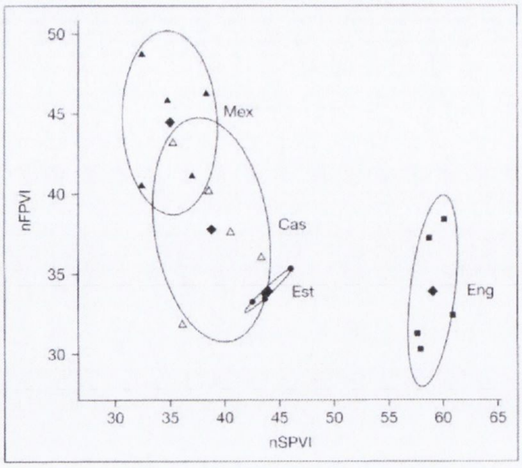


Figure 2.23: Graph reproduced from Nolan & Asu (2009, p.73) showing plots of syllable (nSPVI, x-axis) and foot PVI metrics (nFPVI, y-axis) for the five analysed speakers for each language including English, Mexican and Castilian Spanish and Estonian.

These metrics were also calculated in a pilot study on rhythmic variability between three dialects of Irish (Kerry, Connaught and Donegal) (Dorn, O'Reilly, & Ní Chasaide, 2012) and this will be discussed in Chapter 7.

To sum up, the main interest in the present study is on intonation characteristics, but an intentionally limited study of rhythmic characteristics of the four Donegal varieties is included, and these are compared to similar measures of the southern dialects of Connemara and Kerry (Dorn, O'Reilly & Ní Chasaide, 2012). The PVI metrics are used to test a hypothesis that Donegal Irish veers somewhat further towards the syllable-timed end of the continuum (showing less temporal variability in the PVI measures) than the southern varieties. No particular differences were expected among the four Donegal varieties.

2.11 Conclusion

This chapter has provided a review of the most relevant pieces of literature for this thesis. First, the current AM framework for intonational analysis was discussed as well as the two most widely used labelling systems, ToBI and IViE. Then, the basic linguistic properties of the Irish language were discussed, covering aspects of the grammatical structure of Irish as well as, more specifically, the sound system of Donegl Irish. The sections that followed, the body of studies on Irish and Irish English, both northern and southern dialects, was reviewed. Studies on Urban Northern British English intonation were also included for a complete overview. Subsequently, an overview of relevant studies for each of the analytic chapters of this thesis including sentence mode, alignment, focus and certain rhythmic aspects were provided.

The next chapter, Chapter 3, presents information on the subjects recorded for this study along with a description of the recording procedure. Expected as well as unexpected challenges that emerged during the recording process are explained. In addition, the more specific research questions addressed in each of the following data chapters are introduced.

3 Subjects, materials and specific research questions

3.1 Introduction

This chapter gives an overview of the materials used in this thesis and outlines the data collection and analysis procedure. The materials analysed in this study present a sub-set of a larger corpus of data of Donegal Irish varieties, collected over the last four years. At the outset, it was envisaged to collect a variety of different materials, including different speaking styles (read speech: dialogues, matched declaratives and questions, tonal alignment, focus; a read story, spontaneous speech and semi-spontaneous speech). These materials were made with the help of colleagues and Irish native speakers in the Phonetics & Speech Laboratory in Trinity College. Both, Irish and English data from the same speakers were collected in pilot recordings for a small number of people from different locations in the Donegal Gaeltacht. Even though the analysis covered here is only a fragment of this larger corpus, the additional material will serve for further more detailed analysis at a later stage, including also a possible comparison with English.

The full set of all materials analysed and reported on in this thesis is included in the Appendices 1 - 4. Each Appendix lists the materials relevant for each of the data chapters: Appendix 1 (Chapter 4: Sentence mode), Appendix 2 (Chapter 5: Tonal alignment), Appendix 3 (Chapter 6: Focus), Appendix 4 (Chapter 7: Rhythmic features – the PVI). A summary of the contents, material type and number of informants is shown in Table 3.1. A breakdown of the number of speakers for each dialect, by age and gender is given in Table 3.2. First, information on informants and informant selection for this study is given below. Then, the recording procedure and data collection are described. Subsequently, a description of the recording materials for each of the chapters mentioned above is given together with the methodology and annotation procedure for data analysis.

Table 3.5: Overview of sections of the corpus together with corresponding appendices, content type and total number of informants recorded.

Corpus sections	Type	Appendix	No. of Informants
Section A	Sentence Mode	1	16
Section B	Tonal alignment	2	16
Section C	Focus	3	16
Section D	Rhythmic features – the PVI	4	8

Table 3.2: Breakdown of the number of speakers for each dialect, by gender (female (F) and male (M)) and age.

location	informants' initials	gender	age
Rann na Feirste	SMR	M	20-30
Rann na Feirste	CME	M	20-30
Rann na Feirste	RMD	F	40-50
Rann na Feirste	MNG	F	50-60
Baile na Finne	MNC	F	40-50
Baile na Finne	ANM	F	50-60
Baile na Finne	POBR	M	40-50
Baile na Finne	POBA	M	60-70
Gleann Cholm Cille	SNC	F	40-50
Gleann Cholm Cille	MNC	F	40-50
Gleann Cholm Cille	SMC	M	40-50
Gleann Cholm Cille	MMGE	M	40-50
Ros Goill	FP	F	30-40
Ros Goill	MM	F	40-50
Ros Goill	SMO	F	60-70
Ros Goill	AML	M	60-70

3.2 Informants and data collection

3.2.1 Informant selection

For this study, a total of sixteen informants both male and female were selected. Initially, six informants had been recorded for each of the four locations. After initial careful auditory analysis, however, not all data collected was suitable for analysis, for a number of reasons (see section 3.2.2). The number of informants selected for this study was then limited to four for each of the four locations in the Gaeltacht: Rann na Feirste (hereafter RF), Gleann Cholm Cille (hereafter GCC), Baile na Finne (hereafter BF) and Ros Goill (hereafter RG) to have a balanced set of speakers (Figure 3.1).

Figure 3.1: Map showing the locations of selected places (dark green) for this study in Co. Donegal.

All speakers were recruited and recorded *in situ* in the Donegal Gaeltacht with the help of locals working at Irish language centres who could advise on finding informants with representative local accents. The locations were chosen after consulting the Wagner Atlas (1969) for places that were considered strongholds of the Irish language in Co. Donegal at the time. After this, local Irish speakers working in language schools and institutions were consulted for advice on locations within the Gaeltacht area which to-date have the strongest number of Irish speakers. It was then decided to choose one location in the north (Ros Goill), south (Gleann Colm Cille), middle (*Gaeltacht lár*) (Baile na Finne) and west (Rann na Feirste) in the Irish speaking area. Although Gaoth Dobhair (see Figure 3.1), neighbouring to Rann na Feirste, is considered one of the locations in Donegal with most Irish speakers nowadays, it was not chosen in this study, since Gaoth Dobhair Irish intonation has been investigated before by Dalton (2008) and is also part of a current study on cross-dialect variation in Irish (O'Reilly, forthcoming).

For this study then, only informants who grew up, attended primary and/or secondary school and lived in each of the specified locations for most of their lives were recorded. This choice was made in order to avoid influences from other varieties of Irish or English on the development and local colouring of the dialect as far as possible, since during adolescence language features (e.g. accent) are acquired which are said not to be lost later (Lenneberg, 1967). For similar reasons teenagers were an age group not considered for this study. This socio-linguistically relevant information was gained prior to recording, when the author had a brief conversation in English with each of the speakers to confirm that Irish was their main language at home and/or at work and that they had grown up in the respective location and/or are still living there to-date. For the initial pilot recordings, the author relied on help of local Irish speakers, living in the Donegal Gaeltacht, who advised on informants with representative local accents. No questionnaire was presented then. This includes informants SMR, CME (Rann na Feirste), MNC, MMGE (Gleann Cholm Cille), POBA, POBR (Baile na Finne) and AML, SMO (Ros Goill). Informants recorded in the second recording session (MNG, RMD (Rann na Feirste), SMC, SNC (Gleann Cholm Cille), ANM, MNC (Baile na Finne) and FP, MM (Ros Goill), were presented with a short socio-linguistic questionnaire which is included in Appendix 5. Informants' profiles are provided in Appendix 6.

As to the distribution of age and gender of informants we are not dealing with a balanced data set here. Varying numbers of both male and female speakers between 20 – 70 years of age were recorded for each of the four regional varieties. Possible differences in intonation due to gender or social background were reported before for Belfast English (Douglas-Cowie et al., 1995; Lowry, 2002b; Sullivan, 2007b). However, as commented on in Chapter 2.3, the number of Irish speakers in the Gaeltacht areas who still use the language on a daily basis today is rather limited (23,175 people or 24% of the population (CSO, 2011). This means that there are many living in the Gaeltacht who may speak the language, but do not have the competence, fluency one would require, and who would not necessarily be representative of the local variety of Irish. This poses a major challenge for the process of informant selection for the present study. It is crucial to identify native speakers, who use language on a daily basis in the home and at work, and who are considered by others to have representative local accents. This is why the help of local native speakers was necessary in the recruitment process. It also meant that in cases where it was not easy to find informants, the focus was on ensuring that these factors were the primary consideration, even if it meant sometimes sacrificing the homogeneity of the group (e.g., having informants matching in terms of age etc.).

3.2.2 Challenges during informant selection, data collection and the recording process

In the process of carrying out fieldwork for this study, a number of predictable, but also unpredictable challenges and problematic cases in terms of informant selection, data collection and data analysis emerged. As problematic cases are often dealt with in passing, the author feels that there is a need to inform the reader also about factors and situations that can prove difficult for any researcher collecting audio data during fieldwork. Although some readers may consider these factors discussed below as possible shortcomings of this thesis, the information provided here may be useful for readers who are new to the field of intonation.

Recordings were made in local schools or libraries in the four respective locations in County Donegal. These areas are rural and rather remote and, if rooms are very quiet, one would often hear the wind or noise from the street outside, e.g., cars driving past, a lawnmower, dogs barking etc. In some cases these noises were picked up the microphone and are audible on recordings. In addition, some of the rooms in which recordings were made had an audible echo, which was also picked up by the microphone.

A number of unexpected situations also emerged during the informant selection process: some of the more mature informants (60-70) who had grown up with Irish and were fluent speakers, were not comfortable reading it. When presented with the written material, they were not able to read the prepared dialogues and as a consequence could not be selected as informants. In addition, several other unexpected problematic factors emerged.

When asked to read the prepared materials from the computer screen, some informants produced utterances as if taking on another character, similar to when reading a story to children, even though informants had been instructed by the author to read in a ‘neutral’ way. This sometimes caused extreme values for pitch ranges or difficulty in annotation due to falsetto or creaky voice and as a consequence such utterances had to be excluded from analysis as they would influence results. At this point, one can only speculate if these issues were due to the recording material or other influences.

Another unexpected situation presented itself in one of the recording locations, a local library in Baile na Finne which is generally a quiet location and ideal for recording. When the author arrived to carry out the recordings, a nearby alarm system had gone off, which gave off high pitched sounds at regular intervals and could not be turned off. As a result these signals were picked up by the microphone and distorted the speech signal in some of the utterances, when reading coincided with the alarm sound. As a consequence several utterances had to be discarded because of this reason.

In a small number of cases, informants who had volunteered to be recorded, informed the author during the recording process that they had to leave because of other commitments. As a result not the full set of materials could be recorded. Similarly, informants, since recorded in pairs, started chatting or laughing during the recording process and did not finish reading the individual utterances. And this is another reason why for some parts of the corpus a smaller number of tokens is available than expected.

Initially, it had also been envisaged to collect data for Toraigh Irish. As this island is rather remote, one of the attempts to travel to the island and collect data was unsuccessful due to the inclement weather conditions. The second time, the author had arranged to meet a number of possible informants. When the author arrived, however, they would rather talk to her casually than read the prepared materials, even though the aim of the study and the recording process had been explained. As a result, this Donegal Irish variety could not be included in the present study as no comparable material is available.

3.2.3 Data collection and recording procedures

Data collection for this study was carried out in a time frame of two years and involved two recording sessions when data was collected. In the first recording session a total of eight speakers, two speakers from each of the four locations were recorded in a quiet room in a language institution in Gaoth Dobhair. All of them worked in the Gaoth Dobhair area, but lived or originally came from the area they identified their accent with. Recordings were made on a digital recorder (ZOOM Handy Recorder H4), then transferred to PC. Data from these initial recordings served as material in the pilot studies for Chapter 4 (Sentence mode) and Chapter 6 (Focus). The second set of recordings was carried out in each of the specified locations, in a quiet room of a local library, language institution or school. Recordings were made directly to a digital format using an Edirol 25 USB Audio Interface via Audacity sound recording software through head mounted microphones (Sony ECM lavier microphones). No major differences in recording quality between the recordings made on the digital recorder (ZOOM Handy Recorder H4) and those recorded using the Edirol 25 USB Audio Interface and Audacity software were noted.

For this study it was decided to collect and work with read material rather than free speech. Although working with unscripted speech offers many valuable insights into how speakers employ certain prosodic characteristics, the decision to work with scripted speech was made in order to have comparable material across the four regional varieties. Besides, more controlled data also better lends itself to more fine-grained analysis, minimising the influence of random paralinguistic influences which may have an effect on the pitch contour (Xu, 2010).

All informants were recorded in pairs, two speakers at a time. They were presented with prompts of the read materials on a computer screen, where target phrases were embedded into short dialogues. Five repetitions of each of the target phrases in context were presented in randomised order to avoid repetitiveness in reading. Speakers were instructed to read the dialogues as they would normally speak to a friend or peer. This was done to assure a more natural elicitation of the materials and a bigger set of representative speech samples for each dialect. The same procedure was applied to all materials of the corpus.

3.3 The collected corpus

The following sections introduce the materials used in each of the four analytic chapters. The specific materials, annotation of variables and analysis methodology in the respective analytic chapter (Chapter 4 – Sentence Mode, Chapter 5 – Tonal alignment, Chapter 6 – Focus, and Chapter 7 – Rhythmic properties-the PVI). All materials, with exception of that in Appendix 4 for the analysis of rhythmic features, was designed with the help of native Irish speakers and colleagues at the Phonetics and Speech Laboratory at Trinity College. As it was initially intended to collect comparable material for other Irish dialects as well, the same material used here may also be used in further studies on other Irish varieties.

All data was labelled manually and analysed in Praat (Boersma & Weenink, 2008). Some annotations were carried out semi-automatically, but all measurements were extracted automatically with the aid of adapted Praat scripts based on those written by Pauline Welby (Welby, 2008). All phrases were annotated prosodically using IViE annotation (Grabe, 2001). All transcriptions were made by the author and there was no second transcriber involved.

Problematic cases where it was not entirely clear which tone label to choose, were discussed with colleagues also working in the area of prosody and intonation in the Phonetics and Speech Laboratory at Trinity College. The choice of final transcription, however, was entirely that of the author of this study. Utterances produced with hesitations, disfluencies, narrow focus when not intended or other disruptions to the pitch contour such as creaky voice, coughs and laughter were discarded and excluded from the data set. For the exact token number in each analysis part see the respective analytic chapter.

The following sections give a brief introduction to the materials in the four analytic chapters. In addition to the three main research questions of this thesis which were outlined in chapter 1, each data chapter addresses another more specific set of questions, which link the analysis in the chapters to the wider research questions presented in Chapter 1.2. In the following sections these more specific questions are introduced for each analytic chapter.

3.3.1 Section A – Sentence Mode

Chapter 4 of this thesis contains the analysis of sentence mode differentiation in the four Donegal Irish varieties. The material in this corpus was designed to provide an insight into the distinction between statements (ST) and two question types (wh-questions (WHQ) and y/n questions (YNQ)). The material and annotation methodology for this part of analysis is given in Chapter 4, section 4.2. The full set of phrases is shown in Appendix 1. The specific research questions this chapter addresses are the following:

Q1: In addition to syntactic marking of questions, are ST, WHQ and YNQ differentiated by intonation? If yes, is differentiation achieved
- **a)** by tune
- **b)** by specific phonetic sentence modality markers?

Q2: How are ST, WHQ and YNQ differentiated in the individual sub-dialects?

Q3: Is the differentiation between ST, WHQ and YNQ achieved in the same way in the different sub-dialects with regard to Q1 a) and/or b)?

3.3.2 Section B – Alignment

Chapter 5 deals with the analysis of tonal alignment features in the Donegal Irish varieties. This part of the recorded corpus contains the set of sentences designed for investigating tonal alignment with varying rhythmic contexts in pre-nuclear (PN) and nuclear (N) conditions. The full set of materials and annotation methodology are presented in Chapter 5, section 5.2. For the full set of phrases in context see Appendix 2. The more detailed research questions addressed in this analytic chapter are the following:

Q1: How does an increased
a) tail length b) anacrusis
affect the alignment of L and H turning points relative to the accented syllable?

Q2: Are there sub-dialect differences with regard to Q1 (a) and/or Q1 (b)?

3.3.3 Section C – Focus

This section of the corpus was designed to investigate the effects of focus on f_0 and duration in the Donegal Irish varieties. The material and data annotation methodology are reported in Chapter 6, section 6.2. For a full set of target phrases an elicitation contexts see Chapter 6.2.1 and Appendix 3. This chapter therefore aims to answer the following more specific research questions:

Q1: What are the pitch effects of focus, both narrow and contrastive (compared to broad focus) on the

a) tonal patterns
b) f_0 excursions of the potentially accented items ($f_0$exA1, $f_0$exA2, $f_0$exA3)

Q2: What are the duration effects of focus, both narrow and contrastive, (compared to broad focus) on the

a) duration of the potentially accented syllable (dursA1, dursA2, dursA3)
b) duration of feet (durftA1, durftA2, durftA3)

Q3: Are there sub-dialect differences with regard to Q1 and/or Q2?

3.3.4 Section D – Rhythmic properties – the PVI

Chapter 7 is the last analytic chapter in this thesis and deals with the analysis of rhythmic features, more precisely the PVI (Pairwise Variability Index) metrics. The materials and data annotation methodology is described in chapter 7, section 7.2. The text recorded for analysis in this chapter is shown in Appendix 4. The chapter addressed the following specific research questions:

Q1: In terms of the PVI measure, do the Irish varieties group with languages traditionally described as

a) 'stress-timed' or
b) 'syllable-timed' ?
c) intermediate?

Q2: Are there sub-dialect differences?

3.4 Statistical analyses

In this study a number of statistical tests were carried out on specific sub-sets of the recorded corpus, to examine patterns in the data with respect to sub-dialect variation in the measured parameters. Statistical tests were carried out for data analysed in Chapter 4 (sentence mode) and Chapter 6 (Focus), and the respective tests are described in detail below.
No statistical tests were carried out in Chapter 5 (alignment) because of the rather limited number of tokens analysed. Similarly, in Chapter 7 (rhythmic features – the PVI) no tests were carried out since we are dealing with a small-scale study, with a limited number of speakers per variety.

Two different types of statistical treatments were carried out. The first, a one-way ANOVA with *focus* as the dependent variable was run on each of the conditions separately within each variety. The subsequent Tukey pairwise comparisons (post hoc tests) were aimed at within-variety examination, and at establishing the importance of the variables under investigation. The second treatment, using the Linear Mixed Model, served to provide a measure of the difference between the varieties in how specific parameters were used and whether the varieties differed in their use of specific parameters.

Statistical tests were carried out using the software Minitab (version 13.32) and the statistics software R (RCoreTeam, 2014).

3.4.1 Sentence Mode

In the analysis of sentence mode in the four Donegal Irish varieties, first the effect of focus on the pitch excursion and on the duration of focal syllables and focal feet is analysed for each variety separately.

To ascertain the overall impact of sentence mode on the Donegal Irish varieties, a series of statistical analyses were carried out to test the effect of the independent variables (i.e. sentence mode and dialect) on the dependent variables (i.e. N excursion, f_0 slope, span and H slope). The analyses included a series of linear mixed models (Pinheiro, Bates, DebRoy, & Sarkar, 2007).

In our first models, *mode* (3 levels: ST, WHQ, YNQ) and *dialect* (4 levels: RF, BF, GCC, RG) were treated as fixed factors. *Speaker* (4 levels) and *repetitions* (5 levels) were included as a random factors to take into account inter-speaker and repetition variability. Pairwise interactions between the fixed factors were also tested and models log-likelihoods compared.

As the interactions between *mode* and *dialect* were not significant, simpler models were chosen to investigate the significance of the main effect *mode*. We report the outputs of our latest models where mode was treated as a fixed factor and *inter-speaker*, *repetition* and *dialect* were treated as random factors. The relevance for including these three random factors in our models was evaluated by carrying out a set of likelihood tests (Pinheiro & Bates, 2000).

The p-values were calculated using the method of Monte Carlo sampling by Markov chain (pMCMC = Monte Carlo Markov Chain) (Baayen, 2008). In all our models, significance is set at a pMCMC $\alpha < 0.01$. The analysis results are included in section 4.6.2 and a summary of all results is included in Appendix 1, Table A1.1 together with the R code in Table A1.2.

3.4.2 Focus

In a detailed analysis for each variety separately, a series of one-way ANOVA tests were carried out, followed by Tukey's HSD post-hoc tests, to allow us to check the significance of differences between the three focal conditions being analysed (*bf, nf, cf*) in terms of focal f_0 excursion. The alpha level was set to 0.05. In addition, the effect size was calculated as eta squared (η^2) ($\eta 2 = 0.1$: small effect; $\eta 2 = 0.3$: medium effect, $\eta 2 = 0.5$: large effect). Results of Tukey's post hoc tests are reported in the text in Chapter 6 together with eta squared.

Cross-variety statistical analysis was then carried out to test the effect of the independent variables (i.e.focus and dialect) on the dependent variables (i.e. duration and f_0 excursion). The analyses included a series of linear mixed models (Pinheiro et al, 2007).

In our first models, the focus condition (3 levels: nf, cf, bf) and the dialect (4 levels: BF, GCC, RF, RG) were treated as fixed factors. *Speaker* (4 levels) and *repetitions* (5 levels) were included as a random factors to take into account inter-speaker and repetition variability. Pairwise interactions between the fixed factors were also tested and models log-likelihoods compared.

As the interactions between condition *focus* and *dialect* were not significant, simpler models were chosen to investigate the significance of the main effect focus condition. We report the outputs of our latest models where focus condition was treated as a fixed factor and inter-speaker, repetition and dialect were treated as random factors.

The relevance for including these three random factors in our models was evaluated by carrying out a set of likelihood tests (Pinheiro & Bates, 2000).

Accent position (a1, a2, a3) was not included as fixed factor in our models as for the broad focus condition, accent position A2 is not available. Analyses were performed for the three sub-sets separately (dataset A1, A2 and A3).

The p-values were calculated using the method of Monte Carlo sampling by Markov chain (pMCMC = Monte Carlo Markov Chain) (Baayen, 2008). In all our models, significance is set at a pMCMC $\alpha < 0.01$. The analysis results are included in Chapter 6.6.2 and a summary of all results is included in Appendix 3, Table C3.1 and the R code in Table C3.2.

3.5 Conclusion

This chapter presented an overview of the specific research questions addressed in each of the four analytic chapters. The findings from each of the analytic parts answer these specific questions, which again contribute to answering the three main questions introduced in chapter 1.

The next chapter, Chapter 4, is the first data chapter in this thesis and deals with the analysis of sentence mode in the four Donegal Irish varieties.

4 Sentence Mode

4.1 Introduction

This chapter presents the results for the analysis of sentence mode differentiation in the Donegal Irish varieties. The analysis is based on section A of the Corpus (see Appendix 1) as outlined in Chapter 3, section 3.1. The differentiation between statements (ST) and two question types (WHQ, YNQ) for each of the four Donegal Irish varieties are discussed. As a preamble to the present study, the results from a pilot study on the signalling of sentence mode in a typically falling (Inis Mór) and a typically rising (Donegal) variety of Irish (Dorn, O'Reilly, & Ní Chasaide, 2011) are presented. Then, the tonal patterns for statements and each of the question types are discussed for each of the regional varieties. The following sections also discuss the phonetic markers (pitch span, f_0 slope, N excursion and H slope) for ST, WHQ and YNQ respectively. Finally, a summary of all the pooled data is shown.

In a number of languages including English, for example, statements have been associated with falling tonal patterns, questions with rising tonal patterns in nuclear pitch accents (Bolinger, 1978; Gussenhoven, 2004). In the UNB (Urban Northern British) English varieties (i.e. Belfast), both statements and questions are characterised by rising nuclear pitch patterns (Cruttenden, 1997; Grabe, 2004; Grabe & Post, 2002a; Grabe et al., 2000; Jarman & Cruttenden, 1976) and the same has been reported for a northern variety of Irish (Gaoth Dobhair) before (Dalton, 2008). Many of the studies carried out within the AM framework have looked at the differences in tonal patterns between statements and questions (e.g. Grabe, 2004; Grabe & Post, 2002; Dalton, 2008). There is a general lack of studies, however, examining the more fine-detailed phonetic features that speakers may use to signal sentence mode differentiation in these UNB English varieties and also in the Irish dialects. Such phonetic features, which may be used to distinguish questions from statements, can include wider pitch span, higher register level and/or wider nuclear f_0 excursion (c.f. Haan, 2002). As outlined in Chapter 2, section 2.3., questions in Irish are already marked syntactically and it was of interest to investigate whether additional prosodic markers would be used to distinguish statements from questions. Therefore, the specific research questions addressed in this chapter are:

Q1: In addition to syntactic marking of questions, are ST, WHQ and YNQ differentiated by intonation? If yes, is differentiation achieved

- **c)** by tune
- **d)** by specific phonetic sentence modality markers?

Q2: How are ST, WHQ and YNQ differentiated in the individual varieties?

Q3: Is the differentiation between ST, WHQ and YNQ achieved in the same way in the different varieties with regard to Q1 a) and/or b)?

The following section gives an overview of the materials analysed in this chapter and the specific annotation methodology.

4.2 Materials and Methodology

4.2.1 Materials

The material in this corpus (section A) was designed to provide insights into the distinction between statements and two question types (wh-questions, y/n questions).
The target phrases are presented in Table 4.1. Initially, two separate sets were created, one with phrases with three potentially accentable syllables (set 1) and one with two potentially accentable syllables (set 2) (see Table 4.1). Set 1 comprises a statement (ST) with a structurally matching wh-question (WHQ) and statement with matching y/n question (YNQ) with three potentially accentable syllables (set 1 = 2 x ST, 1 x WHQ, 1 x YNQ). Set 2 comprises a statement (ST), wh-question (WHQ) and y/n question (YNQ) with two accentable syllables and matching structure (set 2 = 1 x ST, 1 x WHQ, 1 x YNQ). Working with two separate sets was intended to permit analysis of the effect of sentence length on declination. It was later decided, however, not to include this particular measure here, as a pilot study on the prosodic signalling of sentence mode in two varieties of Irish (Donegal and Inis Mór), in which a sub-set of the data included here was analysed, showed no effect of sentence length on the f_0 measures in Donegal Irish (Dorn et al., 2011). Consequently, the two sets in this study (set 1, set 2) were merged for analysis. This yields 3 x ST, 2 x WHQ, 2 x YNQ. The pilot study is explained in more detail in section 4.3.

Table 4.1: Target sentences in Section A of the recorded corpus

Set 1 Phrases with 3 potentially accented syllables (underlined)

ST	Bhuail	mé	le	Gráinne	sa	bhialann.	
	met	*I*	*with*	*Gráinne*	*in*	*restaurant*	
	/ 'wialʲ	mʲe	lʲə	'grˠænʲə	sˠə	'vʲiəlˠənˠ /	
	'I met Gráinne in the restaurant.'						

YNQ	Ar	bhuail	tú	le	Gráinne	sa	bhialann?
	did	*meet*	*you*	*with*	*Gráinne*	*in*	*restaurant*
	/ərʲ	'wialʲ	tˠu	lʲə	'grˠænʲə	sˠə	'vʲiəlˠənˠ /
	'Did you meet Gráinne in the restaurant?'						

ST	Thaitin	an	damhsa	le	Nuala.
	Enjoyed-I	*the*	*dance*	*with*	*Nuala*
	/'hatʲən	ənˠ	'dˠausˠə	lʲə	'nˠualˠə/
	'I enjoyed the dance with Nuala.'				

WHQ	Cé	bhí	ag damhsa	le	Nuala?
	who	*was*	*dancing*	*with*	*Nuala*
	/'ce	vʲi	ə 'dausˠə	lʲə	'nˠualˠə/
	'Who was dancing with Nuala?'				

Set 2 Phrases with 2 potentially accented syllables (underlined)

ST	Bhuail	mé	le	Dónall.
	met	*I*	*with*	*Dónall*
	'wialʲ	mʲe	lʲə	'dˠonˠəlˠ/
	'I met Dónall.'			

WHQ	Cár	bhuail	tú	le	Dónall?
	where	*met*	*you*	*with*	*Dónall*
	/karˠ	'wialʲ	tˠu	lʲə	'dˠonˠəlˠ/
	'Where did you meet Dónall?'				

YNQ	Ar	bhuail	tú	le	Dónall?
	did	*meet*	*you*	*with*	*Dónall*
	/ərʲ	'wialʲ	tˠu	lʲə	'dˠonˠəlˠ/
	'Did you meet Dónall?'				

All target sentence outlined in Table 4.1 were embedded in mini-dialogues to avoid the production of narrow focus on a particular word in the phrase. For the full set of sample dialogues and contexts in which the target sentences were elicited see Appendix 1.

Target phrases were repeated five times per speaker per dialect, yielding a total of 560 tokens across the three sentence modes (see Table 4.2 for a full breakdown of token numbers). A total of 111 tokens had to be excluded from analysis due to the production of narrow focus on specific items in the phrase, disruptions in the pitch contour because of coughs, laughs, creaky voice or because informants did not finish reading the phrase.

Table 4.2: Breakdown of token numbers for sentence mode analysis

	#	repetitions	no. of speakers	varieties	total no. of tokens	tokens excluded	tokens analysed
ST	3	5	4	4	240	-46 (19%)	194 (81%)
WHQ	2	5	4	4	160	-30 (19%)	130 (81%)
YNQ	2	5	4	4	160	-35 (22%)	125 (78%)

4.2.2 Annotation of tunes and measurements of phonetic features

As a first step in the analysis, pitch accent labels and boundary markers were annotated in Praat (Boersma & Weenink, 2008) using IViE labelling (Grabe, 2001). Then, labels for crucial f_0 points in the pitch contour in each utterance were annotated. An example of annotated tiers and f_0 points are illustrated in Figure 4.1. Each phrase was transcribed orthographically (tier 4), beginnings (<) and ends (>) of lexically stressed syllables were annotated and boundary tones transcribed (tier 3). Then, tone labels were assigned (tier 2). Finally, the specific f_0 points in the pitch contours were annotated (tier 1): the beginning (B) and end (E) of the pitch contour/utterance, the absolute low (L) and high (H) turning points in each accent group, as well as the overall f_0 minimum (m) and maximum (M) in the phrase.

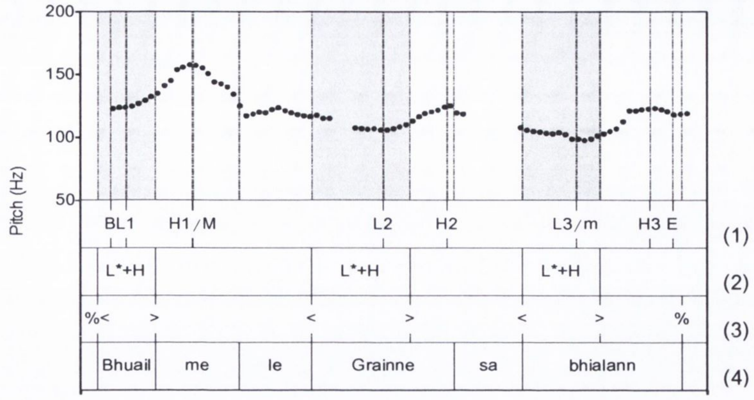


Figure 4.1: Example of annotation for statements and questions. The three potentially accentable syllables are shown in grey. The top panel shows the pitch trace for the phrase Bhuail mé le Gráinne sa bhialann / 'wialʲ mʲe lʲə 'grˠænʲə sˠə 'vʲiəlˠənˠ/ *'I met Grainne at the restaurant'*. The panels below the pitch trace show the four annotation tiers: orthographic transcription (tier 4), marking of stressed syllables and boundary tones (tierl 3), IViE transcription of tones (tier 2), and annotation of specific f_0 points (tier 1). Soundfile: (DI-CME-d1-1)

From the direct measurements the following derived metrics were calculated for each utterance:

i) *register span* (M – m)
ii) *pitch (f_0) slope* (E – B)
iii) *nuclear (N) pitch excursion* ($H_N - L_N$)
iv) *slope H* (f_0 difference in peak height between pre-nuclear and nuclear H (H_N-H_{PN})

Register span was calculated as the difference between the absolute f_0 maximum (M) and f_0 minimum (m) of the utterance. *Pitch (f_0) slope* was calculated as the differences between f_0 at the beginning (B) and the end (E) of the phrase, *nuclear (N) pitch excursion* as the difference between the absolute high (H_N) and low (L_N) in the phrase final accent group. *Slope H* here refers to the difference in peak height between the absolute f_0 maximum in the phrase-initial pre-nuclear (H_{PN}) accent group and the absolute f_0 maximum in the phrase-final/nuclear accent group (H_N). These derived measurements are illustrated in Figure 4.2. Similar metrics, among others, have been used in previous studies covering the analysis of question intonation (cf. Haan, 2002; Kalaldeh, 2011) and were chosen here to provide comparable analysis. A summary of annotation points, extracted values and derived metrics is presented in Table 4.3.

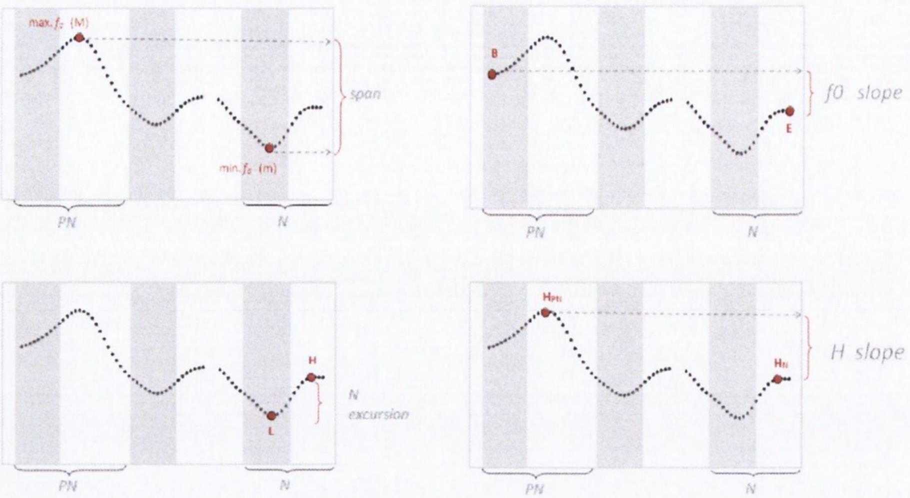


Figure 4.2: Illustrations of derived metrics of phonetic features. The black dotted lines show a L*+H L*+H L*+H % pitch contour derived from the pitch trace of a typical Donegal Irish (DI) statement. The f_0 annotation points are shown as red dots and the derived metrics in grey. Accentable syllables in pre-nuclear (PN) and nuclear (N) accents are shaded in grey. (Soundfile: DI-RF-SMR)

After the data annotation, f_0 values for each of the annotated points in each utterance were extracted and calculations of the derived metrics were made with an adapted Praat script. F_0 values were first extracted in hertz (Hz) and subsequently converted to a semitone scale (st) (Fant & Kruckenberg, 2004), taking the individual speaker's minimum f_0 as reference values. The semitone scale was chosen as a measure of conversion over other scales, as it was deemed most appropriate in the representation of perceived pitch (F. Nolan, 2003). The extracted values were averaged across all speakers per variety for the main tune type.

Table 4.3 Labels of direct acoustic annotations, extracted values and derived measures

f_0 target time point labels		
B	beginning of the utterance	
L1	absolute low target in the 1st accent group	
H1	absolute high target in the 1st accent group	
L2	absolute low target in the 2nd accent group	
H2	absolute high target in the 2nd accent group	
L3	absolute low target in the 3rd accent group	
H3	absolute high target in the 3rd accent group	
E	end of the utterance	
M	absolute maximum pitch in the utterance	
m	absolute minimum pitch in the utterance	
Extracted f_0 values in Hz		
f0B	beginning of the utterance	
f0L1	absolute low target in the 1st accent group	
f0H1	absolute high target in the 1st accent group	
f0L2	absolute low target in the 2nd accent group	
f0H2	absolute high target in the 2nd accent group	
f0L3	absolute low target in the 3rd accent group	
f0H3	absolute high target in the 3rd accent group	
f0E	end of the utterance	
f0M	absolute maximum pitch point in the utterance	
f0m	absolute minimum pitch point in the utterance	
Derived f_0 measures in semi-tones (st)		
f_0 slope	difference between the onset and offset of the utterance	E – B
span	difference between the absolute maximum and absolute minimum of the utterance	M – m
N excursion	difference between the absolute high and low target of the nuclear accent group	H2 – L2 / H3 – L3
H slope	difference between the absolute f_0 peak in the phrase initial accent group and the absolute f_0 peak in the phrase final accent group	H2 – H1 / H3 – H1

The following section outlines the pilot study carried out on the differentiation of sentence mode in two Irish dialects (Donegal and Inis Mór Irish). As sentence mode in Irish is already syntactically marked (see Chapter 2, section 2.3), it was investigated in the pilot paper whether interrogativity would additionally be conveyed by means of f_0. Provided that such dual differentiation of sentence type existed, it was investigated whether the same intonational devices were used in both dialects.

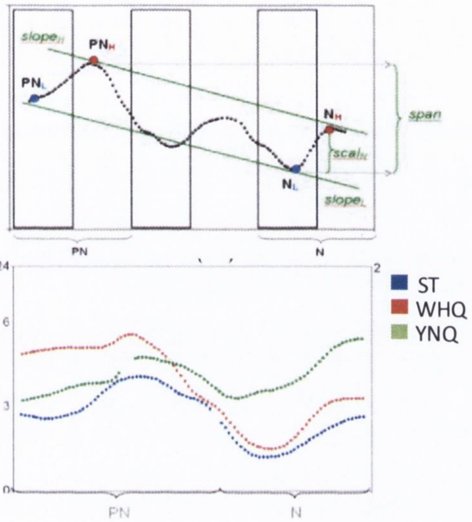
4.3 Pilot study – preliminary comments

A pilot study on the signalling of sentence mode in a typically falling (Inis Mór) (IM) and a typically rising (Donegal) variety of Irish (DI) was carried out by Dorn, O'Reilly & Ní Chasaide (2011). The study covered the phonological analysis of tunes as well as global and local $f0$ metrics in statements (ST) and two question types (wh-questions (WHQ) and yes/no questions (YNQ). Their analysis is based on data from five speakers from each of the two dialects. The DI data is a sub-set of the data used in the present study. It covered the analysis of a total of five speakers from three different locations in the Donegal Gaeltacht that are also included here (RF, BF and GCC). Target utterances were designed in the three sentence modes with two different IP-lengths (two and three stress groups respectively). The material was the same as shown in section 4.2.1 in this chapter. Figure 4.3 shows an illustration of the annotated f_0 contours and the thereof calculated metrics.

As a first step in the analysis, tonal contours of each utterance type were determined by careful auditory analysis. For the quantitative analysis, four f_0 points in the contour were measured (see Figure 4.3 top panel, left): two f_0 points corresponding to the H and L targets in the phrase-initial (PN_L, PN_H) and two in the phrase-final accent groups (N_L, N_H). This was done to ensure uniform treatment of all data. The four target measurements were first converted to semitones and then served for deriving four further f_0 metrics: span (*span*), baseline and topline declination slopes ($Slope_L$ and $Slope_H$ and scaling of the nuclear (N) pitch accent ($scal_N$ respectively).

The auditory analysis showed, that in DI the preferred nuclear tonal contour type in ST, WHQ and YNQ is the rise L*+H %, and high rises (L*+H H%) also occurred in YNQ in about half the data. As to the pre-nuclear patterns, the rise L*+H was the overall preferred pattern except for WHQ where a bigger number of high tones (H*) occurred. To determine the effect of sentence mode and IP length on the calculated f_0 metrics (see Figure 4.3, right panel), a two-way repeated measures ANOVA with factors sentence mode (3 levels) and IP-length (2 levels) was run. No effect of IP-length on any of the metrics were found. The subsequent statistical tests (Tukey's HSD post hoc tests) showed that the scaling of the nuclear accent (scaling of N), register span (register span) as well as the low (PN_L) and high pre-nuclear (PN_H) f_0 targets were significantly different for WHQ and ST (see Figure 4.3, right panel). All four parameters (scaling of N, register span, PN_L , PN_H) had raised (higher f_0 values) in WHQ than in ST. YNQ was characterised by an expanded scaling (scaling of N) and raised low L (N_L) and H (N_H) targets in the nuclear accent, as well as an overall increased pitch slope of low ($Slope_L$) and high ($Slope_H$) f_0 target points. The only metric which was significantly different for both WHQ and YNQ from ST was the scaling of the nuclear accent (*Scaling of N*). Scaling of N (nuclear f_0 excursion) was wider for WHQ and YNQ compared to ST. Among the two question types the *scaling of N* was wider for YNQ than for WHQ

(ST<WHQ<YNQ). The results from this pilot experiment showed, that in DI, sentence mode is prosodically marked by specific f_0 adjustments in the phrase-initial and phrase final accents.



F0 metrics	ST vs WHQ	ST vs YNQ
PN$_L$	√	
PN$_H$	√	
N$_L$		√
N$_H$		√
Scaling of N	√	√
Register Span	√	
Slope$_L$		√
Slope$_H$		√

Figure 4.3: Sentence mode differentiation in Donegal Irish. Left (lower panel): superimposed f_0 contours of a typical L*+H L*+H % statement (ST, blue line), H* L*+H % wh-question (WHQ, red line) and L*+H L*+H % yes/no question (YNQ, green line). Right: summary of f_0 metrics. Green ticks indicate significant differences between ST and the respective question type at $p<0.05$. The yellow bar indicates the metrics distinguishing both question types from statements in Dorn, O'Reilly & Ní Chasaide, 2011.

Results from the pilot study showed, that the calculated metrics are useful in showing sentence mode differentiation in the Irish dialects. For this reason, the same methodology was applied in this study. In the present study we expected to find similar results to those in the pilot paper for Donegal Irish. The number of analysed metrics, however, was limited to the *scaling of N* (nuclear f_0 excursion), *register span*, f_0 *slope* and *slope H.*

The following sections discuss IP-initial pre-nuclear (PN) and nuclear (N) tonal patterns as well as the phonetic markers mentioned above for statements and two question types in each of the four Donegal Irish varieties.

4.4 Tonal patterns

4.4.1 Pooled tune inventories across varieties

This section presents an overview of the pooled tune inventories for both pre-nuclear (PN) and nuclear (N) tonal patterns across ST, WHQ and YNQ in Rann na Feirste (hereafter RF), Baile na Finne (hereafter BF), Gleann Cholm Cille (hereafter GCC) and Ros Goill (hereafter RG) varieties of Donegal Irish. A summary of tunes for each variety is shown below in Figure 4.4

Looking first at the nuclear accents (N) (Figure 4.4, right panel) a relatively uniform pattern presents itself regarding the choice in tunes for RF, BF and GCC with some minor variations: the rise-plateau L*+H % is the preferred tune across the three varieties. This is not the case for RG. In this variety the rise-fall L*+H L% is the preferred tune in more than half of the data, whereas rises only occur for around a third of cases. The rise falling patterns also occur in all other varieties, but to a noticeably smaller degree. Similarly, the high rising tune L*+H H% is a choice in BF, GCC and RG, but not in RF. Minor instances of falls H*+L % were found in the RF and RG data, but we are dealing with very limited numbers in these cases.

Looking now at the IP-initial pre-nuclear (PN) tonal patterns, (Figure 4.4, left panel) we can immediately observe a more complex picture than in the choice of tunes in the nucleus. The rise L*+H is again the main choice of accent type in RF and BF. It occurs in less than 50% of cases in GCC, and in less than a third in RG. Note that in RF, a variant of the rise (L*H) was grouped as a separate category. Here the absolute L and H targets were both located outside the accented syllable and it was decided to label these as L*H (see also Chapter 2, section 2.2.3). If we are indeed dealing with a separate category is doubtful, and therefore these instances could essentially be grouped with the L*+H pattern. Apart from the low rise there is a second preferred pattern in PN accents: high pitch accents H* are the second choice in RF and BF. They occur in around 50% of cases in BF, and are the overall preferred pitch pattern in RG. H* was most typically realised with an on-glide from a lower f_0, but a small number of utterances in the RF variety had a high IP-initial onset (H% H*). Additionally, in RG, upstepped high pitch accents (^H*) occurred in the data, though to a lesser extent. We believe that these could essentially be grouped with H* and are not a categorically different group. Nevertheless, these instances were perceptually different to the more often observed H* and were for this reason plotted separately. Falling pitch patterns H*+L only occurred to a minor degree across all of the four local varieties.

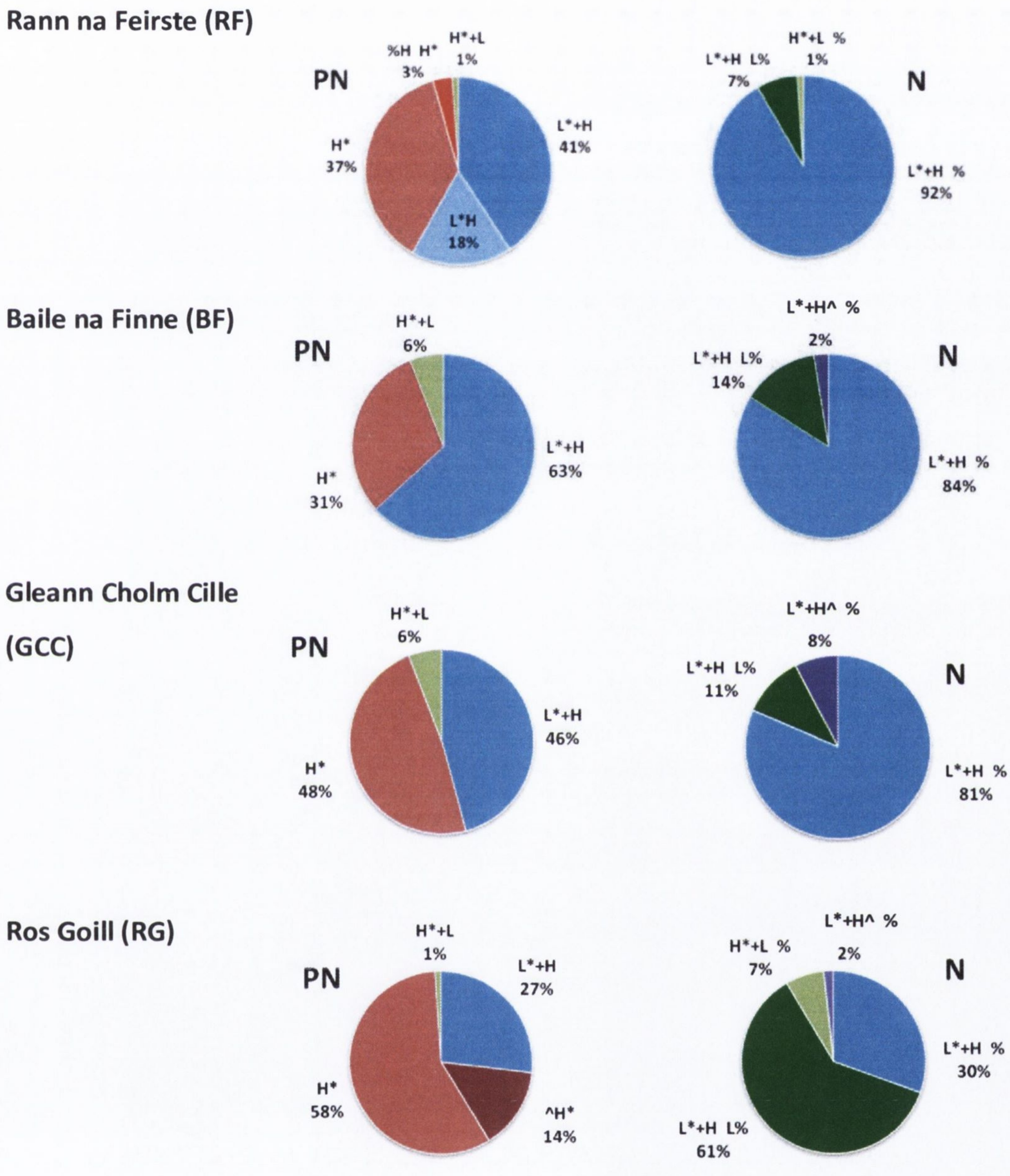


Figure 4.4: Overview of pooled pitch accent inventory in IP-initial (PN) and nuclear (N) conditions for each variety across all sentence types.

4.4.2 Pooled tune inventories across sentence modes

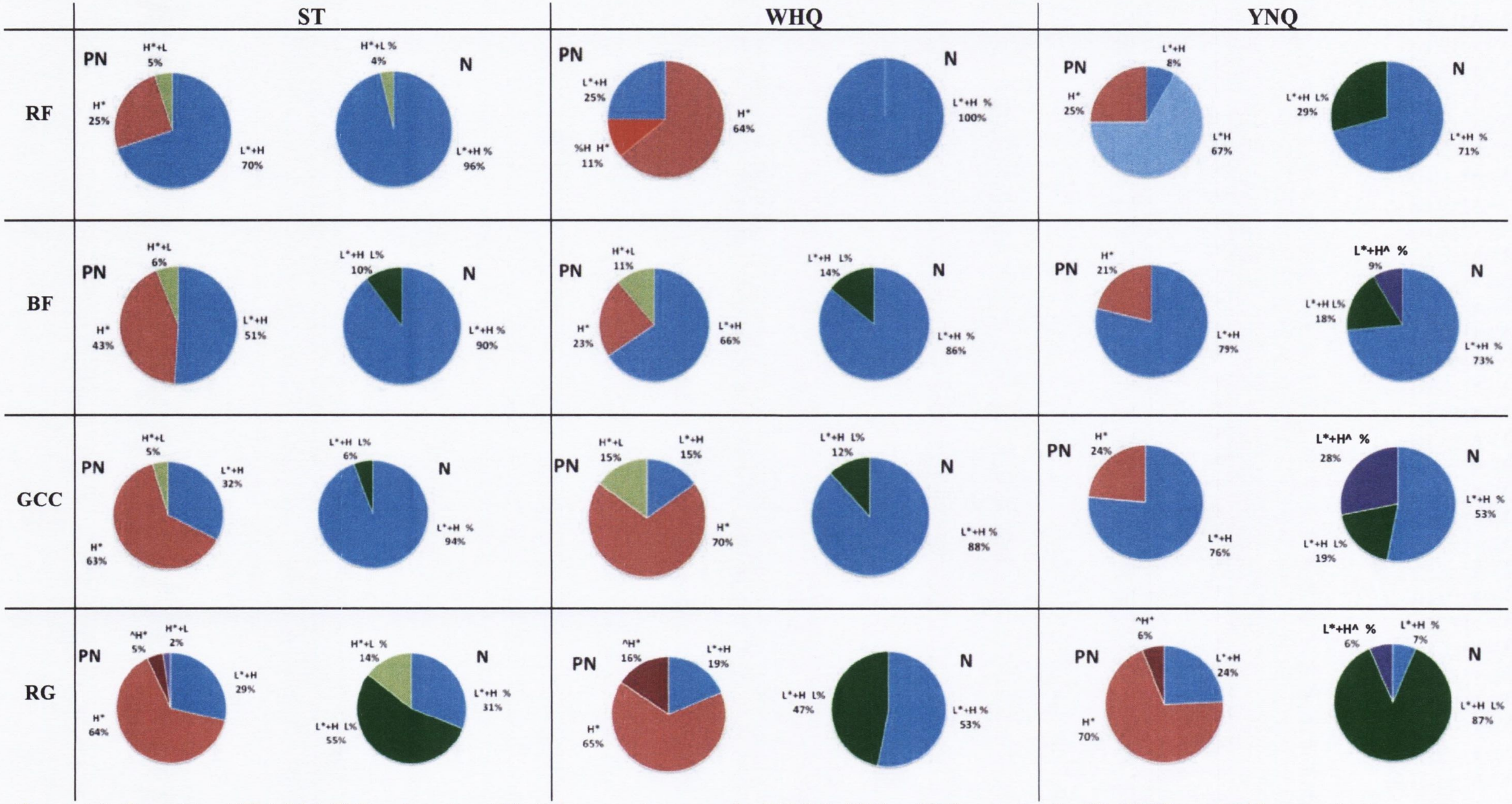


Figure 4.5: Overview of IP-initial (PN) and nuclear (N) pitch accent inventory for RF, BF, GCC and RG varieties for ST, WHQ and YNQ respectively.

Figure 4.5 presents an overview of the IP-initial pre-nuclear (PN) and nuclear (N) tunes in RF, BF, GCC and RG respectively, grouped according to sentence mode type (ST, WHQ, YNQ).

Looking first at the tonal patterns in ST across the four varieties, we can observe a clear preference for certain tune types in PN and N. In N conditions, the rise L*+H % is the dominant tune for RF, BF and GCC. RG, however, is strikingly different with over 50% of rise-falls L*+H L% and only about a third of nuclear L*+H %. In the other varieties rise-falls or rise-plateau slumps L*+H L% are only marginally present as are falls H*+L %. As to the PN pitch patterns, L*+H is again the preferred tune in RF, and BF, and is present to a lesser degree in GCC and RG (RF>BF>GCC>RG). High pitch accents H* occur in the majority of PN patterns in RG and GCC, but in less than half of the data in BF and RF (RG>GCC>BF>RF). Only minor occurrences of falls or up-stepped high tones were observed in PN across the varieties.

Looking next at the tonal patterns for WHQ there is a visible trend of preferred patterns in PN and N accents. For N accents, the rise L*+H is again the preferred choice in RF, BF and GCC. RG again stands out by the relatively high frequency of L*+H L%. Overall, tune choices for N are very similar to those observed for ST. In PN accents, the possible patterns are again more varied. H* is the dominant PN tune for WHQ in all varieties with the exception of BF. There, the rise L*+H occurs most often, but is only a second option in the remaining varieties. Only a small number of variants of H* (e.g. H% H* and ^H*) were observed.

Looking now at the tunes in YNQ, nuclear tunes are more varied than in WHQ and ST, although L*+H % is again the dominant tune in RF, BF and GCC. Predominant L*+H L% realisation are found in RG. Rises with raised H trailing peaks L*+H^ % occurred in YNQ among the secondary choices in BF, GCC and RG, but not in RF. This pattern did not occur in ST or WHQ. In PN the tune distribution is similar to ST for each of the varieties. Again, RF, BF and GCC mainly use the rise, while H* is the preferred pre-nuclear tune in RG and a second choice in the other varieties. The early rise L*H only occurs in RF.

Next, a detailed analysis of preferred tunes and secondary tunes for ST, WHQ and YNQ are discussed per variety and exemplified by stylised contours for visual support. The illustrated contours are derived by connecting the mean f_0 measurement points (B, L1, H1, L2, H2, L3, H3, E) which had been manually annotated. Pitch contours are shown for the preferred tune type across all speakers per sub-dialect. Secondary tunes are included if the number of tokens was similar to the preferred tune type.

4.4.3 Rann na Feirste (RF) tunes

So far in this chapter the broad distribution of tonal patterns was described for each variety and subsequently for each sentence mode. Now we are going to take an even more detailed look at the tunes and their realisations: this section deals with the tonal patterns for ST, WHQ and YNQ in the RF variety, looking at 2-accent and 3-accent phrases separately.
Figure 4.6 gives an overview of the PN and N tonal patterns, IViE transcription of preferred and secondary tunes as well as stylised pitch contours for the dominant 'tune' derived from the manually annotated f_0 points for each of the sentence modes.

In ST the preferred tune is the sequence of rises L*+H L*+H L*+H % in both short and long phrases. N tonal patterns are relatively uniform, and there is more variation in possible PN patterns. Apart from rises, the second preferred choice is a high pitch accent H* which occurred in just under a third of cases in the data for both sentence lengths. Overall, however, the realisation of declaratives in RF mirrors the typical rising tune described before for Goath Dobhair Irish (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2007b). Given the geographical proximity of these two places, this finding is rather unsurprising.

For WHQ, however, the tunes of first choice are H* L*+H% and H* !H* L*+H % for short and long phrases respectively. Although patterns in N mirror those in ST the preferred PN tonal pattern is a high tone H* in over 50% of cases. Note that in the 3-accent phrases L*+H was also a common second choice. Looking at the stylised contour, however, it is clear that both L and H targets are raised considerably in the pitch range. As to the short utterances, high PN targets with a preceding high boundary %H H* were also a secondary choice. Since H* was most typically realised with an on-glide from a lower f_0, and %H H* with a raised boundary and more prominently raised peak it was decided to group these separately. We consider H% H* to be essentially a variant of H* and not a categorically different type. All in all, tunes in WHQ mirror those in ST in nuclear patterns, but differ in pre-nuclear ones where L and H targets are considerably boosted or realised with a high tone instead. Taken together, one can say that the pitch elevation in the initial tone of the sentence is characteristic of WH-questions.

As to YNQ, looking first at tunes in the nuclear accent, we can observe some variability: the rise L*+H % is again the preferred choice in tune, but L*+H L% is a frequent secondary choice. PN tonal patterns are overall realised as L*+H and for this sentence mode H* is only a second choice. Note the rising pre-nuclear L*H pattern in long utterances. In these cases, neither the low L nor the peak H aligned with the accented syllable. We believe that L*H and L*+H are not categorically different in this variety of Irish.

Overall we can summarise that YNQ largely resemble ST in the choice of tunes. Visual inspection of the stylised contour suggests a boosting of the N peak compared to ST. These phonetic differences, however, are discussed later in this chapter in section 4.5.

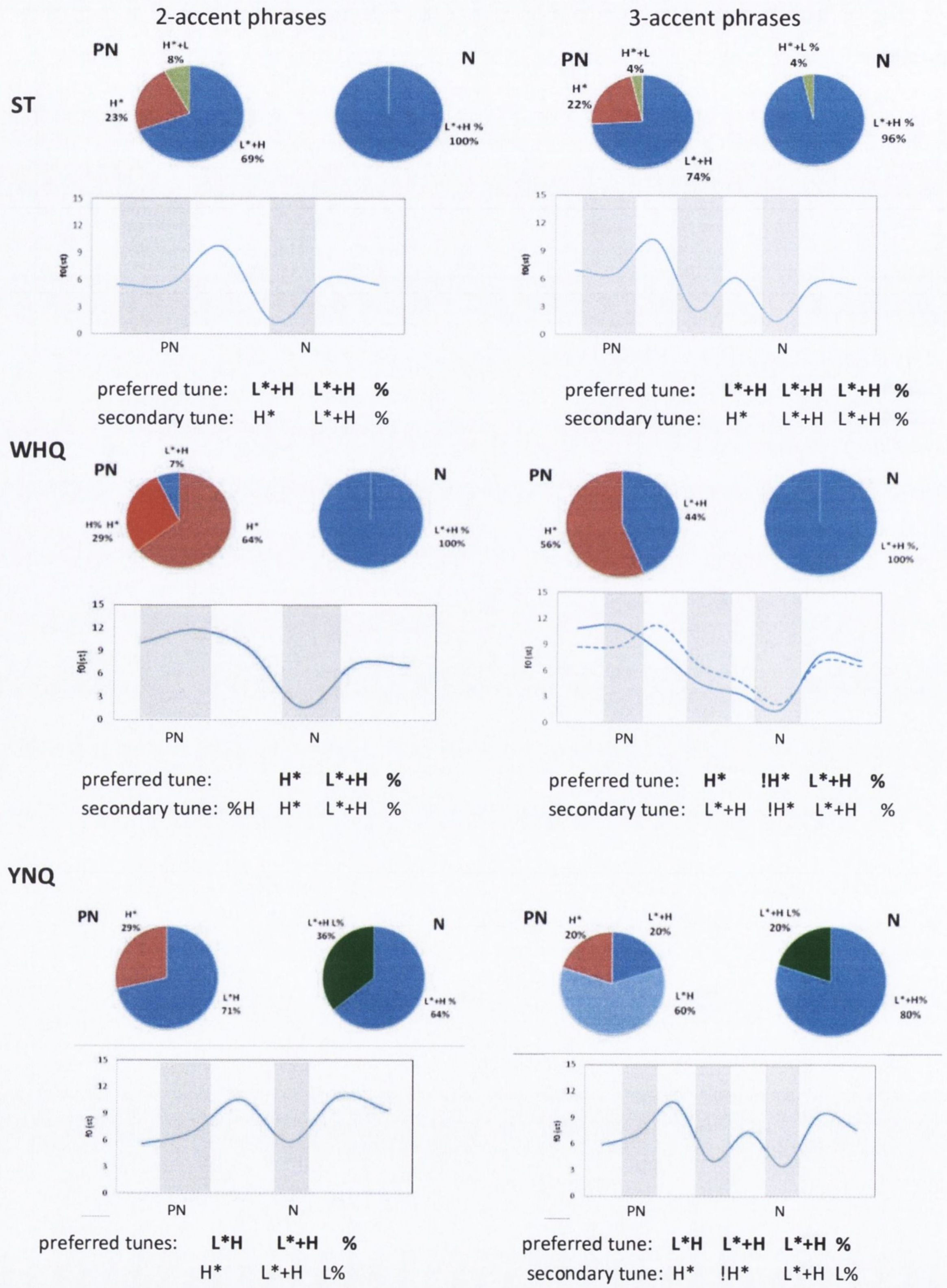


Figure 4.6: Tunes in RF: IP-initial pre-nuclear (PN) and nuclear (N) accent inventory (pie charts) for ST, WHQ and YNQ. F_0 contours (blue lines in grey boxes) are derived from the measured f_0 points for the preferred tune. Left panels show phrases with two potentially accentable syllables, right panels show phrases with three potentially accentable syllables. Accentable syllables are shaded in grey. Secondary tunes (dashed blue lines) are shown if token numbers were similar to the preferred tune.

4.4.4 Baile na Finne (BF) tunes

Figure 4.7 shows a summary of tonal patterns in the BF-variety. As regards ST, we can observe some differences with regard to the long and short phrases: the preferred tune in N is again the rise L*+H %, and this is also the preferred PN pattern in long phrases, but a high tone H* occurs more often in the initial pre-nuclear position in short utterances. Apart from the preferred tunes there is again a second choice: this variation mainly affects the PN tone pattern, where H* is an option in long utterances and the fall H*+L in short ones. Rise-plateau slumps (L*+H L%) are also second choices in the nucleus, however, only to a small degree.

As to WHQ, the rising pattern L*+H is the preferred tune in PN and N for the two sentence lengths. Note that falls (H*+L) occurred in PN in longer utterances as a second choice of tonal pattern. These instances, however, can be attributed to one specific speaker (POBR), rather than a phenomenon across speakers. High PN pitch accents (H*) in WHQ, which were the preferred pattern in the BF-variety for this mode, and are also a second choice here. Overall, nuclear tunes in WHQ resemble those in ST. Differences in pre-nuclear tunes were observed in short and long utterances: phrase-initial H* occurred more often in ST than WHQ in short phrases. Summarising, WHQ is realised with considerably raised L and H targets or with a high tone instead. Similar to the RF-variety, the pitch elevation in the initial tone of the sentence is characteristic of WH-questions.

Looking now at YNQ, the rise L*+H is again the overall preferred tune for PN and N in both short and long utterances. Where rise-plateau slumps L*+H L% occurred again as second choices in the nuclear accent, there were also instances of rises with upstepped peaks L*+H^ % in the shorter utterances. High pitch patterns were also found in pre-nuclear accents in short phrases, but only as second choices.

Overall we can sum up that YNQ resemble the tunes in ST. Similar to results observed in the RF variety, YNQ pitch contours show a boosting of the N accents compared to ST, which involves a raising of the nuclear H trailing peak.

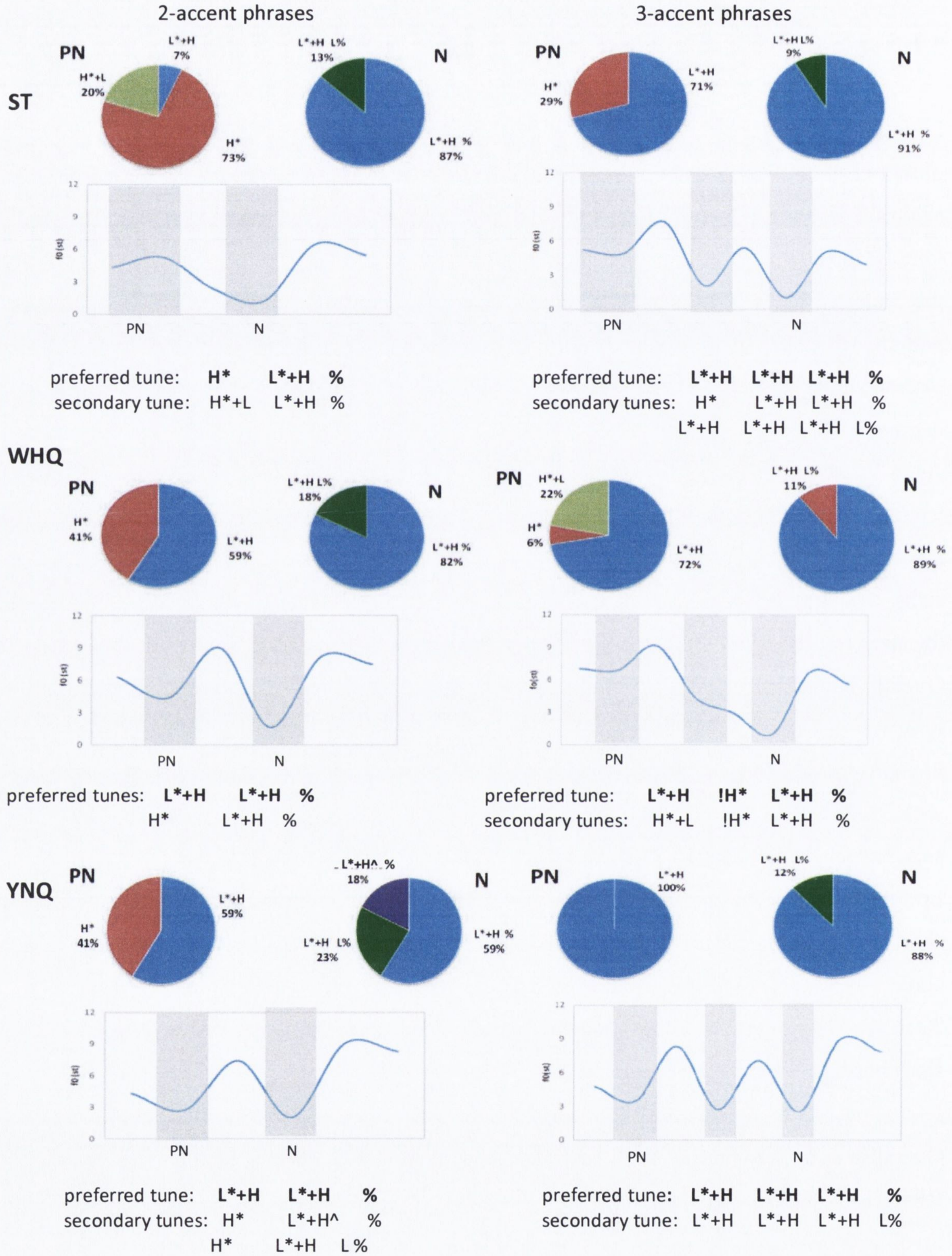


Figure 4.7: Tunes in BF: IP-initial pre-nuclear (PN) and nuclear (N) accent inventory (pie charts) for ST, WHQ and YNQ. F_0 contours (blue lines in grey boxes) are derived from the measured f_0 points for the preferred tune. Left panels show phrases with two potentially accentable syllables, right panels show phrases with three potentially accentable syllables. Accentable syllables are shaded in grey. Secondary tunes (dashed blue lines) are shown if token numbers were similar to the preferred tune.

4.4.5 Gleann Cholm Cille (GCC) tunes

The choices in tonal patterns in the GCC-variety are presented in Figure 4.8 below.
Looking first at ST, the preferred nuclear tune is again the rise L*+H % in both utterance lengths. In phrase-initial pre-nuclear accents L*+H is (marginally) preferred over H* in longer utterances, H* is the tone used by most speakers in the short utterances. Again there are secondary choices in tonal patterns for both PN and N conditions. A small number of rise-plateau slumps (L*+H L%) occurred in the nucleus. PN patterns were more varied in short than in longer utterances.
Looking next at WHQ, we observe a similar trend as seen before in RF and BF: the nuclear pattern is on average the same as in ST (L*+H %), but the high tone H* is the first choice in pitch pattern for this sentence mode. Note, that in this variety, speakers tended to accentuate the question word *'cár'* which was not the case in the other varieties and if so, only in a minority of cases. In the other varieties the question particle tends to be unaccented and the accent is instead places on the following verb *'bhuail'*. This difference in the position of the accent did not affect the choice in tone patterns. Overall we can summarise that WHQ is characterised by a phrase-initial high tone in this variety. Similar to RF and BF the considerable pitch elevation on the phrase-initial pitch accent is characteristic for WHQ.
As to YNQ, a similar trend to the other varieties is visible in this condition. Rising pitch patterns L*+H are the preferred pattern in both PN and N accents. Compared to the other modes in this variety, we can observe more variation in the N pitch patterns: in the shorter and longer utterances the rise with raised H peaks L*+H^ % was again a second choice in accent type. Utterances in which the N peak is raised and perceived as higher than the PN peak were labelled in this way. In addition, rise-slumps L*+H L% also occurred in N which had an audible drop in *f0* at the boundary. Although at this stage it is not entirely clear why these three very different tonal boundary options are used in YNQ. All in all, the boosting of the nuclear peak (H) of the bi-tonal accent L*+H is characteristic for YNQ also in this variety.

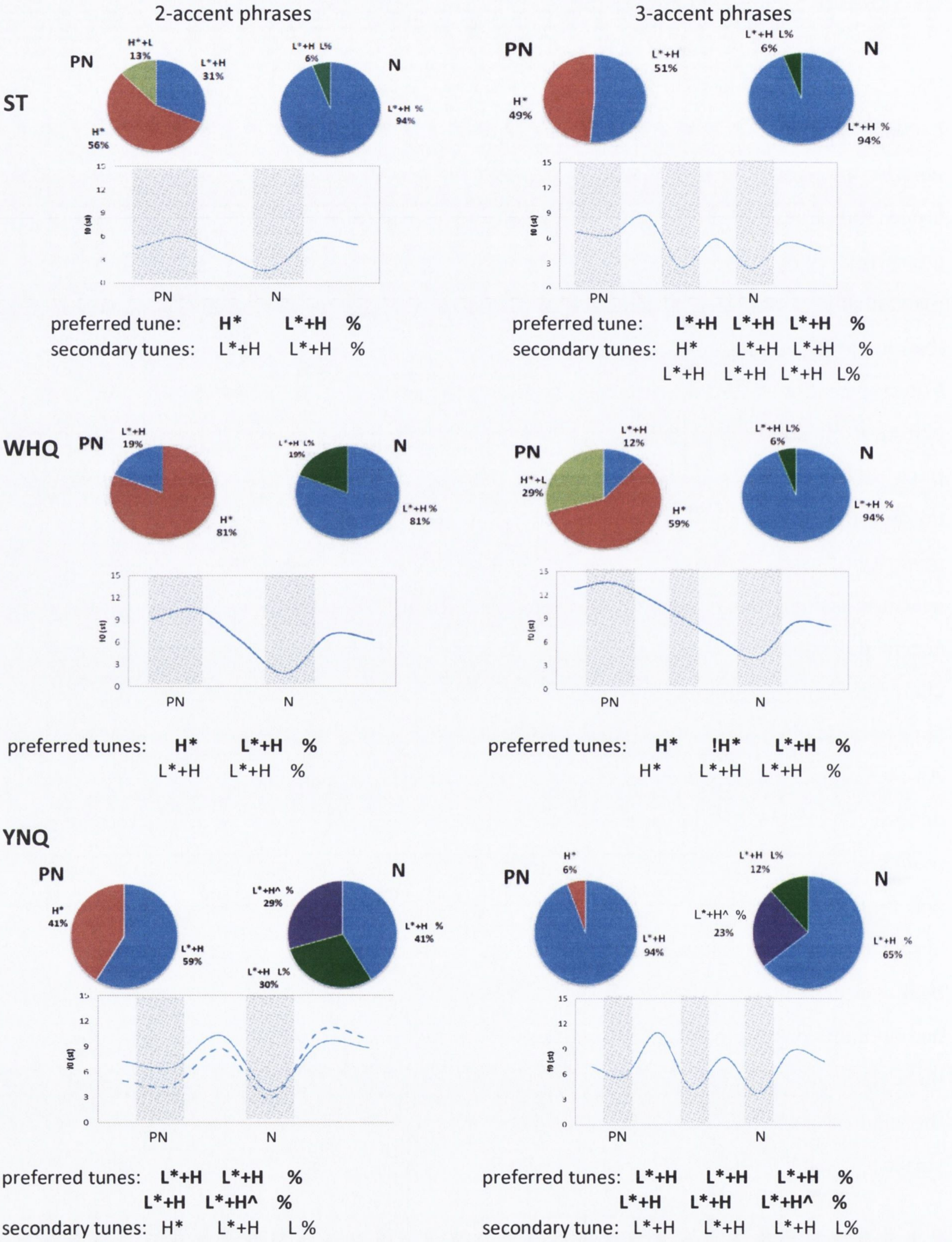


Figure 4.8: Tunes in GCC: IP-initial pre-nuclear (PN) and nuclear (N) accent inventory (pie charts) for ST, WHQ and YNQ. F_0 contours (blue lines in grey boxes) are derived from the measured f_0 points for the preferred tune. Left panels show phrases with two potentially accentable syllables, right panels phrases with three potentially accentable syllables. Accentable syllables are shaded in grey. Secondary tunes (dashed blue lines) are shown if token numbers were similar to the preferred tune.

4.4.6 Ros Goill (RG) tunes

Looking now at the tonal patterns for ST, WHQ and YNQ in the RG-variety (Figure 4.9), we see a striking difference in the choice of overall tonal patterns.

In ST the first choice in tune is the rise-fall L*+H L% for both short and long phrases. In general there was high variability between and across speakers in this variety as regards the realisation of tunes in each of the respective modes, which added to the complexity of analysis. This variability was observed across the four speakers and was not speaker specific. In PN, H* occurs in the majority of cases. The rise L*+H, which in RF, GCC and BF was the overall preferred pattern in N, is here only a second choice in PN and N accents. In addition, there were also instances of falls H*+L% in the nucleus, as well as upstepped high accents (^H*) in longer phrases in PN.

In WHQ, there is higher variability with regard to PN and N accent types. The preferred nuclear tune in long phrases is the rise L*+H %, but the rise-fall L*+H L% occurred for the majority of cases in shorter phrases and L*+H % was only a second choice. As to PN patterns, H* is again the first choice in tone pattern, but L*+H is also an option. Note again that an upstepped high accent ^H* is again present in longer phrases. As pointed out in earlier sections, we believe that this is not a categorically different tone from H*, but it was plotted separately since the phonetic differences in peak height are important to note for the analysis of *f0* metrics in the following sections 4.5 in this chapter. Overall, nuclear and pre-nuclear tunes in WHQ are similar to those in ST. The raising of the IP-initial high (H*) pitch accent is characteristic for WHQ, similar to the varieties previously described.

Finally, in YNQ rise-falls are once more the preferred accent choice in the nucleus, and H* in pre-nuclear accents. In the shorter utterances, a smaller number of rises and rises with extra raised trailing peaks occurred in N, which were not present in the longer phrases. Variability in pre-nuclear tune choices are largely the same as in the other modes observed for this variety. Summarising we can conclude that YNQ tunes are rather similar to those in ST. Similar to results observed in the other varieties, a boosting of the N peak is characteristic of YNQ compared to ST.

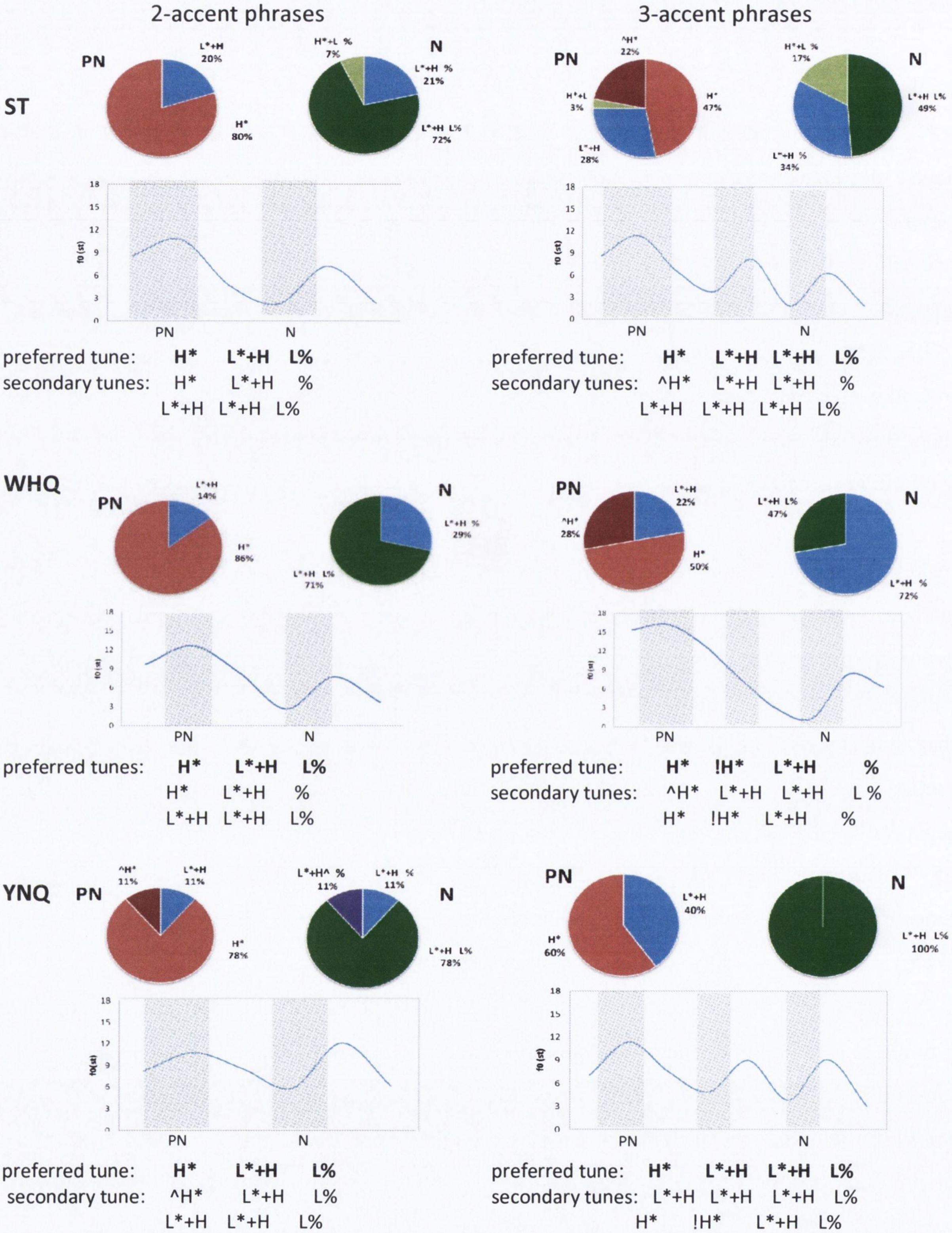


Figure 4.9: Tunes in RG: IP-initial pre-nuclear (PN) and nuclear (N) accent inventory (pie charts) for ST, WHQ and YNQ. F_0 contours (blue lines in grey boxes) are derived from the measured f_0 points for the preferred tune. Left panels show phrases with two potentially accentable syllables, right panels phrases with three potentially accentable syllables. Accentable syllables are shaded in grey. Secondary tunes (dashed blue lines) are shown if token numbers were similar to the preferred tune.

Having established the tonal inventory for pre-nuclear (PN) and nuclear (N) tunes in the four Donegal Irish varieties, the following sections discuss how the derived metrics of phonetic markers outlined in Table 4.3 above in section 4.2.2 show the similarities and/or differences in sentence mode differentiation in the four Donegal Irish varieties. A brief reminder of the calculated measures is give below in Figure 4.10.

4.5 Phonetic Markers

So far, we have examined in detail the preferred tonal patterns for ST, WHQ and YNQ. Now we proceed to a more fine-grained analysis in terms of sentence mode differentiation by analysing possible phonetic markers. The following sections discuss the phonetic markers derived from the direct f_0 measurements: *pitch span*, *N excursion*, *f_0 slope* and *H slope*. A schematic representation of annotation points and derived metrics is shown in Figure 4.10.

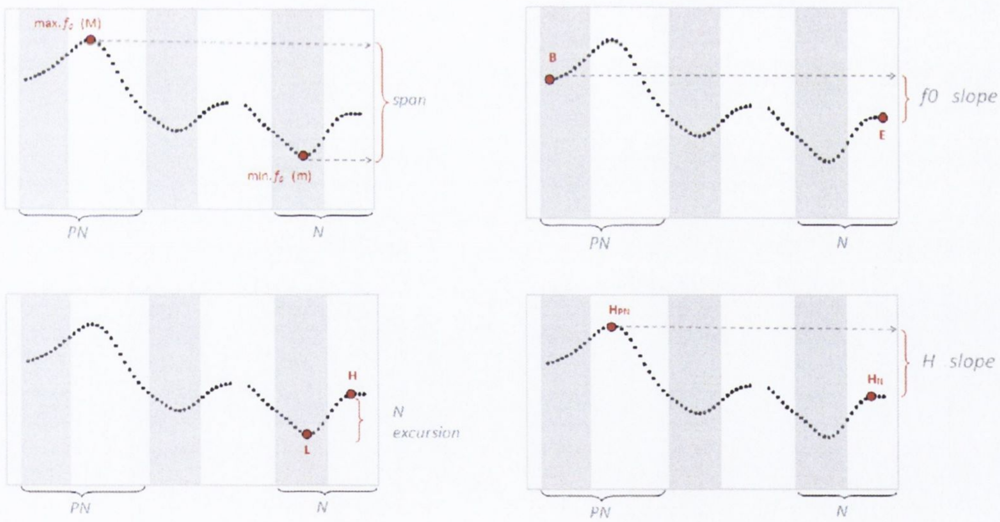


Figure 4.10: Illustrations of an f_0 contour with three rising pitch accents (L*+H L*+H L*+H %) together with the f_0 annotation points (red dots) and derived metrics of phonetic features. Accentable syllables are shaded in grey for pre-nuclear (PN) and nuclear (N) accents.

As pointed out in section 4.2.2, the following derived metrics were calculated for each utterance from the direct measurements:

i) register span (defined as the difference between the absolute f_0 maximum (M) and f_0 minimum (m) in the phrase)

ii) pitch (f_0) slope (E – B)
positive value = rising slope
negative value = falling slope

iii) nuclear (N) pitch excursion ($H_N - L_N$)

iv) slope H (f_0 difference in peak height between pre-nuclear and nuclear H (H_N-H_{PN})
positive value = rising slope
negative value = falling slope

Measures discussed here are calculated for preferred tune types only for each of the four varieties. First, the above named metrics are shown for each variety for the two sentence lengths respectively (Figure 4.11). Then, an overview of pooled data for both sentence lengths is shown for each of the four varieties (Figure 4.12).

4.5.1 Phonetic markers in short and long phrases

An overview of the calculated f_0 measures for each of the varieties is presented in Figure 4.11 below. Similar measures have been used in previous studies (Haan, 2002; Kalaldeh, 2011) to capture sentence mode differentiation.

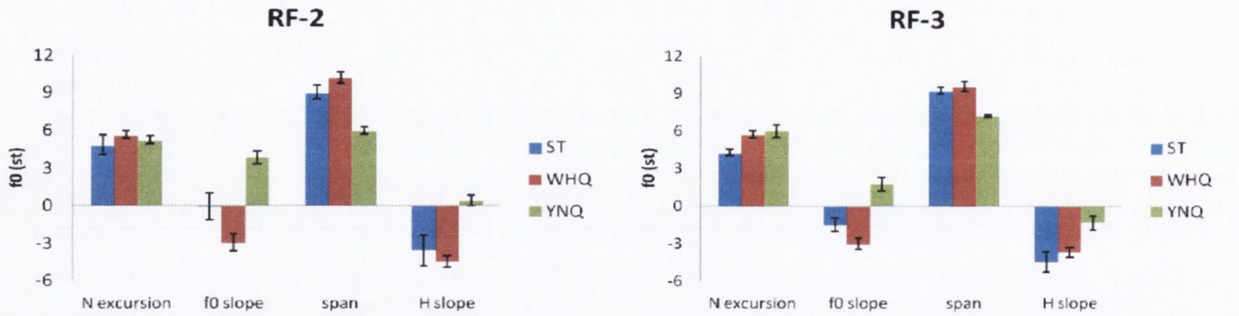
Looking first at the RF variety, the metrics are rather similar across the phrase lengths: N excursion is wider for WHQ and YNQ than for ST. This is a well known feature of question/statement distinction has also been reported for Dutch (Haan, 2002). Further, f_0 slope shows downdrift (= falling f_0 slope) for ST and WHQ, but upsweep (= rising f_0 slope) for YNQ. Earlier analysis of tonal patterns showed that the pre-nuclear accent is raised in WHQ, but it is the nuclear accent in YNQ that gets elevated. Hence this finding complements the analysis of tune types. As regards pitch span, it is widest in WHQ. This is most likely be caused by the raised pre-nuclear peak, which leads to a substantial expansion of the pitch range in this mode. H slope is negative (=falling slope) across the mode types in the longer phrases, but considerably less (reduced) for YNQ than for ST or WHQ, and H slope shows a small increase in YNQ for the shorter phrases. Although a raising of the nuclear peak has elsewhere been described to indicate question intonation more clearly (Grabe, 2004), it seems that raising the N peak higher than the PN peak is not obligatory as long as the slope of downdrift is a lot less pronounced than to ST and WHQ.

As to the BF variety, we can observe similar results to those observed in RF across the metrics with some minor differences. The f_0 slope for ST and WHQ in short phrases is not negative, but nonetheless quite different from YNQ where there is marked upsweep. The related measure H slope shows a similar difference (suspension of downdrift) for WHQ in the longer sentences, but this is less evident for the shorter sentences.

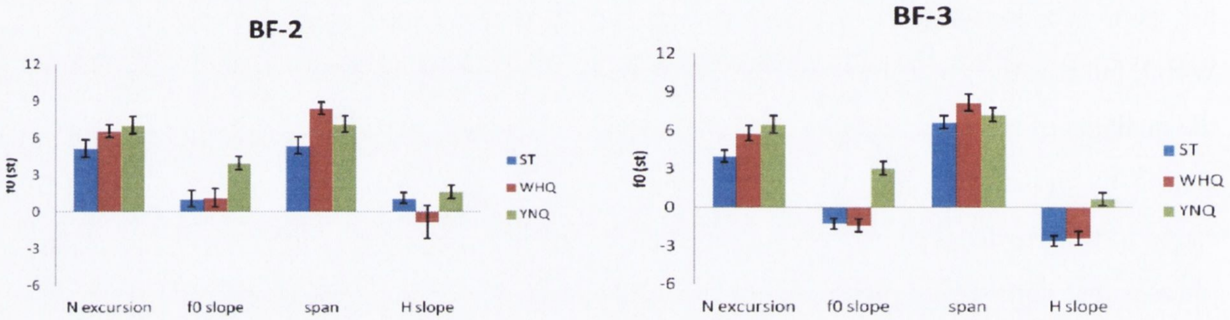
In the GCC variety, results for all metrics across the short and long phrases largely mirror those of RF.

As to RG, we can also observe similar results across the derived metrics, despite the difference in preferred tunes compared to the other three varieties. H slope in YNQ is rising in short phrases, but falling in longer phrases. It is clear, however, that the f_0 slope falls a lot less steeply for YNQ than for ST and WHQ in the longer utterances.

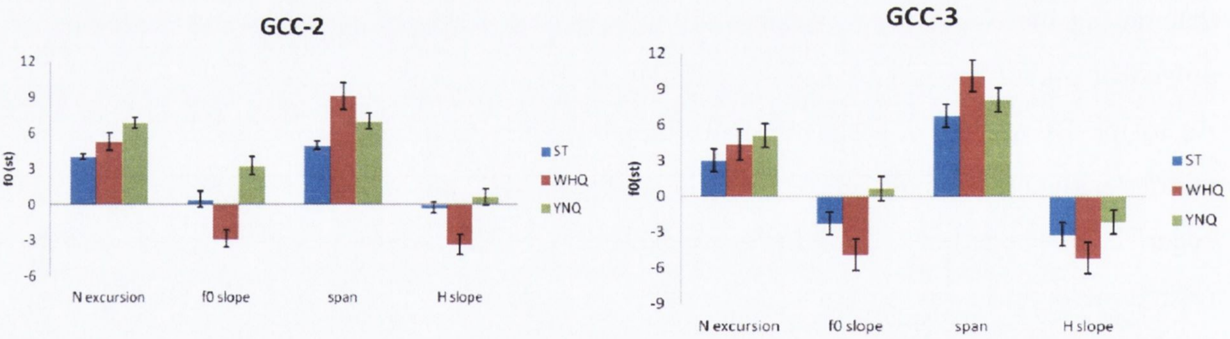
Rann na Feirste (RF)



Baile na Finne (BF)



Gleann Cholm Cille (GCC)



Ros Goill (RG)

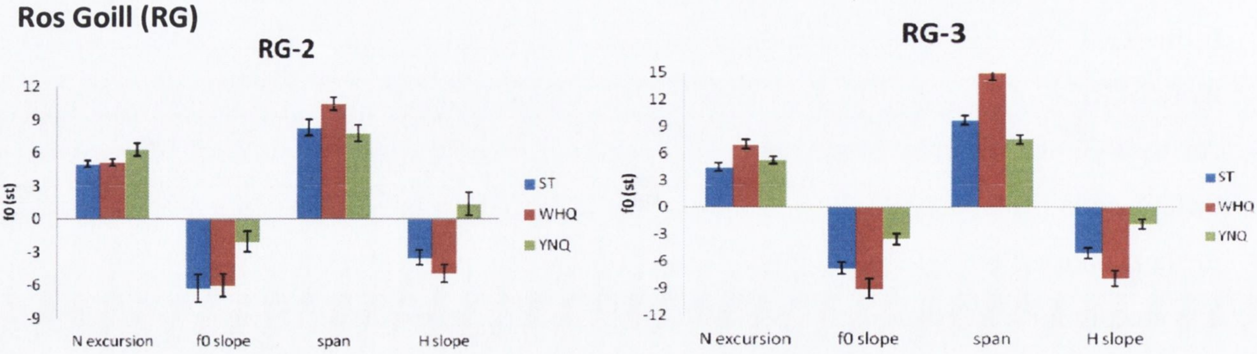


Figure 4.11: Mean values of f_0 metrics N excursion, f_0 slope, span and H slope presented for ST (blue), WHQ (red) and YNQ (green) for short (left panel, RF-2) and long (right panel, RF-3) phrases per variety. Whiskers show standard errors.

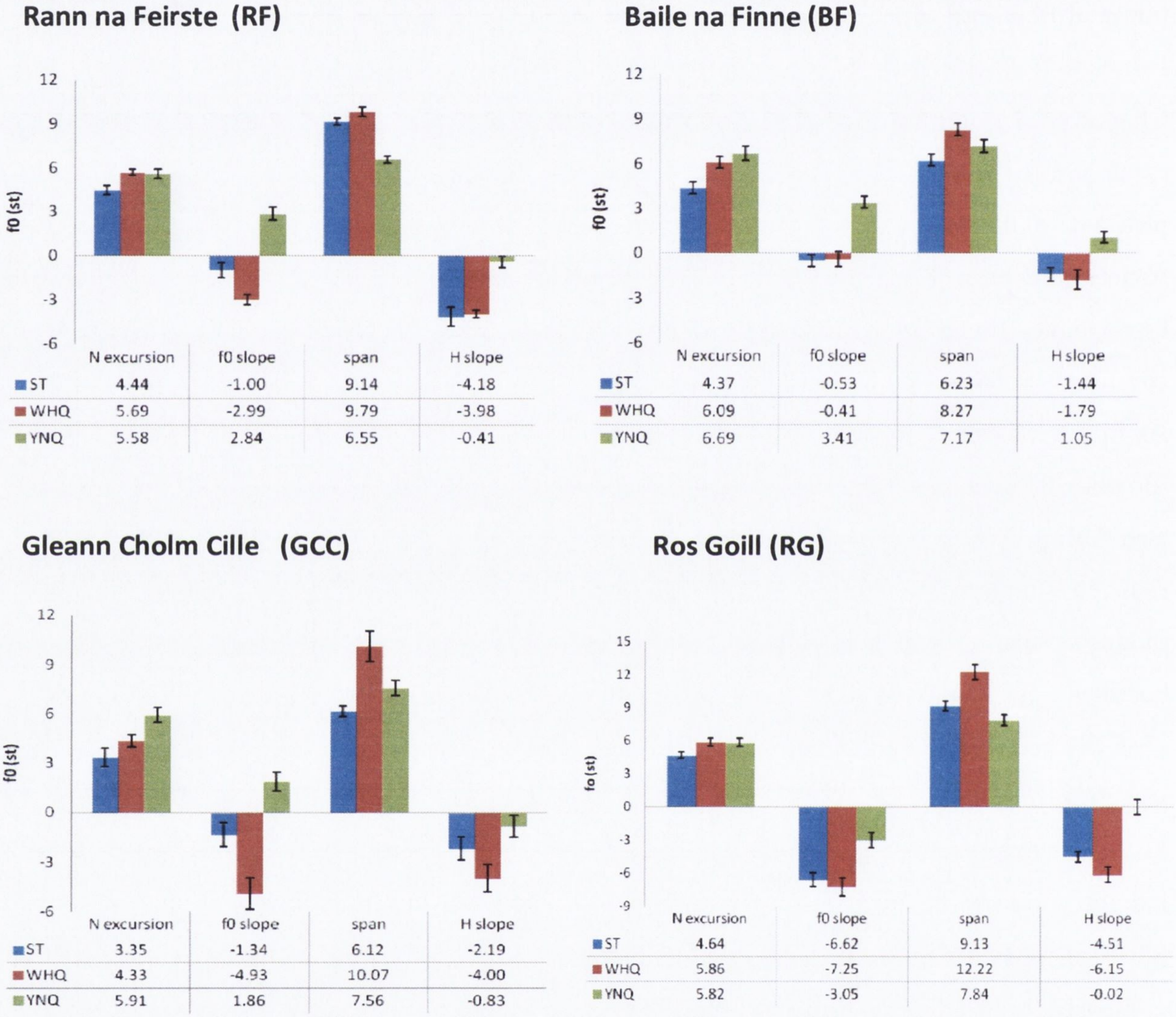
4.5.2 Pooled results of phonetic markers per variety

In Figure 4.12, the pooled data for each of the phonetic markers is presented for each variety (RF, BF, GCC and RG) separately. Despite differences in preferred tonal patterns, the four varieties are rather similar in the use of specific phonetic sentence modality markers and only minor differences are observed. To ascertain the overall impact of sentence mode on the Donegal Irish varieties, a series of statistical analyses were carried out (as explained in Chapter 3.4.1). Statistical tests confirmed, that across the four Donegal varieties, the excursion of the nuclear accent (*N excursion*) is significantly wider in WHQ (t=0, pMCMC=0.0001) and YNQ (t=0, pMCMC=0.0001) when compared to ST. Whereas the varieties differ in the relative extent of the excursion of WHQ and YNQ, both these question types have, on average, a wider excursion than declaratives and this is a phenomenon commonly reported for marking interrogatives.

As to pitch slope (*f_0 slope)*, results show that ST and WHQ are realised with a falling slope (downdrift), whereas it is raised (upsweep) for YNQ in all dialects except for RG where it is also falling. Note, however, that despite the falling slope for YNQ in RG it is noticeably reduced compared to ST and WHQ and so the relative slope differences among sentence modes is also present here. Overall, the differences in f_0 slope were significantly different between ST and WHQ (t=0, pMCMC=0.0001), between ST and YNQ (t=0, pMCMC=0.0001) and also between WHQ and YNQ (t=0, pMCMC=0.0001) across the four varieties.

Looking next at pitch span (*span*), we can observe a similar trend across all varieties: WHQ has the widest pitch span across the three modes and is also significantly larger compared to ST (t=0, pMCMC=0.0001) and YNQ (t=0, pMCMC=0.0001). The relative span in YNQ compared to ST varies across the dialects and is not significantly different (t=0.3891, pMCMC=0.3736). We can attribute the wider register span in WHQ to the raised PN peak (H*).

Finally, *H slope* is on average falling in all modes across the varieties, with the exception of YNQ in the BF variety where the N peak is raised higher than the PN peak. Note, however, that despite down-drifting *H slopes* in YNQ, they are noticeably reduced compared to ST and WHQ, indicating that the N peak is considerably raised compared to that in ST and WHQ, even if the peak does not exceed that in the IP-initial pre-nuclear accent. This suggests that raising the nuclear peak in YNQ compared to ST is a typical feature in distinguishing the two modes, and in this parameter YNQ is significantly different from ST (t=0, pMCMC=0.0001) and also from WHQ (t=0, pMCMC=0.0001). The differences between *H slope* in ST and WHQ are not significantly different (t=0.0117, pMCMC=0.0102).



Rann na Feirste (RF)

	N excursion	f0 slope	span	H slope
ST	4.44	-1.00	9.14	-4.18
WHQ	5.69	-2.99	9.79	-3.98
YNQ	5.58	2.84	6.55	-0.41

Baile na Finne (BF)

	N excursion	f0 slope	span	H slope
ST	4.37	-0.53	6.23	-1.44
WHQ	6.09	-0.41	8.27	-1.79
YNQ	6.69	3.41	7.17	1.05

Gleann Cholm Cille (GCC)

	N excursion	f0 slope	span	H slope
ST	3.35	-1.34	6.12	-2.19
WHQ	4.33	-4.93	10.07	-4.00
YNQ	5.91	1.86	7.56	-0.83

Ros Goill (RG)

	N excursion	f0 slope	span	H slope
ST	4.64	-6.62	9.13	-4.51
WHQ	5.86	-7.25	12.22	-6.15
YNQ	5.82	-3.05	7.84	-0.02

Figure 4.12: Summary of phonetic markers pooled across sentence lengths for ST (blue), WHQ (red) and YNQ (green) modes for each of the four varieties (RF, BF, GCC and RG). Tables below graphs show mean semitone (st) values for each parameter in the graph. Whiskers indicate standard errors.

4.6 Summary

The following sections provide a summary of the main findings from this chapter. A summary of preferred tunes is shown below in Figure 4.13. Superimposed f_0 contours derived from the measured f_0 points are shown per variety per sentence length. Subsequently, an overview of the measured f_0 metrics is given in Figure 4.14, grouped per metric.

4.6.1 Summary of tonal patterns

A brief visual summary of pooled preferred tunes in each variety is shown in Figure 4.13. The illustrations of f_0 contours are superimposed for ST, WHQ and YNQ for direct comparison, but they are not time-aligned. These contours are derived from the previously annotated f_0 points. The mean value of the f_0 points (B, L1, H1, L2, H2, L3, H3, E) across all speakers of the overall preferred tune was calculated separately for each variety.

First of all, we note a difference in the choice of nuclear tune type: the RG variety stands out from the other varieties, showing a preference for rise-falling patterns (L*+H L%) to the more typical rises (L*+H %) in the remaining three varieties. Further, the previously discussed results have shown that the choice in nuclear tone patterns is largely the same across the three modes, but there are more apparent differences in the choice of pre-nuclear tones, especially with regard to WHQ when compared to ST. Although differences in sentence mode may be discernible by tune type (ST vs WHQ), this is not necessarily the case for all modes (ST vs YNQ). Only a more fine-detailed analysis of specific phonetic sentence modality markers shows the more precise differentiation between the ST, WHQ and YNQ. These phonetic markers are summarised and discussed in the following section 4.6.2.

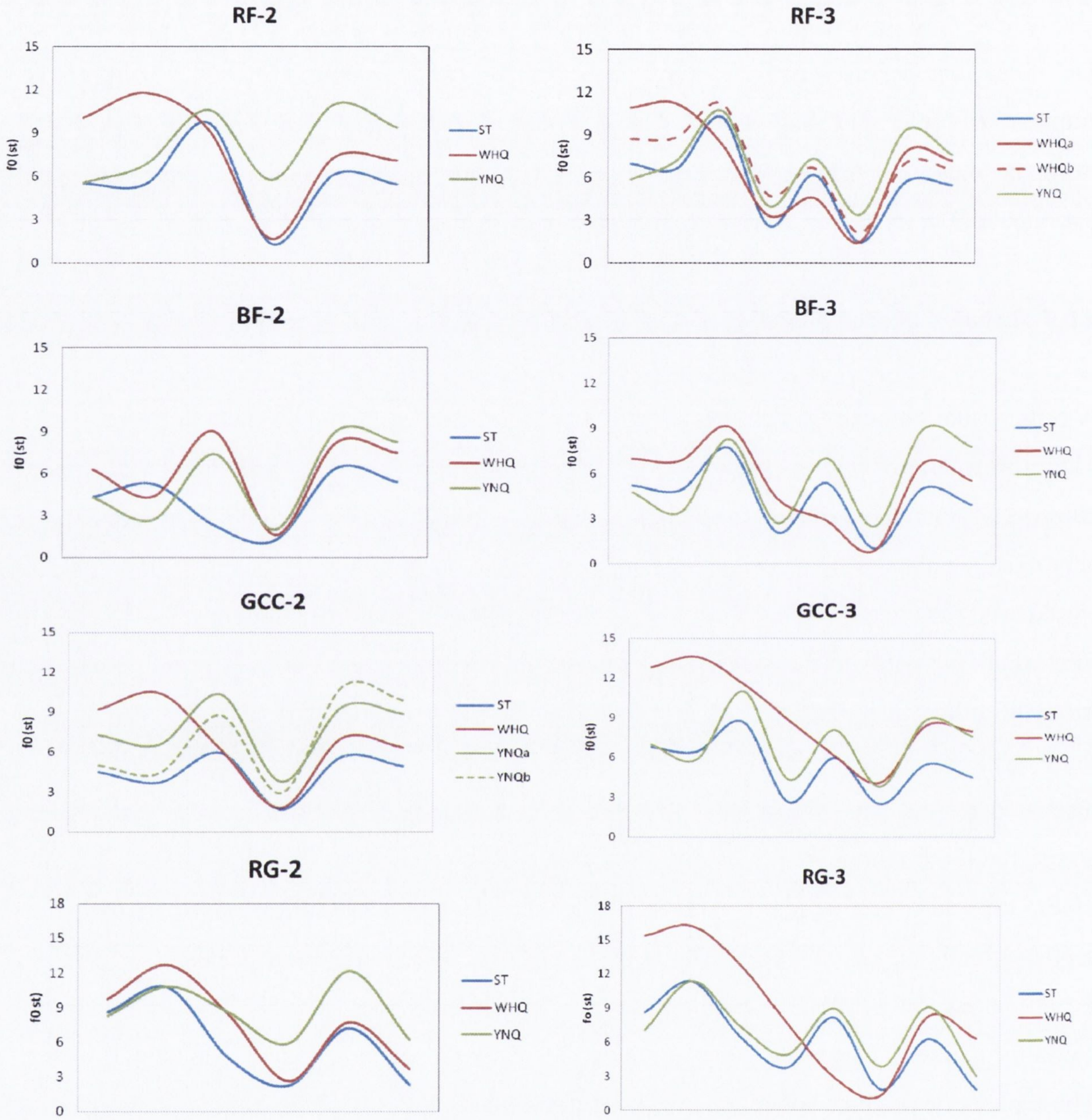


Figure 4.13: Tunes in RF, BF, GCC and RG. Superimposed f_0 contours (in semitones (st)) for ST (blue line), WHQ (red line) and YNQ (green line) are shown for two-accent phrases (left panels) and three-accent phrases (right panels) for each variety separately. Dashed lines indicate secondary tune choices using the same colour coding.

4.6.2 Summary of phonetic markers

Figure 4.14 presents a summary of pooled phonetic measures for each of the calculated metrics across the varieties. As regards the overall *f_0 slope* we note a negative f_0 slope for ST and WHQ in all varieties. YNQ shows upsweep in BF, GCC and RG, but also down drift in RG. This is brought about by the difference in the choice of nuclear tone (L*+H L%).

As to span, WHQ has the highest expansion in all varieties across the three modes. There is variation with regard to ST and YNQ, which suggests that this feature contributes less to the distinction between these two modes.

Similarly, *N excursion* is wider in WHQ and YNQ than in ST. This is the case in all varieties. Overall results show that WHQ and YNQ are distinguished from ST by an overall wider expansion of the nuclear accent excursion. The difference between the two question types is not.

Finally, looking now at the pooled results for *H slope*, we can observe a falling f_0 slope in all sentence modes across the four varieties with the exception of YNQ in BF. Note, also that *H slope* is considerably reduced for YNQ, compared to ST and WHQ.

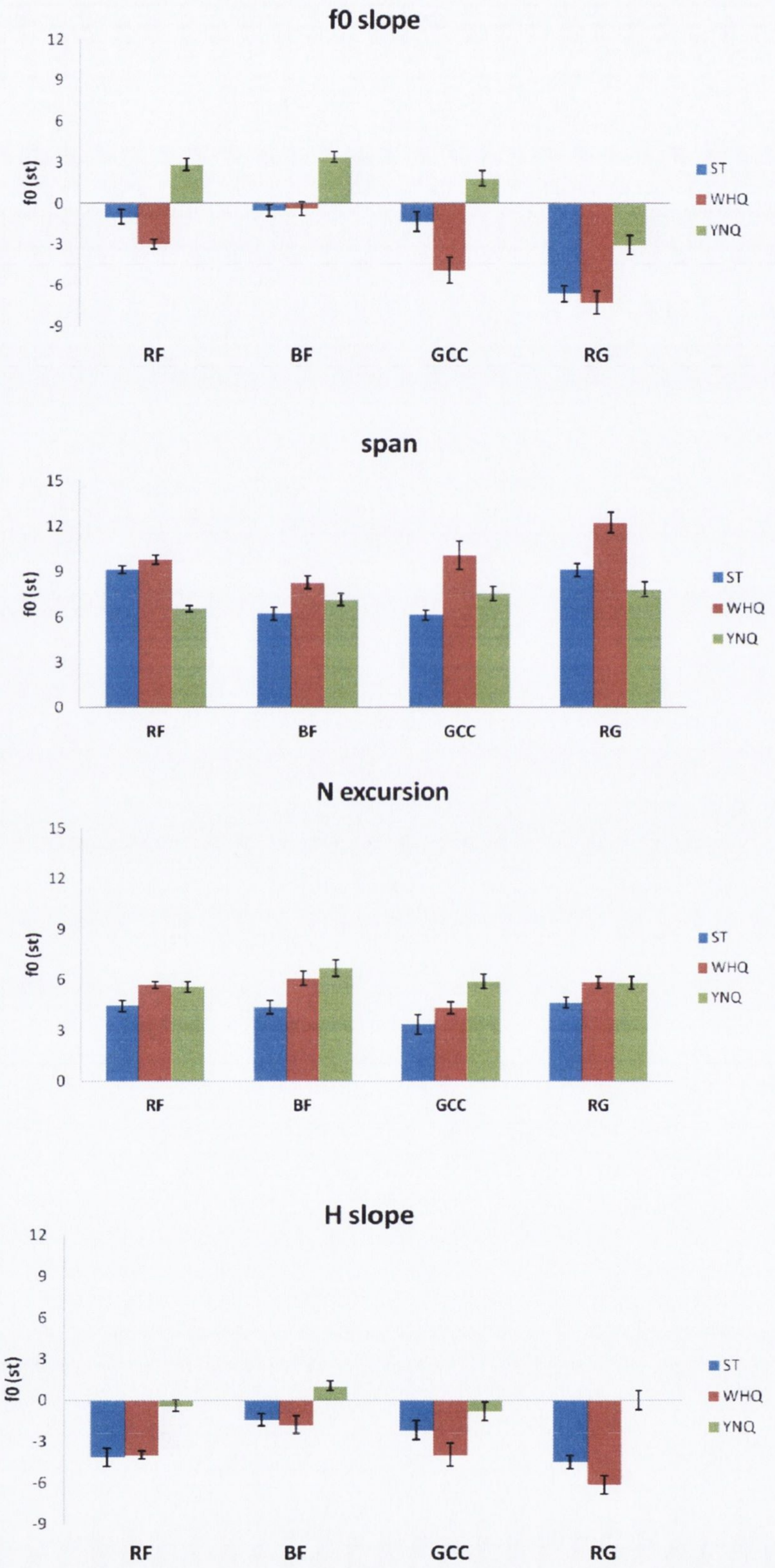


Figure 4.14: Summary of results for phonetic sentence modality markers *H slope*, *f0 slope*, *span* and *N excursion* plotted for ST (blue bars), WHQ (red bars) and YNQ (green bars) on a semi-tone scale (st) (y-axis) for each variety (RF, BF, GCC and RG) (x-axis) separately. Whiskers indicate standard errors.

4.7 Conclusion

This chapter discussed the tunes as well as the phonetic sentence modality markers, distinguishing between statements (ST) and two questions types (WHQ, YNQ) in four local varieties of Donegal Irish (RF, BF, GCC and RG). The analysis started with a broad look at the overall tonal inventories for pre-nuclear (PN) and nuclear (N) tonal patterns for each dialect. Then, an overview of tune inventories for the three modes per variety was presented. In the following sections, preferred tunes and secondary tunes for ST, WHQ and YNQ were outlined, exemplified by f_0 contours derived from the annotated f_0 points, for the phrases with two and three pitch accentable syllables. After this coarse-grained analysis, the subsequent sections looked at the phonetic markers of sentence mode in each variety: pitch slope (f_0 slope), pitch span (*span*), nuclear rise excursion *(N excursion)* and pre-nuclear/nuclear (PN/N) peak height differences (*H slope*). These measures were first discussed in detail for the short and long phrases respectively. Then, a pooled overview of the four metrics was shown for each variety. Concluding, an overview of superimposed ST, WHQ and YNQ pitch contours was presented, for visual inspection of the pitch effects of sentence mode. Similarly, a summary of each of the phonetic measures was shown across the varieties.

This chapter aimed to answer the following research questions:

> **Q1:** In addition to syntactic marking of questions, are ST, WHQ and YNQ differentiated by intonation? If yes, is differentiation achieved
>
> **a)** by tune?

Results from this study showed that in the Donegal Irish varieties, in addition to syntactic markers, sentence modality can also be signalled by intonation. The differentiation by tune is an option, and there is overlap, so that one can, in each dialect, find instances of the same tune type being used for all the sentence modes. So we could conclude that differences in tonal patterns are optional and not obligatory. Since no statistical tests were run on the analysis of tunes, no strong claims can be made. Apart from preferred tunes in each mode, other options are available to speakers to express the same concept. This study draws attention to tune variation in each of the dialects, and even, at times, to some apparent differences in tune preferences across sub-dialects. As to the tonal patterns, a higher number of instances of high tones (H*) can be observed in WHQ compared to ST. The rise L*+H, however, is also a second choice. YNQ have an overall similar nuclear tonal pattern to ST and WHQ (L*+H %), but there are more of instances of rise-falls (L*+H L%) and rises with extra high raised peaks (L*+H^ %) than in the other two modes which suggests that there are more choices with regard to the tune type.

b) by specific phonetic markers of sentence modality?

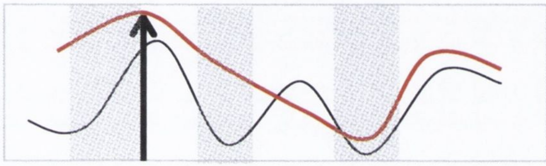
Yes. As to the phonetic markers, both WHQ and YNQ have a significantly wider nuclear (N) rise excursion than ST. WHQ is further characterised by the widest pitch span among the three modes. And as regards pitch (f_0) slope, YNQ is overall characterised by a considerably reduced pitch slope compared to ST, and WHQ. These differences were significant across the different Donegal varieties.

Q2: How are ST, WHQ and YNQ differentiated in the individual sub-dialects?

The same phonetic sentence modality markers are used by speakers of all varieties, however, to varying degrees. The sentence mode differentiation includes a boosting of the pre-nuclear part of the phrase for WHQ and a boosting of the nucleus in YNQ.
More precisely, as regards the pre-nuclear accent in WHQ it seems to be the case that both L* and H turning points are raised substantially in the speaker's pitch range. Alternatively there may be a H*. It is tempting to speculate that the raised L*+H is the basic pattern, which may have, over time, given rise to the H*. For YNQ, the nuclear L and H targets are substantially raised and typically the entire phrase is produced on a higher register level than ST. In more extreme realisations this nuclear raising may result in a perceptibly different rise L*+H^ %. Figure 4.15 provides a visual summary of the main prosodic features distinguishing WHQ and YNQ from ST.

- **WHQ** — IP initial — use of:
  - PN (Acc 1)
  - **H*** **(tune)**
  - deaccentuation/ reduction of Acc 2
  - **(metrics)**
    - expanded pitch span
    - steeper f_0 slope
    - higher N excursion

  → **Raising of 1st PN accent**



- **YNQ** — IP final — use of:
  - **(tune)**
    - more L*+H^ % tunes
    - extra audibly high nuclear peak (even though considered a variant)
  - **(metrics)**
    - raised f_0 slope, H slope
    - higher N excursion

  → **Raising of N accent**

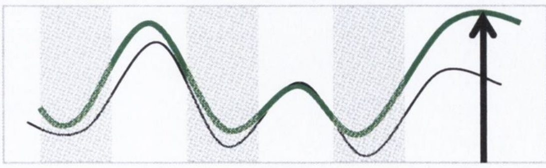


Figure 4.15: Summary of the use of phonetic markers in the expression of interrogativity.

Q3: Is the differentiation between ST, WHQ and YNQ achieved in the same way in the different sub-dialects with regard to Q1 a) and/or b)?

✓ **a)** tune?

Yes. As regards Q2 (a), results showed that there are sub-dialect differences in the choice of preferred tunes for each of the sentence modes. RG stands out from the other varieties by a preference in rise-falling tunes L*+H L% in nuclear and high IP-initial pre-nuclear pitch accents H* across ST, WHQ and YNQ. RF, BF and GCC, on the other hand, group together in having the rise-plateau L*+H % as their first choice in nuclear tune type. These dialects tended to show more variability in the PN accents.

✗ **b)** specific phonetic sentence modality markers?

As to Q2(b) on the whole all varieties use the same means to differentiate between declaratives and the two question types. Cross-differences only emerged in one parameter (f_0 slope) which showed down drift in RG, but not in the other varieties. This is due to the different choice in pitch pattern which tends to end with a low boundary tone (L*+H L%).

Findings from this thesis also largely support the findings of our pilot study (Dorn, O'Reilly & Ní Chasaide, 2012). Both studies, register span (*span*) is widest in WHQ compared to ST. The nuclear rise excursion (*N excursion*) is also the parameter distinguishing both WHQ and YNQ from ST. As regards *H slope*, however, results from this study showed that both WHQ and YNQ were differentiated from ST by this parameter. In the pilot experiment, *H slope* was only significantly different for YNQ compared to ST, but not for WHQ and ST. We reason that this difference may be due to the smaller sample size in the pilot experiment.

5 Tonal alignment

5.1 Introduction

This chapter deals with the alignment of tonal targets relative to the segmental string in the Donegal Irish varieties. The analysis is based on the sentences outlined in section B of the corpus (see Appendix 2). A detailed description of the materials in this study is given in section 5.2.1, and the specific annotation points and the derived measures are outlined in section 5.2.2.

As reviewed in Chapter 2.8, the alignment of specific tonal target points to the segmental string is a central part of the AM analysis that has been well studied over the last years from varying perspectives. Some studies have, for example, looked at how differences in syllable structure and intrinsic segment durations affect segmental anchoring (Dilley et al., 2006; Ladd, 2008; Ladd et al., 2009), while other studies have looked at the effect of varying rhythmic conditions of anacrusis or tail length on the alignment of accentual peaks or valleys (Dalton & Ní Chasaide, 2007a; Knight, 2004; Ladd, 2008; F. Nolan & Farrar, 1999; Schepman et al., 2006; Silverman & Pierrehumbert, 1990; Sullivan, 2007b). Alignment differences between varieties of the same language have also been addressed in several studies (Atterer & Ladd, 2004; Dalton & Ní Chasaide, 2005a, 2005b, 2007a; Ní Chasaide & Dalton, 2006; Sullivan, 2006).

As mentioned in Chapter 2.8, most research on alignment has focussed on the alignment of peaks in bi-tonal falling (H*+L) or mono-tonal high (H*) pitch accents, and only a small number of studies have covered the analysis of tonal alignment of rises (L*+H). For these rising accents, in principle, both the L and H targets might be subject to an influence of either the preceding or the following context (cf. Dalton & Ní Chasaide, 2005b; Sullivan, 2006; 2007; Atterer & Ladd, 2004), and for that reason both contexts are looked at here: the effects of the preceding context is examined by varying the size of the anacrusis for the initial pre-nuclear accent; the effects of the following contexts are examined by varying the length of the tail following the nuclear accented syllable.

In Chapter 4 of this thesis we have established that the rise L*+H is the dominant pre-nuclear and nuclear accent type in the four Donegal Irish varieties, similar to the geographically close Gaoth Dobhair Irish (cf. Dalton, 2008). The RG-variety, however, overall low boundaries in nuclear tunes (L*+H L%), and the rise L*+H % was also a second choice. Given the tonal alignment features reported for Gaoth Dobhair Irish (Dalton & Ní Chasaide, 2003, 2005b), and discussed in Chapter 2.8, a default expectation might be that four varieties analysed in this study show similar alignment features for the L and H targets. If so, we would expect L* to be aligned to the end of the vowel of the accented target syllable, and the H peak to increasingly drift rightwards with the increased amount of unstressed material after the nucleus. On the other hand, we are open to the possibility that this default expectation might not be borne out. In a study of the very closely related varieties of the southern dialect of Connemara (Cois Fharraige and Inis Oírr varieties), some striking differences in tonal alignment emerged (Dalton, 2008; Dalton & Ní Chasaide, 2005a; 2007b; Ní Chasaide & Dalton, 2006). It was therefore of interest to establish whether such variation might also apply in these Donegal varieties.

To recap, this chapter addresses the following research questions:

Q1: How does an increased

a) tail length b) anacrusis

affect the alignment of L and H turning points relative to the accented syllable?

Q2: Are there sub-dialect differences with regard to Q1 (a) and/or Q (b)?

This study looks at the effect of varying rhythmic conditions after the nuclear accent (N) and before the IP initial pre-nuclear accent (PN) on the alignment of the low elbow (L) and the high peak (H) of the rising pitch accents (L*+H). The rhythmic conditions are tested in two separate sets: (a) increasing the anacrusis size by adding up to two unstressed syllables before the initial pre-nuclear accent and (b) increasing the tail length by up to two unstressed syllables after the nuclear accent. The conditions were as follows (see Table 5.1 below):

Table 5.1: Pre-nuclear (PN) and nuclear (N) alignment conditions.

(a)	Pre-nuclear (PN) conditions	(b)	Nuclear (N) conditions
0PN	no syllables preceding the IP-initial accented syllable	**N0**	no syllables following the IP-final accented syllable
1PN	one syllable preceding the IP-initial accented syllable	**N1**	one syllable preceding the IP-final accented syllable
2PN	two unstressed syllables preceding the IP-initial accented syllable	**N2**	two unstressed syllables preceding the IP-final accented syllable

The timing of L and H are calculated relative to the onset of the accented syllable *'lán'* /lˠæːnˠ/. Here L and H alignment (*al-L*, *al-H*) are presented both in **absolute** terms as the interval in milliseconds (ms) from the onset of the accented syllable to either L or H, and as **proportions** which present this interval as a percentage (%) of the duration of the accented syllable (see Figure 5.1). Both absolute and proportional values are included in the present analysis since it has been pointed out that results for the same targets may differ if expressed in absolute or relative terms (Knight & Nolan, 2006). (Note that what we term *al-H* would be frequently referred to as 'peak delay' in the literature e.g., (Gussenhoven, 1984). A further measure included was the time-interval between the two tonal targets, i.e. the distance between the low elbow (L) and the high peak (H) of the rise (L*+H) in milliseconds, which we term the *LH interval*.

There is a potential problem that arises in relation to what we are referring to as the accented syllable 'lán' /lˠæːnˠ/. At the time of planning these materials, we were operating with the assumption, very frequent in the literature on Irish phonetics, and also adopted in the earlier work on Irish intonation (Dalton & Ni Chasaide, 2005b, 2007b discussed in Chapter 2.8), that the final consonant in /lˠæːnˠ/ belongs to the accented syllable. Although widespread, this view is not universally held however (see discussion in Chapter 2.3.2). A recent experimental study (Ní Chiosáin et al., 2012) suggests that the situation is complex and that syllabification may vary with factors such as the duration of the accented vowel. In the design of the sentence set for this experiment a problem therefore arises. In the N2 and 2PN conditions, the word 'lán' /lˠæːnˠ/ was followed by a vowel: effectively, this entails that the syllabification is potentially uncertain. The final consonant in the N2 and in 2PN conditions could be treated as a coda as was initially assumed, but it is also possible (especially as the vowel in 'lán' is a long vowel) that the final consonant is ambi-syllabic. So in this chapter, while we refer to 'lán' /lˠæːnˠ/as the accented syllable, this caveat must be borne in mind, and the uncertainty concerning syllabification in these two conditions mentioned is something that we will need to bear in mind also in interpreting results.

The analysed materials and specific annotation methodology is outlined below in section 5.2. Tonal alignment in nuclear (N) tunes is discussed for each of the four Donegal Irish varieties in section 5.3, and section 5.4 covers the analysis of pre-nuclear (PN) alignment features. A summary is given in section 5.5 and conclusions are drawn in section 5.6. To conclude, similarities and differences to previously reported alignment characteristics in Irish dialects are provided in section 5.7. Similarities and differences to UNB English varieties are discussed in section 5.8.

5.2 Materials and Methodology

This section outlines the materials designed for the investigation of tonal alignment features in the four Donegal Irish varieties along with the annotation of tunes and specific phonetic parameters. Section 5.2.1 outlines the speech material (the target phrases together with the elicitation contexts) and section 5.2.2 explains the methodology (tune annotation and specific f_0 measurements).

A total of 480 tokens were collected for this part of analysis: 6 conditions x 5 repetitions x 4 speakers x 4 dialects. A total of 197 tokens across the 6 alignment conditions were excluded, because of disfluencies, production of narrow focus on particular elements in the phrase, disruption of the pitch contour due to creaky voice, coughs or laughs. A breakdown of the specific token numbers is shown in Table 5.2 below.

Table 5.2: Overview of token numbers for PN and N conditions in this study.

	#	repetitions	no. of speakers	varieties	total no. of tokens	tokens excluded	tokens analysed
0PN	1	5	4	4	80	-31 (39%)	49 (61%)
1PN	1	5	4	4	80	-35 (44%)	45 (56%)
2PN	1	5	4	4	80	-31 (26%)	59 (74%)
N0	1	5	4	4	80	-42 (52%)	38 (48%)
N1	1	5	4	4	80	-28 (35%)	52 (65%)
N2	1	5	4	4	80	-30 (37%)	50 (63%)

5.2.1 Materials

Section B of the corpus (included in Appendix 2) contains the set of sentences designed for investigating tonal alignment with varying rhythmic contexts in the pre-nuclear (PN) and nuclear (N) conditions. Similar to what was described for the previous data chapter, all phrases were annotated manually in Praat (Boersma & Weenink, 2008) and the values extracted automatically with Praat scripts (Welby, 2008). The pre-nuclear speech material in this section is composed of phrases where the number of unstressed syllables before the phrase-initial pitch accent (PN) varying between zero and two (0PN, 1PN, 2PN), see Table 5.3. In the nuclear set, the unstressed syllables following the nuclear pitch accented syllable (N) vary between zero and two (N0, N1, N2), see Table 5.3. The target syllable is the syllable *'lán'* /ˈlˠæːnˠ/ which was the same across the two sets. This strategy is adopted to investigate the behaviour of pitch peaks and valleys depending on a varying preceding/following rhythmic context. For the full set of phrases and the elicitation context see also Appendix 2. For the full list of annotation points, extracted values and derived metrics see Table 5.4.

Table 5.3: Phrases in pre-nuclear (PN) and nuclear (N) conditions for investigating tonal alignment. Target sentences are shown along with the elicitation contexts.

Q:	D'tíg	leat	an	leabhar	seo	a	thógáil?
	Could	*you*	*the*	*book*	*this*	*to*	*take*
	/ 'dʲɪɟ	lʲatˠ	ənˠ	'lʲorˠ	ʃɤ	ə	'hogalʲ /
	Could you take this book?						
N0:	Tá	brón	orm.	Tá	mo	mhála	lán.
	is	*sorrow*	*on me*	*is*	*my*	*bag*	*full*
	/ tˠæ	'bˠrˠonˠ	ɤrˠəmˠ/	/tˠæ	mˠə	'walˠə	'lˠænˠ/
	I'm sorry.		'My bag is full.'				

Q:	A' bhfuil	uisce	ar	bith	fágtha	sa	bhaile?
	is there	*water*	*any*	*left*	*in*	*the*	*home*
	/əwˠɪlʲ	'iʃcə	ərˠ	bʲi	'fˠak ə	sˠə	'walʲə/
	Is there any water left at home?						
N1:	Tá.	Tá	an	citeal	lán	de/do.	
	is	*is*	*the*	*kettle*	*full*	*of it*	
	/ 'tˠæ /	/ 'tˠæ	ənˠ	'citʲəlˠ	'lˠænˠ	dˠə/	
	'Yes.'	'The kettle is full of it.'					

Q:	An	bhfuil	aon	uisce	sa	bhaile?
	is there	*any*	*water*	*in the*	*home*	
	/ənˠ	'wilʲ	enˠ	'iʃcə	sˠə	'wˠalʲə /
	Is there any water at home?					
N2:	Tá.	Tá	an	citeal	lán	aici.
	is	*is*	*the*	*kettle*	*full*	*she has*
	/ 'tˠæ /	/ 'tˠæ	ənˠ	'citʲəlˠ	'lˠænˠ	ɛci/
	'Yes.'	'She has the kettle full of it.'				

Q:	Caidé	mar	a bhí	an	dioscó?
	How	*was*		*the*	*disco*
	/cə'dʲe	mˠarˠ	ə 'vʲi	ənˠ	'dʲisˠko/
	How was the disco?				
0PN:	Lán	go	dtí 'n	doras.	
	full	*to*	*the*	*door*	
	/'lˠænˠ	gə	dʲinʲ	'dˠʌrˠəsˠ/	
	'Full to the door.'				

Q:	Cé	nár	thaitin	an	cóisir	leo?
	Who	*didn't*	*enjoy*	*the*	*party*	*with them*
	/'ce	nˠærˠ	'hatʲənʲ	ənˠ	'koʃərˠ	lʲɔ /
	Who didn't enjoy the party?					

1PN:	A	lán	de	na	seandaoine.
	a	*lot*	*of*	*the*	*old people*
	/ə	'lˠænˠ	dˠe	nˠə	'ʃanˠdˠinʲi /
	'A lot of the old people.'				

Q:	An	raibh	trioblóid	leis	na	mic	léinn	aréir?
	was there		*trouble with*	*the*		*students*	*last night*	
	/ ənˠ	ɾˠo	'tʲɾʲibˠlˠodʲ	lʲiʃ	nˠə	mʲic	'lʲenʲ	ə'ɾˠeɾʲ/
	Was there trouble with the students last night?							

2PN:	Bhí	a	lán	acu	ag	ól.
	was	*a*	*lot*	*of them*	*drinking*	
	/'vʲi	ə	'lˠænˠ	aku	eɟ	'olˠ/
	'There were a lot of them drinking.'					

5.2.2 Annotation of tunes and measurement points of alignment features

First, all utterances were manually labelled and transcribed in Praat (Boersma & Weenink, 2008) using IViE labelling (Grabe, 2001). Each phrase was orthographically transcribed, stressed syllables marked and pitch patterns and boundary tones labelled. Then segments for duration exaction were annotated. Also, the low f_0 elbow on the target syllable and the high f_0 trailing peak were marked (see Figure 5.1). For each phrase, the duration of each segment of the target syllable was extracted, as well as the duration of the target word and preceding and following unstressed syllables (see Table 5.4 for details on the calculations derived from the annotated segments and target points).

As to the annotation of low tonal targets (L*), the data showed that these were more often realised as low plateaux, or level stretches of varying lengths rather than local points, making an identification of an absolute target difficult. This phenomenon has been observed before for high peaks being realised as high plateaux (Knight & Nolan, 2006), but has also been reported for low level stretches (Arvaniti, Ladd, & Mennen, 2006; Grice, Ladd, & Arvaniti, 2000; Lickley, Schepman, & Ladd, 2005). In such cases the elbow is favoured as the most suitable measure (Xu, 1998).

The alignment of the low elbow (*al-L*) and the high peak (*al-H*) is first calculated in absolute terms in milliseconds (ms) from the beginning of the accented syllable. Further it is also shown in proportional terms as a percentage (%) of the average duration of the accented syllable. The absolute duration of the interval between low elbow and the peak (the *LH interval*) was also calculated, as it appear to be assumed in the literature that a constant timing relationship is maintained between the targets in complex tones (e.g. Grice, 1995). Figure 5.1 shows an illustration of the f_0 annotation points in Praat and Table 5.4 lists the full set of transcription symbols, extracted values and derived metrics.

Table 5.4: Overview of labels of direct acoustic annotations, extracted values and derived measures

f_0 labels	
L	low elbow
H	high peak (or, less often, onset of high plateau)
Syllable labels	
sp2	2nd unstressed syllable preceding the accented target syllable
sp1	1st unstressed syllable preceding the accented target syllable
s1	accented target syllable 'lán'
s2	1st unstressed syllable following the accented target syllable
s3	2nd unstressed syllable following the accented target syllable
Extracted f_0 time points	
timeL	time of L in seconds
timeH	time of H in seconds
Extracted syllable timepoints	
begsp2	beginning of the second unstressed syllable preceding the target syllable
begsp1	beginning of the first unstressed syllable preceding the target syllable
begs1	beginning of the target syllable 'lán'
ends1	end of the target syllable 'lán'
ends2	end of the first unstressed syllable following the target syllable
ends3	end of the first unstressed syllable following the target syllable
Extracted syllable durations in milliseconds (ms)	
dursp2	duration of the 2nd unstressed syllable preceding the accented target syllable
dursp1	duration of the 1st unstressed syllable preceding the accented target syllable
durs1	duration of the accented target syllable 'lán'
durs2	duration of the 1st unstressed syllable following the accented target syllable
durs3	duration of the 2nd unstressed syllable following the accented target syllable
Derived measures of tonal (L and H) timing in milliseconds	
al-L	**absolute** duration of the low elbow from the beginning of the accented target syllable • **proportional** distance of the low elbow from the beginning of the accented target syllable as a percentage of the syllable duration (%)
al-H	**absolute** duration of the high peak from the beginning of the accented target syllable • **proportional** distance of the high peak from the beginning of the accented target syllable as a percentage of the syllable duration (%)
LH interval	**absolute** time interval between the low elbow and the high peak

The measures *al-L*, *al-H* and *LH interval* as shown in Table 5.4, will be used to address the specific research questions concerning tonal alignment in the RF, BF, GCC and RG varieties (see sections 5.4 and 5.5) in this chapter. No statistical hypothesis tests were run on the parameters, due to the small sample size. Instead, means and standard deviations (st.dev.) are reported for *al-L*, *al-H* and *LH interval* for each dialect.

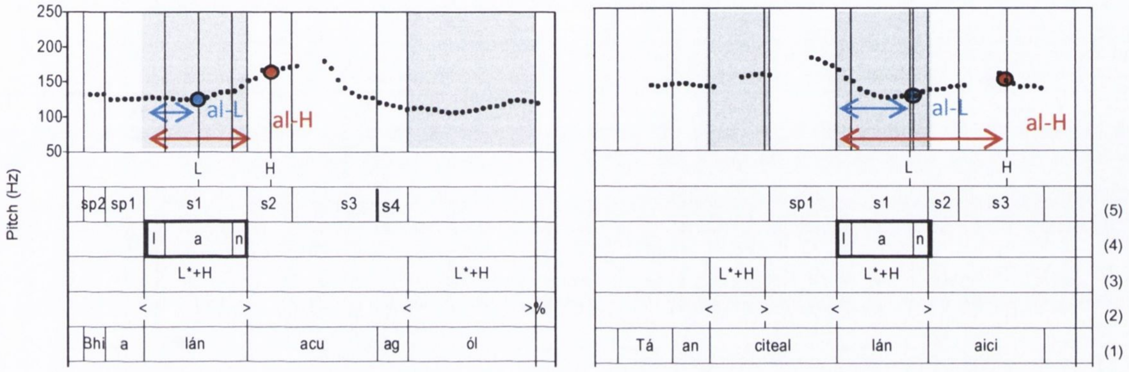


Figure 5.1: Illustrations of f_0 annotation points and derived metrics of alignment features. Orthographic transcription (tier 1), marking of stressed syllables and boundary tones (tier 2) transcription of tones using IViE labelling (tier 3), marking of segmentals of the target syllable (tier 3), annotation of syllables for extraction of duration values (tier 4), marking of f_0 low elbow and high peak (tier 5). For full explanation of transcription symbols see Table 5.4. The example utterances are: *Bhí a lán acu ag ól* /vʲi ə 'lˠænˠ aku eɟ 'olˠ/ 'There were a lot of them drinking.' (left panel) and *Tá an cíteal lán aici* /tˠæ ənˠ 'citʲəlˠ 'lˠænˠ ɛci / 'She has the kettle full of it.' (right panel).

The following sections are now going to look at alignment in the nuclear (N) and pre-nuclear (PN) conditions in each of the four Donegal Irish varieties respectively. The average alignment of the low (*al-L*) and high (*al-H*) turning points in and around the target syllable is shown in diagrams with absolute durations (ms) as well as the proportions (%) of the mean durations of target syllables. In addition, the time interval between the low elbow and the high peak (*LH interval*), along with all mean absolute values for *al-L* and *al-H* for the three PN and three N conditions respectively are shown in box plots for each local variety. The number of tokens, mean numeric values and standard deviations are presented in tables, along with the mean duration of *al-L,* averaged across the three alignment conditions (N0, N1, N2). Finally, a summary of the main findings from this experiment across the dialects is presented at the end of this chapter together with a discussion on the absolute and proportional measures.

5.3 Nuclear (N) alignment as a function of tail length

5.3.1 Preliminary comments

We look here at how increasing the length of the tail might affect the timing of the L and H targets in the nuclear accent, and examine whether these targets occur later as the tail lengthens.

Before discussing nuclear alignment in each of the Donegal Irish varieties, we here provide a commentary on cross-speaker variation and speaker specific features that emerged during data analysis and should be pointed out prior to the discussion of results for clarity in the sections that follow. In the BF variety, we noted a general trend of speakers producing an IP-final breathy voice-offset (Figure 5.2) which gave the visual impression of a dropping f_0 after the rise. This unusual dip in the pitch contour, however, was not audible.

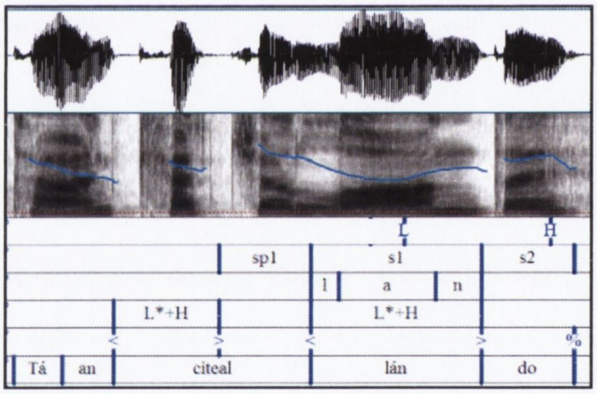


Figure 5.2: Example of IP-final breathy voice-offset, showing as a visible dip in f_0 that is not audible. (Tá an citeal lán do/de. /tʸæ ənʸ 'citʲəlʸ 'lʸænʸ dʸə/ *'The kettle is full of it.'*). Soundfile: DI-BF-ANM-N1-1.

In the RG variety, we noted obvious differences in tunes and alignment characteristics in the nuclear (N) conditions between the two younger speakers FP and MM, and the two senior speakers AML and SMO. As regards differences in tunes, the four RG speakers commonly produced rise-falling pitch patterns in the phrase final accent group (L*+H L%) across N1 and N2, but differences emerged in the N0 condition: the younger speakers FP and MM (see Figure 5.3 panel a), produced utterances overall with rising tunes (L*+H %), whereas the two senior speakers AML and SMO (see Figure 5.3, panel b), produced overall rise-falling tunes

(L*+H L%), similar to the other environments. Results from speakers FP and MM in panel (a) were excluded from the comparative analysis, since the overall preferred tune across the nuclear conditions analysed here is L*+H L%, and so N0 is left blank in result Figures 5.10, 5.11, and Table 5.8.

As to the alignment characteristics in the nuclear accent (N), the two younger speakers (FP, MM) aligned both L and H targets earlier than the two senior speakers. Consequently their data had was not averaged, but plotted separately in section 5.3.5 where N alignment is discussed.

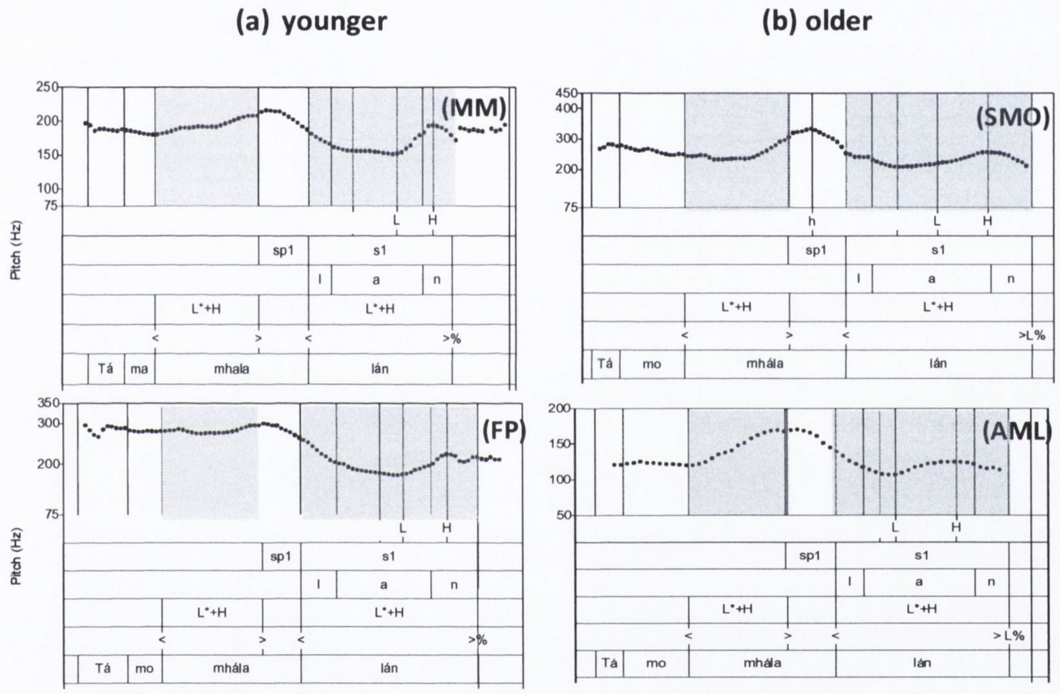


Figure 5.3: Illustrations of speaker specific alignment differences of the L and H targets in the N0 condition from speakers of the RG-variety. Panel (a) (left) shows examples from the two younger speakers (FP, MM). Panel (b) (right) shows examples from the two senior speakers (AML, SMO). The target phrase is: Tá mo mhála lán. /tˠæ mˠə 'walˠə 'lˠænˠ/ *'My bag is full.'*. Example soundfiles: DI-FP-N0-3; DI-MM-N0-2; DI-SMO-N0-2; DI-AML-N0-3.

5.3.2 Rann na Feirste (RF)

In this section a description of alignment as a function of varying the rhythmic context after the nucleus (N) is discussed for the Rann na Feirste (RF) variety. Figure 5.4 presents a summary of tune types (left panel). For the main tune type (black squared box) the alignment results are shown in the right panel, as follow: the absolute durations as well as relative proportional measures of the low elbow (*al-L*) and high peak (*al-H*) relative to the onset of the accented syllable in each of the three rhythmic conditions. Each of the segments of the target syllable 'lán' /lˠænˠ/ is shown in white, the following unstressed syllables are shaded in grey. Blue arrows show the average location of the low elbows, red arrows the average location of the peaks. A summary of the average values for *al-L*, *al-H* and *LH interval* together with their standard deviations is shown in Table 5.5.

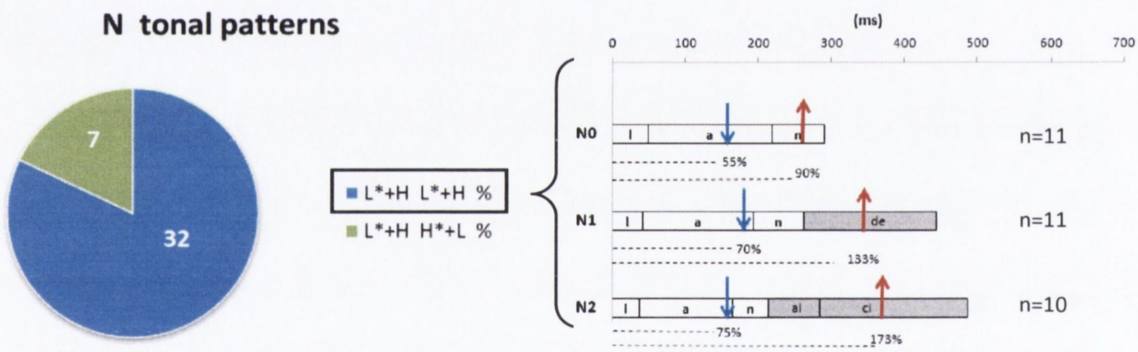


Figure 5.4: Nuclear (N) alignment in Rann na Feirste (RF). Left: summary of tunes including token numbers. Right: for the main tune type, framed in black box (n=32) and illustrations of durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in milliseconds (ms). The nuclear alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) are shown in the three varying rhythmic conditions N0, N1 and N2: for each condition % values beneath show these timings as % of the duration of the accented syllable.

Looking first at the tonal patterns (Figure 5.4., left), the most common tune type across all phrases in this set is the rising tune L*+H L*+H % (n=32). A small number of phrases with falling pitch patterns in the nucleus (L*+H H*+L %) (n=7) were observed, but these were realised by two speakers (RMD, MNG) in N1 and N2. Phrases with tonal patterns other than the main tune type were excluded from further analysis. The following averaged measurements are based on the main tune type only.

As regards the absolute alignment measures (see arrows in Figure, 5.4, Figure 5.5 and Table 5.5) we can observe that in absolute terms the L elbow (*al-L*) alignment is relatively stable in relation to the onset of the syllable with only minor differences (see Figure 5.5 left panel). On average, *al-L* is aligned at 166ms into the accented syllable. The timing of H is somewhat later in N1 and N2 than in N0 (see Figure, 5.5 mid panel). The absolute distance between L and H also increases in N1 and N2 compared to N0 (see Figure, 5.5 right panel).

Regarding the proportional measurements of *al-L* and *al-H* (Figure 5.4, right) we can observe the following trends: with respect to tail length, both L and H occur progressively later relative to the accented syllable. L is on average aligned around the middle of the vowel in N0 but occurs later in the syllable (towards the edge of the vowel) in N1 and N2. Of course, given that the syllable shortens going from N0 → N1 → N2, and given that L occurs at a relatively constant time after the onset of the syllable, it entails that it will be at a later point of the syllable in proportional terms.

H is aligned towards the end of the target syllable in N0 (as it has to), but drifts outside the target syllable when unstressed material follows. It falls on the first unstressed syllable in N1 and on the second in N2.

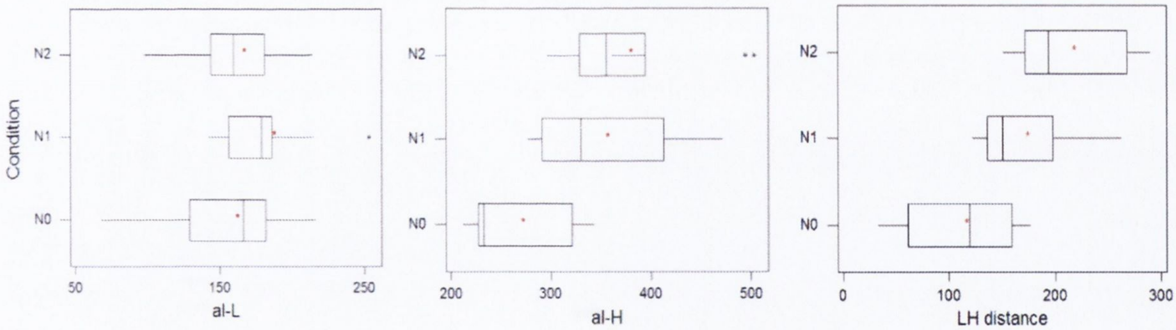


Figure 5.5: RF: Box plots of mean values in milliseconds (ms) of *al-L*, *al-H* and *LH interval* by the rhythmic condition (N0, N1, N2) for the main tune type only. The group means are indicated by red stars, outliers by black stars. The vertical lines inside the boxes denote the median and whiskers show the inter-quantile range.

To sum up for the RF variety, the timing of L* appears to be at a rather constant interval following the onset of the syllable, and appears to follow a time course which is not affected by the length of the tail. The timing of the trailing tail (H) however is affected, and occurs later according to the availability of unstressed material in the tail. The timing relationship of the L and H targets is not constant, but varies with tail length in the nuclear position. Results here are rather similar to those reported for Gaoth Dobhair Irish by Dalton & Ní Chasaide (2005b).

Table 5.5: RF: Token numbers (n) per condition, mean absolute durations (ms) and standard deviations (st.dev) for *al-L*, *al-H* and *LH interval* in N0, N1 and N2. The average (AVG) alignment of *al-L* across the three conditions is also shown.

	al-L			al-H			LH interval	
	n	**means**	**st.dev.**	**n**	**means**	**st.dev.**	**means**	**st.dev**
N0	11	155	48.7	11	264	50.5	108	48.7
N1	11	182	30.4	11	347	66.3	165	42.9
N2	10	161	33.9	10	371	70.5	210	49.8
AVG		**166**	**37.6**					

5.3.3 Baile na Finne (BF)

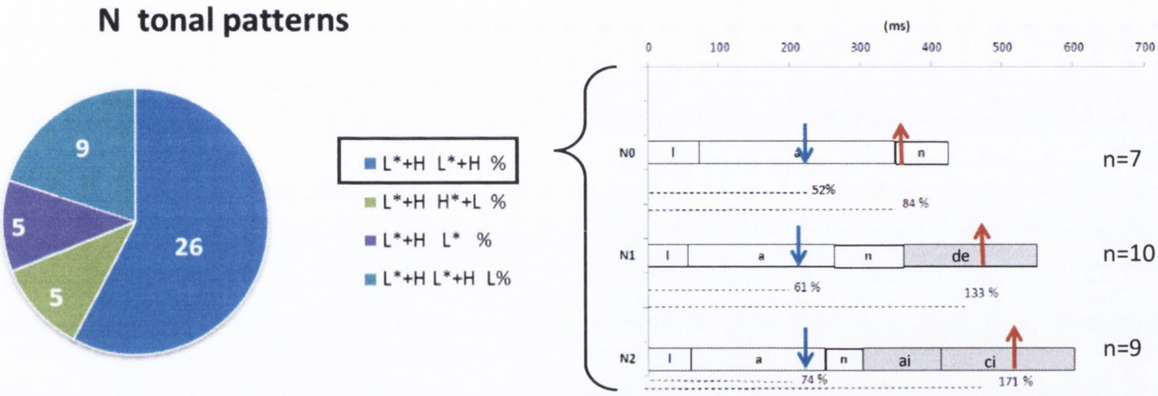


Figure 5.6: Nuclear (N) alignment in Baile na Finne (BF). Left: summary of tunes including token numbers. Right: for the main tune type, framed in black box (n=26) durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in ms. The nuclear alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) are shown in the three varying rhythmic conditions N0, N1 and N2: for each condition % values beneath show these timings as % of the duration of the accented syllable.

Looking now at Figure 5.6, the main tune type in the BF-Irish variety is again the rising tune L*+H L*+H % (52%). Less than a quarter of all utterances (n=9), however, were realised with a rise-slump (L*+H L%) in the nucleus, which was mainly due to the two male speakers (POBR, POBA), and these utterances were omitted. Furthermore, some of the utterances with the dominant tune also had to be omitted due to creaky voice and were not included in the N results.

In terms of absolute timing from the onset of the accented syllable (see Figures 5.6, 5.7 and Table 5.6.), *al-L* remains relatively stable in all three conditions (left panel), whereas the distance to *al-H* increases with the increase in following material after the IP-final accented syllable (mid panel). The *LH interval* also increases in N1 and N2 (right panel). Note the very small variation for the *LH interval* in N0 (Figure 5.7, right panel). On average, *al-L* occurs at 221ms from the onset of the accented syllable. Note that although the average is stable across conditions, there is a wider spread of values overall (see left panel Figure 5.7 and s.d. numbers in Table 5.7.

As to the alignment of L and H as a proportion of the target syllable (Figure 5.6, right) both targets occur later relative to the stressed syllable as one goes from N0 to N1 to N2. Similar to the RF variety, although the average L elbow timing (relative to the syllable onset) does not change with increasing tail length, the accented syllable shortens, and the L elbow consequently is later as a proportion of the syllable (in the middle of the vowel for N0, towards the right edge for N1, N2. The peak H moves outside the target syllable in N1 and N2 conditions, falling on the first unstressed syllable in N1 and on the second in N2.

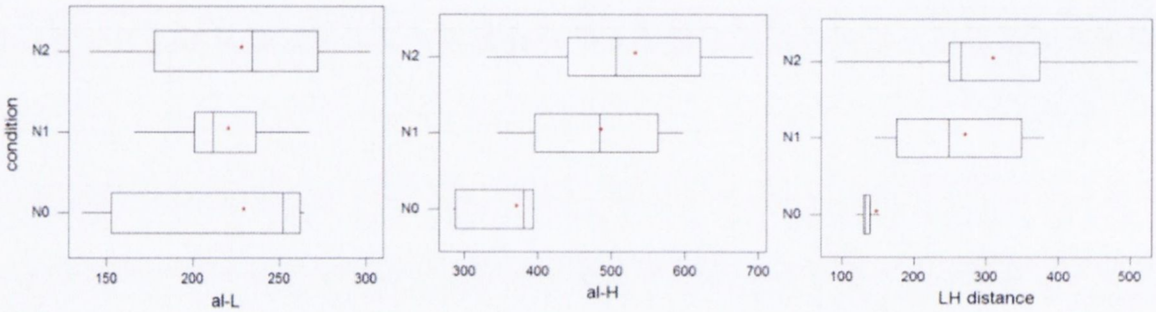


Figure 5.7: BF: Box plots of mean absolute durations in milliseconds (ms) of *al-L*, *al-H* and *LH interval* by condition (N0, N1, N2). Group means are indicated by red stars, outliers by black stars. Vertical lines inside the boxes denote the median and whiskers show the inter-quantile range.

Table 5.6: BF: Token numbers (n) per condition, mean absolute durations (ms) and standard deviations (st.dev.) for *al-L*, *al-H* and *LH interval* in N0, N1 and N2. The average (AVG) alignment of *al-L* across the three conditions is also shown.

	al-L			al-H			LH interval	
	n	**means**	**st.dev.**	**n**	**means**	**st.dev.**	**means**	**st.dev.**
N0	7	224	55.2	7	359	49.8	135	9.8
N1	10	216	27.4	10	474	92.5	258	93.9
N2	9	223	54.6	9	520	111.8	297	118.0
AVG		**221**	45.7					

Overall, the BF results here are very like those obtained for RF, and they both resemble the Gaoth Dobhair variety described in Dalton & Ní Chasaide (2005b).

5.3.4 Gleann Cholm Cille (GCC)

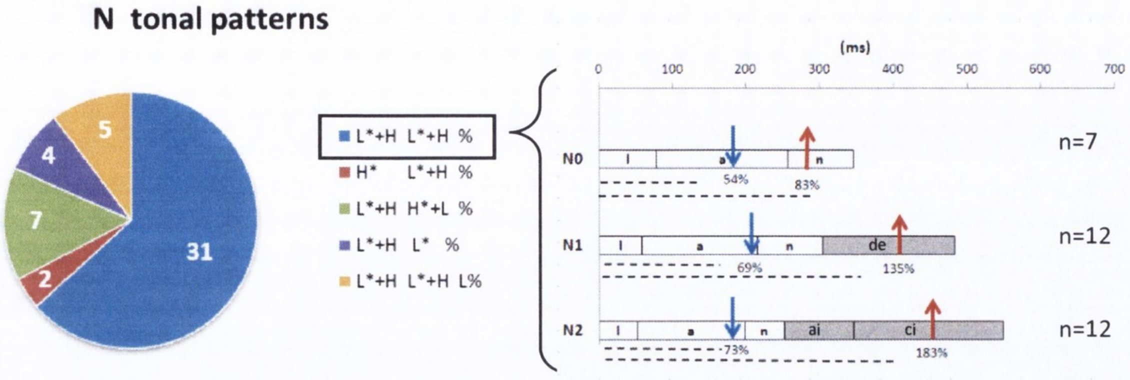


Figure 5.8: Nuclear (N) alignment in Gleann Colm Cille (GCC). Left: summary of tunes including token numbers. Right: for the main tune type, framed in black box (n=31) durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in ms. The nuclear alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) are shown in the three varying rhythmic conditions N0, N1 and N2: for each condition % values beneath show these timings as % of the duration of the accented syllable.

Looking first at the distribution of nuclear tunes in GCC-Irish (Figure 5.8 left), the rising tune L*+H L*+H % is the main tune used in 63% (n=31) of all phrases in this set. The majority of remaining tunes which do not follow the main pattern, were mainly produced by one male speaker (SMC) who almost exclusively used rise-falls (L*+H L%) and falls (H*+L %) in the nuclear accent. Most of his data was excluded from further analysis. One female speaker (SNC) also had such a tendency, but to a much smaller degree.

As to the absolute measures (see Figures, 5.8, 5.9 and Table 5.7), similar to the RF and BF varieties, we can observe for *al-L* that across N0, N1 and N2 the L elbow is aligned at a relatively stable distance (on average 191ms) from the onset of the accented syllable (Figure 5.8, right and Figure 5.9, left panel). There is no systematic effect of tail length on the timing of the L elbow.

The *al-H* measure shows that H is increasingly delayed, the more unstressed material is available after the nuclear accented syllable (Figure 5.9, mid panel). The distance between L and H also increases with the amount of unstressed material following the nuclear accent (Figure 5.9, right panel).

With regard to proportional alignment of *al-L* and *al-H* (Figure 5.8, right) we can make the following observations: as the syllable duration shortens with increasing tail length, L occurs proportionally later in the syllable, being aligned towards the middle of the accented vowel in

N0 or towards the right edge of the vowel N1, N2. H, is also proportionally much later as tail length increases: it falls in the accented syllable in N0, where there is no tail, on the post-accented syllable in N1 and on the second post-accented syllable in N2.

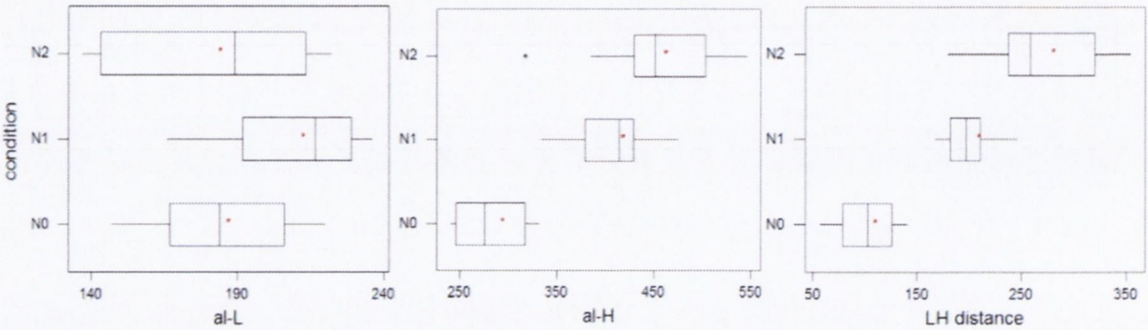


Figure 5.9: GCC: Box plots of mean absolute durations in ms for *al-L*, *al-H* and *LH interval* by condition (N0, N1, N2). Group means are indicated by red stars, outliers by black stars. Vertical lines inside the boxes denote the median and whiskers show the inter-quantile range.

Table 5.7: GCC: Token numbers (n) per condition, mean absolute durations (ms) and standard deviations (st.dev) for *al-L*, *al-H* and *LH interval* in N0, N1 and N2. The average (AVG) alignment of *al-L* across the three conditions is also shown.

	al-L			al-H			LH interval	
	n	**means**	**st.dev.**	**n**	**means**	**st.dev.**	**means**	**st.dev.**
N0	7	184	24.5	7	284	35.3	101	28.6
N1	12	209	23.9	12	409	37.9	200	21.6
N2	12	181	33.5	12	454	61.5	272	53.2
AVG		**191**	27.3					

This variety is very like the RF and BF varieties in terms of alignment characteristics of the nuclear tone, and they all both resemble the Gaoth Dobhair variety described in Dalton & Ní Chasaide (2005b).

5.3.5 Ros Goill (RG)

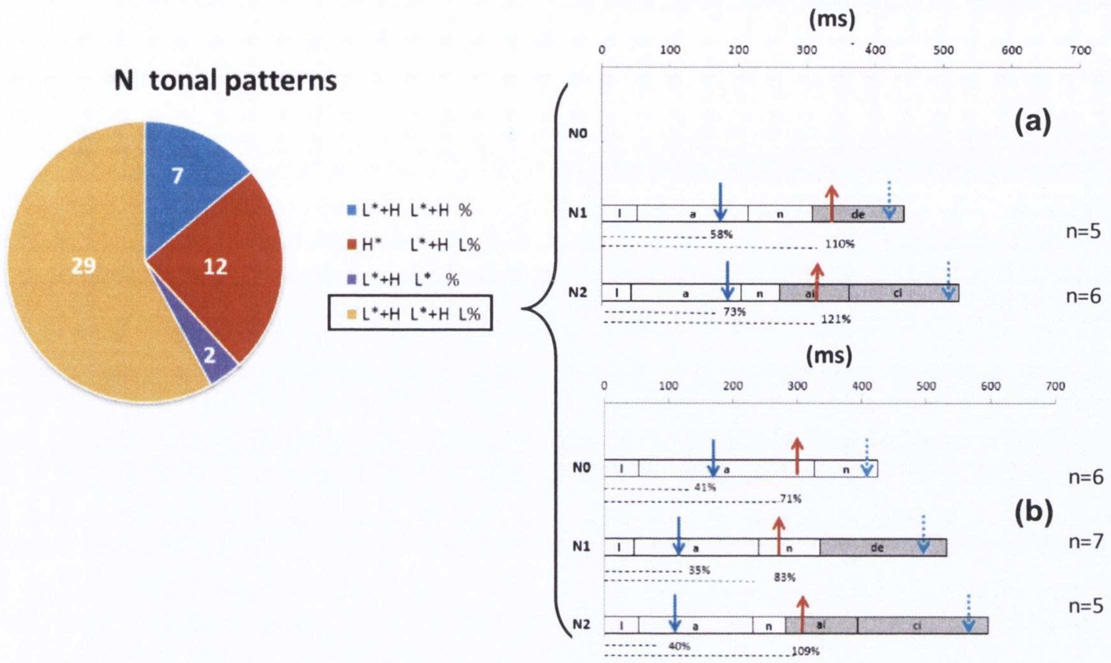


Figure 5.10: Nuclear (N) alignment in Ros Goill (RG). Left: summary of tunes including token numbers. Right: for the main tune type, framed in black box (n=29) durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in ms. The nuclear alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) and the timing of the IP final low boundary tone (blue dashed arrow) are shown in the three varying rhythmic conditions N0, N1 and N2 for each condition. The % values beneath show the timings of the L and H targets of the rising accent as proportions of the duration of the accented syllable. Alignment characteristics are shown for two groups: younger speakers (MM, FP) in panel (a) and senior speakers (SMO, AML) in panel (b). The N0 condition for younger speakers (FP, MM) in panel (a) was excluded as explained before in section 5.3.

Looking first at the tonal patterns (Figure 5.10, left), we observe a striking difference compared to the previous varieties. This is something that already emerged clearly in Chapter 4. The most common tune type across all the alignment utterances in the RG-variety is the rise-falling pattern L*+H L*+H L% (58%) (n=29). In addition, as pointed out earlier in section 5.3 above, there were obvious alignment differences between the two senior speakers (AML, SMO, right side of Figure 5.10, panel b) and the two younger speakers (FP, MM, Figure 5.10, panel a) in this variety. Consequently the data was plotted separately for each group. Due to tune differences, the N0 condition for speakers FP and MM was excluded from the comparative analysis in Figures 5.10, 5.11, and Table 5.8.

As regards the absolute timing (see Figure, 5.10, 5.11 and Table 5.8), we see that the groups differ particularly in the timing of the rise onset (*al-L*), being later for the younger speakers, group (a), than for the older group (b) in Figure 5.10. In the case of the younger group (a), the rise onset is timed rather similarly to the rise in the three varieties we have described so far, whereas for the older group, the rise is timed to begin much earlier relative to the syllable onset. Curiously the N0 condition has the latest rise onset in group (b), the opposite of what might be expected if the tail were to influence L timing.

The timing of the H peak, measured by *al-H,* also differs from the other varieties. In those varieties, where it shifted rightwards (delayed increasingly) as the tail got longer, this does not appear to happen in any consistent way in RG (see mid panel in Figure 5.11). Thus, where in the other three varieties, the peak timing shifts to the post-accented syllable in N1 and to the second post-accented syllable in N2, in this RG data the peak remains either in the accented syllable, or occurs in the post-accented syllable, even in the N2 condition. The *LH interval* increases across the three conditions N0, N1 and N2 for the older group (b), but note that the extent of the increase is considerably less than in the other varieties. In the younger group (a), no increase in the *LH interval* was observed. The low boundary tone L% (dashed blue arrow in Figure 5.10) is closely aligned to the end of the IP, so the part of the nuclear tune that varied most with increasing tail length was the duration of the f_0 fall to the L% boundary.

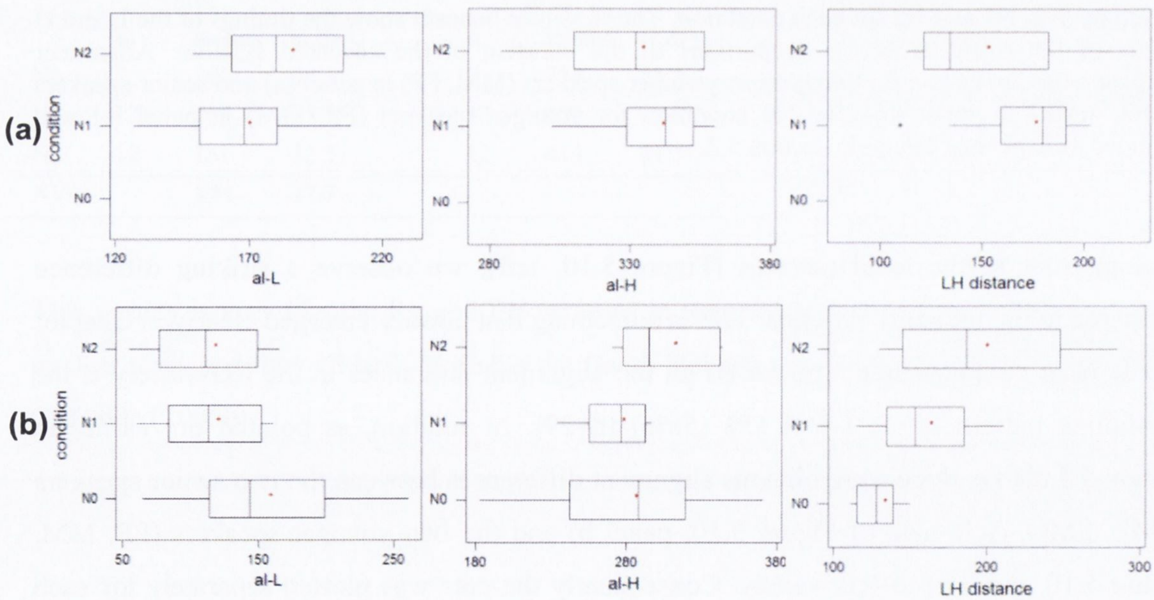


Figure 5.11: RG: Box plots of mean absolute values in milliseconds (ms) of *al-L*, *al-H* and *LH interval* by condition (N0, N1, N2). Group means are indicated by red stars, outliers by black stars. The vertical lines inside the boxes denote the median and whiskers show the inter-quantile range.

Table 5.8: RG: Token numbers (n) per condition, mean absolute durations (ms) and standard deviations (st.dev) for *al-L*, *al-H* and *LH interval* in N0, N1 and N2. The average (AVG) alignment of *al-L* across the three conditions is also shown.

			al-L			al-H		LH interval	
(a)		**n**	**means**	**st.dev.**	**n**	**means**	**st.dev.**	**means**	**st.dev.**
	N0								
	N1	5	179	22.6	5	337	19.3	159	34.7
	N2	6	188	25.1	6	313	20.0	125	11.4
AVG			**184**	**23.9**					
			al-L			al-H		LH interval	
(b)		**n**	**means**	**st.dev.**	**n**	**means**	**st.dev.**	**means**	**st.dev.**
	N0	6	174	51.9	6	303	43.8	129	15.8
	N1	7	117	37.8	7	279	16.2	161	33.6
	N2	5	112	40.9	5	307	33.1	195	58.9
AVG			**134**	**43.5**					

The RG variety stands out, firstly in having a different dominant nuclear tune, a rise-fall L*+H L%, compared to the other varieties, which have a dominant nuclear tune, L*+H %. This was already noted in Chapter 4. This variety is also different in terms of the timing of the rise, and two different trends emerged, which appeared to be related to the age of the informants. In the older group (b), the rise began much earlier in the accented syllable (than in the other varieties) and was little affected by tail length; the peak was also reached much earlier, and was timed also at a fairly constant time distance from the onset of the accented syllable (i.e., not drifting rightwards with increasing tail length as was found in the other varieties). The overall picture is of a nuclear rise that is timed relatively constantly relative to the onset of the accented syllable. It is the last portion of the rise fall tune, the fall to the L% boundary that varies with the lengthening of the tail. The other, younger, group (a) differed from group (b) in that overall, the rise onset (*al-L*) is timed to occur later. Other than that the two groups are fairly similar.

So far in this chapter we have examined the alignment of the low elbow (*al-L*), the high peak (*al-H*) and the distance between L and H (*LH interval*) for N as a function of tail length in each of the four varieties.

Summarising now the main findings of this part of analysis, results have shown that the low L* is aligned at a relatively stable interval in absolute terms from the onset of the accented syllable across N0, N1 and N2. Average *al-L* intervals for all the varieties are shown in Table

5.9. The *al-L* interval is in the region of 190ms for most dialects (RF, BF, GCC and group (a) of RG), but the interval is shorter for the older speakers from RG, group (b) where the average interval was about 134ms. As regards the timing of the peak (*al-H*), the main trend (RF, BF and GCC) was that the peak shifted rightwards as the tail lengthened, occurring (necessarily) in the accented syllable in N0, in the post-accented syllable in N1 and in the second post-accented syllable in N2. This rightwards shift of the peak was not attested in the RG variety. The temporally more constrained realisation of the rise (and peak timing) in RG is undoubtedly related to the fact that the nuclear pattern in this variety is a rise fall. It is the latter portion of the tune, the fall to the low boundary that lengthens with the increase in tail length.

Table 5.9: Overall mean absolute alignment of *al-L* relative to the onset of the accented syllable in milliseconds (ms)

al-L	**RF**	st.d.	**BF**	st.d.	**GCC**	st.d.	**RG(a)**	st.d.	RG(b)	st.d.
N0	155	48.7	224	55.2	184	24.5	---	---	174	51.9
N1	182	30.4	216	27.4	209	23.9	179	22.6	117	37.8
N2	161	33.9	223	54.6	181	33.5	188	25.1	112	40.9
Average (ms)	**166**	(37.6)	**221**	(45.7)	**191**	(27.3)	**184**	(23.9)	**134**	(43.5)

The relative stability of L* is rather striking, and reminiscent of the stable H* tones of the Connemara dialect of Connaught, reported by Dalton & Ní Chasaide (2005a) (see discussion in Chapter 2.8) where the peak did not shift as a function of tail length. It would look as if the L* elbow is timed to occur at a specific time interval (in an absolute sense) from the beginning of the accented syllable. Alternatively, it could be argued that the elbow is aligned to the end of the accented vowel, and only shifts to an earlier time point when there is no post-accentual material available for the realisation of the rise: thus here (N0) the default later L timing could be overridden by the need to realise the rise within the accented syllable.

The trailing tone H is greatly affected by the length of the tail. Other than for the RG variety, where a different nuclear tune is used, the timing of H moves consistently rightwards with increasing tail length, and the effect is similar whether it is viewed in absolute or proportional time: H is located in the accented syllable in N0, in the post-accented syllable in N1 and in the second post-accented syllable in N2.

It was mentioned at the outset to this chapter that the syllabification of N2 is potentially problematic, and that depending on one's viewpoint it could be argued that the syllable boundary could fall at the end of the nasal consonant, in the middle of the following consonant or at its beginning. It is clear from these data that, regardless of how one might syllabify 'lán', there is no indication of L* (or H) being aligned to the end of the accented syllable as such. To that extent we would suggest that uncertainty over the syllabification of the word in N2, does not undermine the likely validity of the observations made here regarding the alignment of the nuclear accent.

5.4 Pre-nuclear (PN) alignment as a function of anacrusis

5.4.1 Preliminary comments

We examine here in a parallel fashion the alignment of the L*+H targets associated with the initial pre-nuclear accent, as a function of varying anacrusis size: 0PN = no anacrusis; 1PN = anacrusis is one unaccented syllable; 2PN = anacrusis is two unaccented syllables.

As pointed out in section 5.3, cross-speaker variation and speaker specific differences arose in the course of data analysis and were also found in the pre-nuclear data. In the sentences produced with the various PN conditions, the data showed relatively high variability within and across the four varieties and some problematic cases emerged which are discussed below. In the 0PN condition in the RF and BF varieties, the 0PN sentence "*Lán go dtí 'n doras*" /ˈlˠænˠ gˠə dʲinʲ ˈdˠʌɾˠəsˠ/ '*Full to the door*', showed an unexpected result: in the RF variety, three out of the four speakers, realised the utterance with three pitch accents rather than the predicted two, which was used by just one speaker (see Figure 5.12).
Consequently the target syllable in 0PN was followed by just one unstressed syllable, and an immediately following stressed syllable (indicated by dashed lines, in the relevant Figure 5.16 below in section 5.4.2). As this was the dominant tune for RF, our analysis in this chapter is based on these three speakers, and the fourth speaker (who produced a two accent phrase) was omitted.

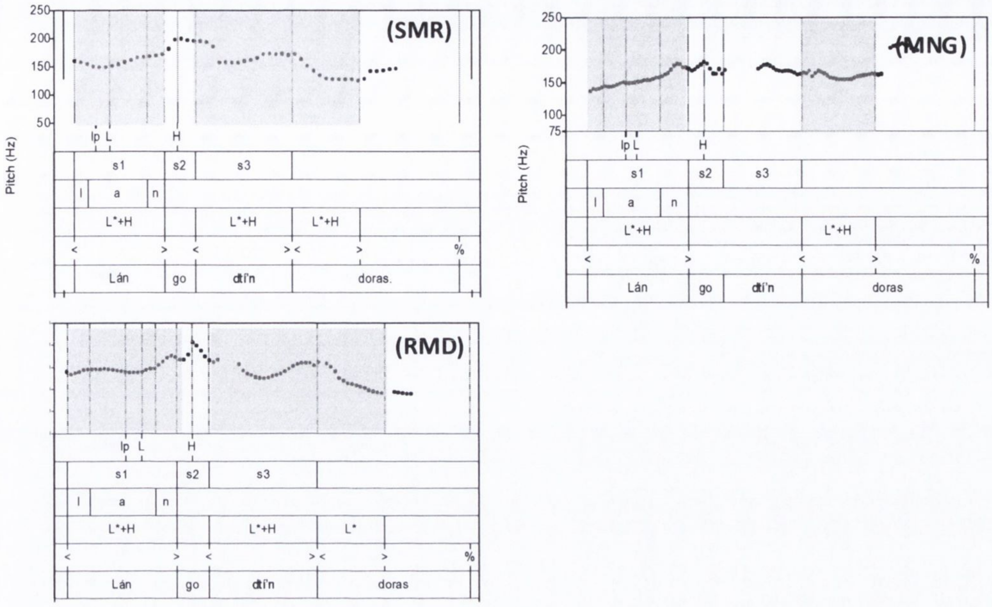


Figure 5.12: Speaker specific tune realisations of the phrase *Lán go dtí'n doras* /'lˠænˠ gˠə dʲinʲ 'dˠʌɾˠəsˠ/ '*Full to the door*' (0PN) in the RF variety. Top left speaker SMR, bottom left speaker RMD, top right speaker MNG. Accented syllables are shown in grey. Soundfiles: DI-RF-SMR-0PN-4; DI-RF-MNG-0PN-3; DI-RF-RMD-0PN-3.

Similarly, in the BF variety the 0PN sentence was also realised with three rather than the expected two pitch accents by three out of the four speakers. In addition, each of the four speakers seems to have different preferred tune realisation for this utterance (see Figure 5.13), and so the patterns after the initial pre-nuclear accent were not identical.

It was decided that results for these 0PN phrases in the BF variety should not be averaged. The decision was taken to base the measures for the 0PN condition in BF on the speaker who had the more "classic" Donegal pattern (L*+H L*+H L*+H 0%).

Figure 5.18, section 5.4.3 for L and H timing are based on the five repetitions from the one speaker (ANM) who produced utterances with the three rising pitch accents (and the additional accented syllable is also indicated by dashed lines in Figure 5.18). This is only a partially satisfactory solution. Since the data in this condition is based on a single speaker the results for this condition in the BF variety should be treated with caution and would thus need further work.

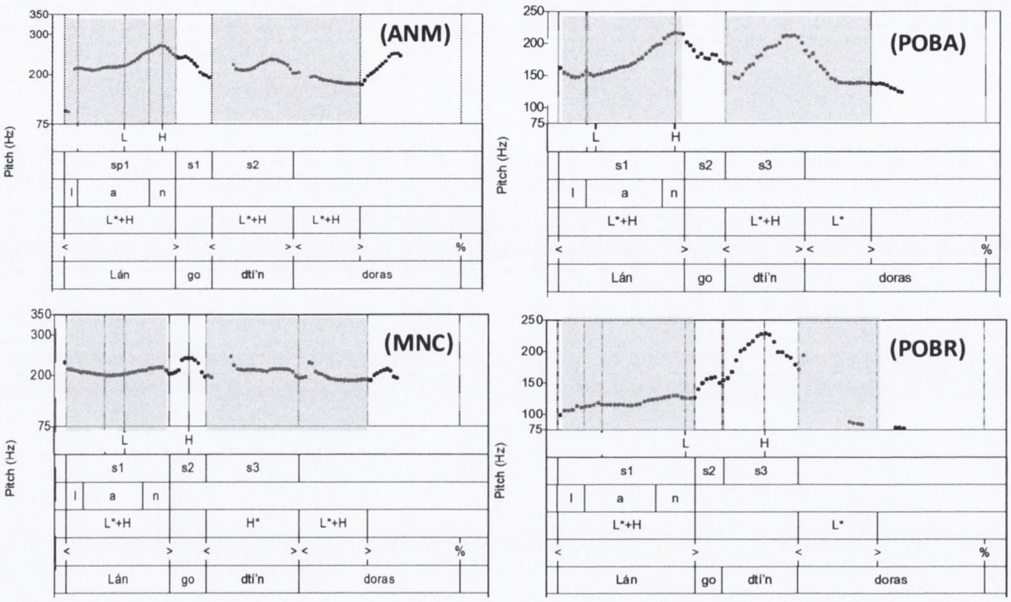


Figure 5.13: Speaker specific tune variation in the realisations of the 0PN utterances *Lán go dtí'n doras* / 'lˠænˠ gˠə dʲinʲ 'dˠʌɾˠəsˠ/ '*Full to the door*'. The productions of utterances from the two female speakers are plotted on the left, those of the two male speakers on the right (top left: ANM, bottom left: MNC, top right: POBA, bottom right: POBR) Soundfiles: DI-BF-ANM-0PN-1; DI-BF-MNC-0PN-2; DI-BF-POBR-0PN-1; DI-BF-POBA-0PN-1.

In the GCC variety, on the other hand, speakers realised the utterance in 0PN with the predicted two pitch accents (Figure 5.14).

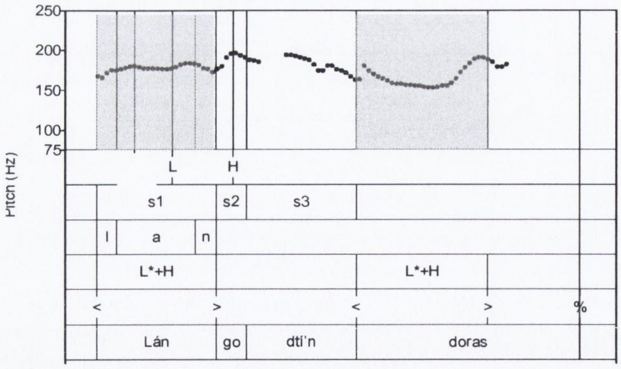


Figure 5.14: Representation of a typical realisation of the 0PN utterance *Lán go dtí'n doras* /'lˠænˠ gə dʲinʲ 'dˠʌɾˠəsˠ/ '*Full to the door*' in the GCC variety. Soundfile: DI-MNC-0PN-3.

In the RF variety, for *al-H* in 2PN, the position of H could not always be clearly identified due to segmental pitch perturbations. There was also a strong tendency to realise the low target as a long level stretch, often beginning as early as the IP onset, illustrated in Figure 5.15 for an utterance in the 2PN condition.

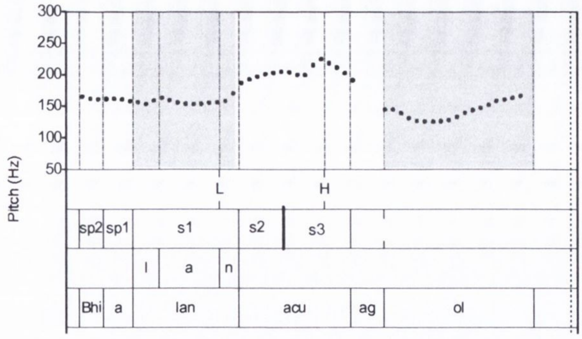


Figure 5.15: Example showing the realisation of L in the pre-nuclear position as a long low level stretch rather than a turning point in the sentence Tá mo mhála lán. /tˠæ mˠə 'walˠə 'lˠænˠ/ *'My bag is full.'* Soundfile: DI-SMR-2PN-2

The RG variety, yielded very variable tonal patterns. In addition, all data from speaker AML who aligned both L and H targets earlier than the remaining three speakers was excluded. As a result, the following observations are based on the analysis of the three female speakers in the RG variety (FP, MM (group a) and SMO (group b)).

Having pointed out the specific issues of cross-speaker variation in the pre-nuclear data, the following section will now discuss PN alignment in the four Donegal Irish varieties.

5.4.2 Rann na Feirste (RF)

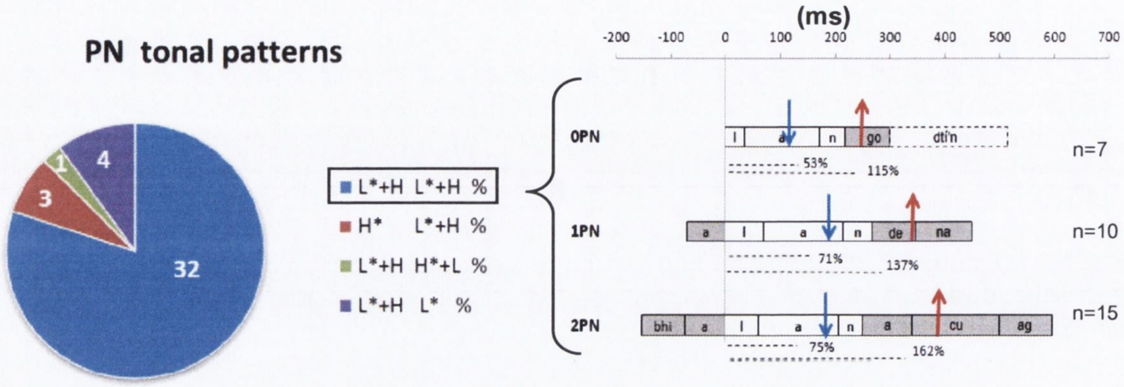


Figure 5.16: Pre-nuclear (PN) alignment in Rann na Feirste (RF). Left: summary of tunes including token numbers. Right: for the main tune type, framed in black box (n=32) durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in ms. The syllable (dashed line) in 0PN shows the additional third accent produced by three of the four speakers. The alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) of the prenuclear accent are shown in the three varying rhythmic conditions 0PN, 1PN and 2PN: for each condition % values beneath show these timings as % of the duration of the accented syllable.

As regards the tune inventory (Figure 5.16, left), the main pattern across all utterances is again the rising tune L*+H L*+H % (80%). A smaller number of utterances were produced with tunes deviating from the main pattern. These were overall realised by two speakers (RMD, MNG) in the N0 and N1 conditions. The following analysis is based on the averaged data of the main tune only. Note that in 0PN condition, the average values shown are for three speakers only, and they produced the sentence with three rising accents (discussed at the beginning of section 5.4). The additional accent in 0PN is indicated in the right of Figure 5.18, by the white dashed box.

As regards the absolute alignment measures (Figure 5.16, 5.17 left panel and Table 5.10), we note that L is aligned at a relatively stable distance from the onset of the accented syllable in 1PN and 2PN. L occurs earlier in 0PN, the opposite of what one would expect if the anacrusis size is to influence its timing. The early L elbow in PN0 is most likely due to the realisation of the extra pitch accent in this condition mentioned earlier, - an influence (unanticipated) from the right context, not from the anacrusis. On average, *al-L* occurs at 173ms from the onset of the accented syllable, and the timing pattern is very like that found in the nuclear position.

The absolute duration from the onset of the target syllable until the peak (H) increases across the three conditions (Fig. 5.17, mid panel), but the direction of the change is the opposite of what one might expect from an anacrusis size influence Looking now at the absolute *LH distance* (Fig. 5.17, right panel), we note a small increase from 0PN to 1PN and a more noticeable increase to the 2PN condition. It is felt that since there was only little variation in the alignment of the main target *al-L,* due to the anacrusis size, any observed variation here in the timing of the H peak (and the duration of the *LH interval*) is more likely to result from the right context, which was not controlled.

Looking now at the proportional alignment parameters (Figure 5.16, right), proportionally, both L and H occur later relative to the segments going from 0PN to 1PN to 2PN. Within the target syllable, L moves from the middle of the vowel (0PN) towards the right edge of the vowel (1PN, 2PN). However, as noted above the difference in the 0PN condition should be disregarded and is more likely to be due to the additional accent that follows than to the anacrusis.

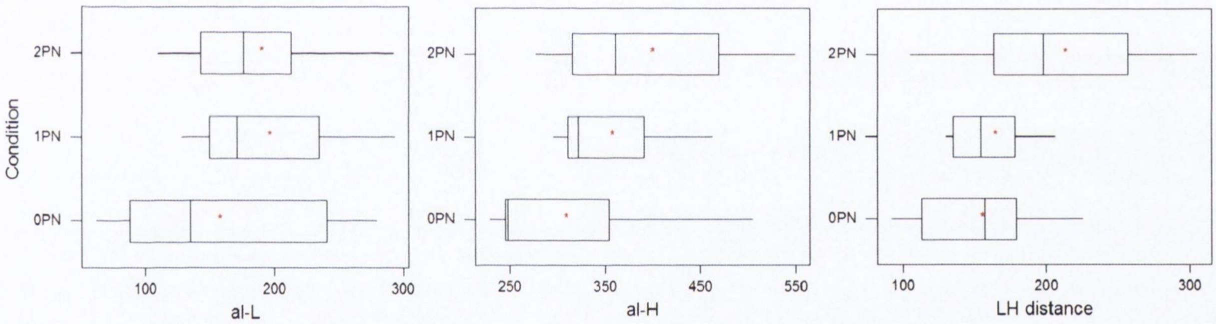


Figure 5.17: RF: Box plots of mean absolute values (ms) of *al-L*, *al-H* and *LH interval* by condition (0PN, 1PN, 2PN). The group means are indicated by red stars. The vertical lines inside the boxes denote the median and whiskers show the inter-quantile range.

Table 5.10: RF: Token numbers (n) per condition, mean absolute durations (ms) and standard deviations (st.dev.) for *al-L*, *al-H* and *LH interval* in 0PN, 1PN and 2PN, along with the average (AVG) alignment of *al-L* across the three conditions.

	al-L			al-H			LH interval	
	n	**means**	**st.dev.**	**n**	**means**	**st.dev.**	**means**	**st.dev**
0PN	7	150	77.3	7	299	94.3	149	39.5
1PN	10	190	55.2	10	347	56.8	158	26.4
2PN	15	183	53.4	15	390	80.5	206	60.6
AVG		**173**	61.9					

5.4.3 Baile na Finne (BF)

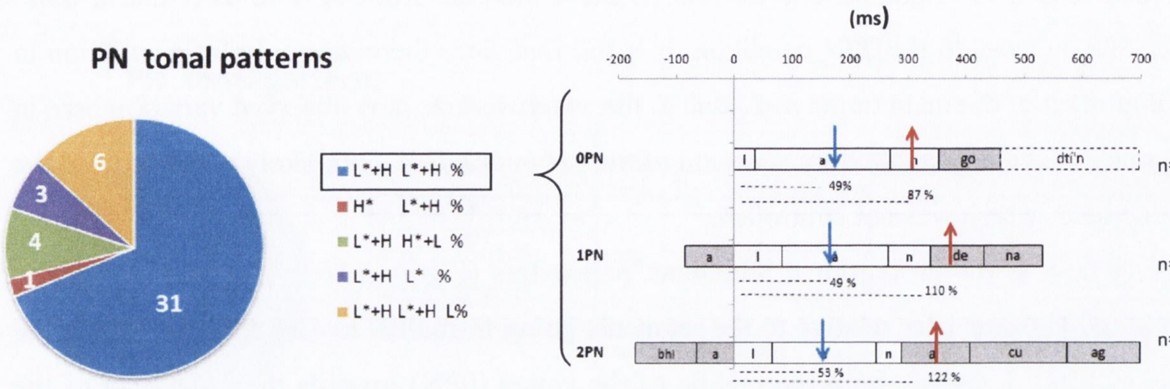


Figure 5.18: Prenuclear (PN) alignment in Baile na Finne (BF). Left: summary of tunes including token numbers. Right: for the main tune type, framed in black box (n=31) durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in ms. The syllable (dashed line) in 0PN shows the additional third accent, and note that 0PN is calculated for one speaker only. The alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) of the prenuclear accent are shown in the three varying rhythmic conditions 0PN, 1PN and 2PN: for each condition % values beneath show these timings as % of the duration of the accented syllable.

The most common tonal pattern across 0PN, 1PN and 2PN is the rising tune L*+H L*+H % (69%) (n=31). There remaining variation in tunes can for the main part be attributed to the two male speakers (POBA, POBR), who tended to realise many of the utterances with nuclear rise-falls (L*+H L%) or falls (H*+L %). Note the speaker specific differences in the realisation of 0PN as pointed out at the beginning of section 5.4 and the fact that the 0PN data shown here is for one speaker only (ANM).

Looking first at the absolute measures (Figures 5.18, 5.19 and Table 5.11), we can observe a similar result: L is aligned at more or less the same distance (164ms) from the onset of the syllable across the different conditions (Figures 5.18, right panel, Figure 5.19, left panel). The timing of H does not appear to be influenced in any consistent way by the increasing anacrusis size. Both the timing of H, and the *LH interval* seem to be reasonably consistent across the three conditions (Figures 5.19, mid and right panels), except for in 0PN, where H occurs relatively earlier, a fact that is likely to be related to the additional (undesired) pre-nuclear accent.

Proportionally, *al-L* is aligned in the same way in 0PN and 1PN and is marginally later in 2PN (see Figure 5.18, right). L is usually aligned around the middle of the syllable. Proportionally, H occurs later, outside the accented syllable in 1PN and 2PN. The difference in H location between 0PN and the other two conditions is likely not to reflect differences in anacrusis, but rather the 3-accent realisations of 0PN.

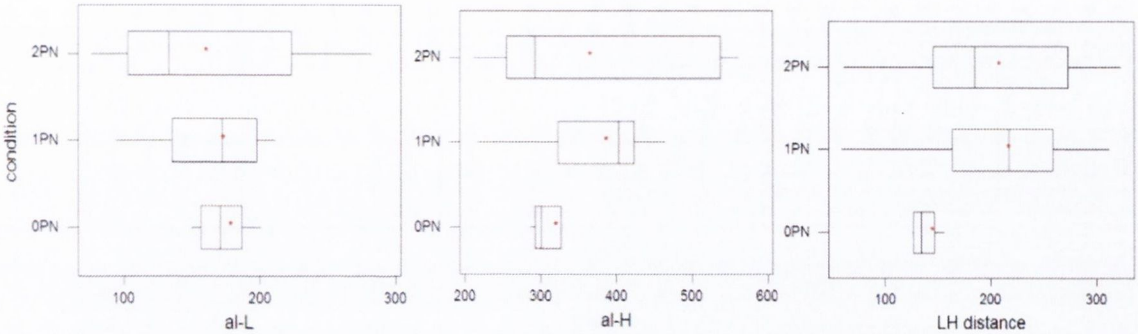


Figure 5.19: BF Box plots of mean absolute values (ms) of *al-L*, *al-H* and *LH interval* by condition (0PN, 1PN, 2PN). The group means are indicated by red stars. The vertical lines inside the boxes denote the median and whiskers show the inter-quantile range.

Table 5.11: BF: Token numbers (n) per condition, mean absolute durations (ms) and standard deviations (st.dev.) for *al-L*, *al-H* and *LH interval* in 0PN, 1PN and 2PN, along with the average (AVG) alignment of *al-L*.

	al-L			al-H			LH interval	
	N	**means**	**st.dev.**	**N**	**means**	**st.dev.**	**means**	**st.dev.**
0PN	5	172	18.7	5	308	18.1	136	11.8
1PN	12	166	36.3	12	375	80.0	209	72.8
2PN	14	154	65.9	14	353	133.9	199	79.5
AVG		**164**	40.3					

5.4.4 Gleann Cholm Cille (GCC)

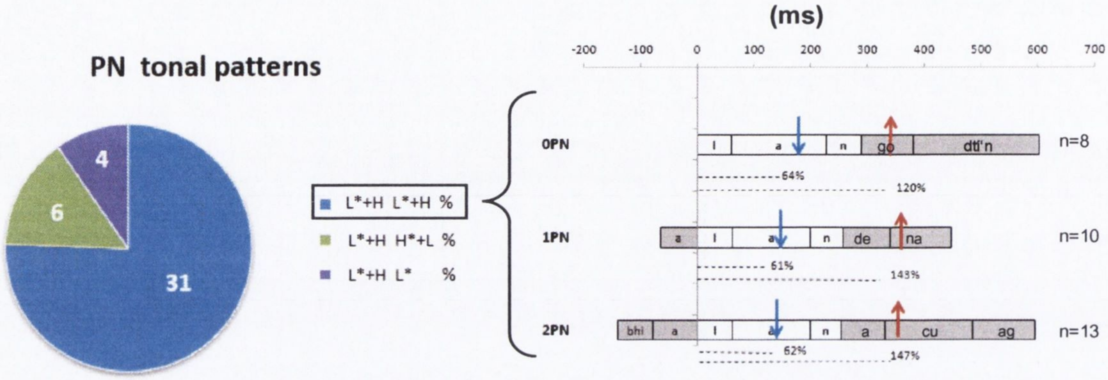


Figure 5.20: Prenuclear (PN) alignment in Gleann Colm Cille (GCC). Left: summary of tunes including token numbers. Right: for the main tune type, framed in black box (n=31) durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in ms. The alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) of the prenuclear accent are shown in the three varying rhythmic conditions 0PN, 1PN and 2PN: for each condition % values beneath show these timings as % of the duration of the accented syllable.

The overall preferred tune across the 0PN, 1PN and 2PN is the rising tune L*+H L*+H % (76%) (n=31). Falling nuclear pitch accents (H*+L %) (n=6) were only observed in 0PN, but not in the other conditions.

As regards the absolute alignment measures (see Figures 5.20, 5.21 and Table 5.12), note that the elbow is aligned at a somewhat shorter distance from the onset of the syllable in 2PN and 1PN than in 0PN (left panel). This is the first instance where a longer anacrusis could be triggering an earlier rise in the first pre-nuclear accent, but the extent of the shift is rather. On average, *al-L* occurs at 163ms from the onset of the accented syllable. The alignment of H is rather invariant across the three conditions (Figures 5.21, mid panel). As to *LH interval* we can observe shorter duration in 0PN, but rather similar values for 1PN and 2PN.

Looking first at the proportional alignment (Figure 5.20, right panel), L is again relatively uniform with minor variability across 0PN, 1PN and 2PN. On average it falls on the middle of the accented vowel, though a little later than in BF. The average alignment is even somewhat earlier in 1PN and 2PN than in 0PN. The peak, on the other hand, is timed increasingly later relative to the syllables across the three conditions. H is most typically aligned after the accented syllable in 0PN, 1PN and 2PN, and is proportionally later in 1PN and 2PN. The precise location of H in 2PN, however, was not always clear-cut due to consonantal perturbations on the syllable.

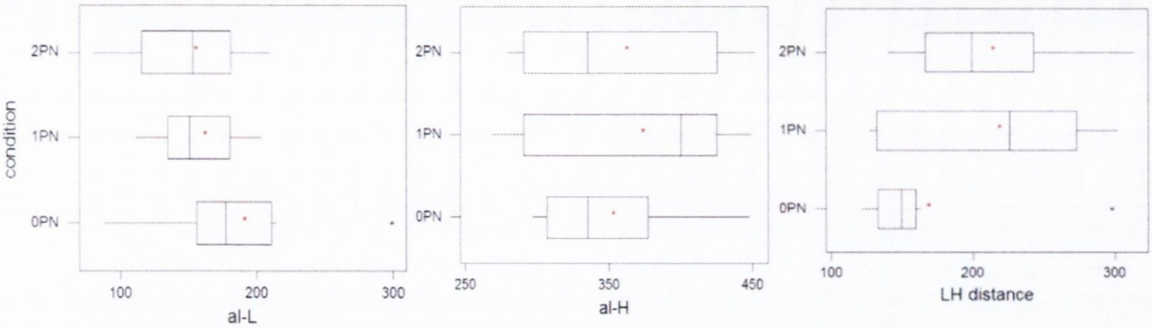


Figure 5.21: GCC: Box plots of mean absolute values of *al-L*, *al-H* and *LH interval* by condition (0PN, 1PN, 2PN). The group means are indicated by red stars. The vertical lines inside the boxes denote the median and whiskers show the inter-quantile range.

Table 5.12: GCC: Token numbers (n) per condition, mean absolute durations (ms) and standard deviations (st.dev) for *al-L*, *al-H* and *LH interval* in 0PN, 1PN and 2PN, along with the average (AVG) alignment of *al-L*.

	al-L			al-H			LH interval	
	n	**means**	**st.dev.**	**n**	**means**	**st.dev.**	**means**	**st.dev.**
0PN	8	184	59.9	8	347	49.7	163	56.2
1PN	10	156	28.8	10	367	70.0	212	69.0
2PN	13	148	41.4	13	357	66.4	208	50.1
AVG		**163**	43.4					

5.4.5 Ros Goill (RG)

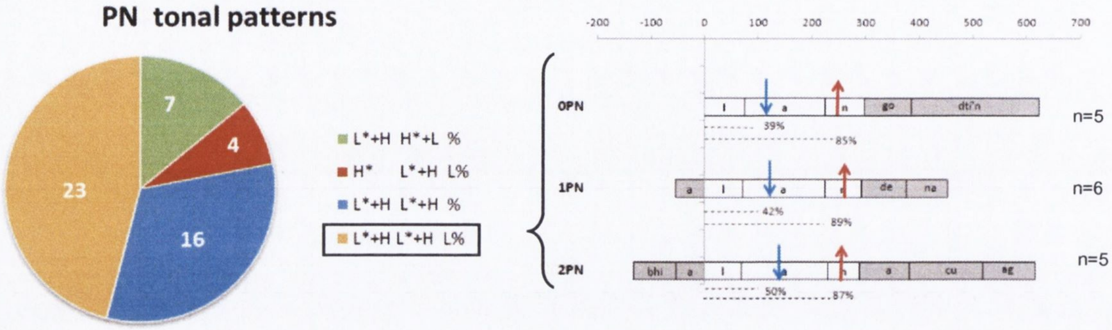


Figure 5.22: Pre-nuclear (PN) alignment in Ross Goill (RG). Left: summary of tunes including token numbers. Right: for the main tune type, framed in black box (n=23) durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in ms. The alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) of the pre-nuclear accent are shown in the three varying rhythmic conditions 0PN, 1PN and 2PN: for each condition % values beneath show these timings as % of the duration of the accented syllable.

Looking first at the tonal patterns (Figure 5.22 left) we can observe greater variability in tunes in RG compared to the other three varieties. The biggest number of phrases are realised with nuclear rise falling patterns (40%), but there is greater variability in the remaining tunes, with around a third of rises (L*+H %) (n=16) in the nucleus as well as a number of tunes with nuclear falls or high pre-nuclear pitch accents. As was pointed out above, the data of three speakers (FP, MM and SMO) only are presented. Data from speaker AML who in the main tune (L*+H L*+H L%) aligned both L and H targets earlier than the remaining three speakers was excluded from the analysis (n=7), and that's why token numbers shown in Figure 5.22 (right panel) are reduced. What is striking here, as in the nuclear data is that the rise occurs early in the syllable compared to the other varieties. The L elbow occurs at about 128ms from the onset of the accented syllable across the three conditions. The H peak is also earlier, is attained always within the accent syllable, with a relatively constant *al-H* timing. There is little variability, whether we express values in absolute terms or in percentages. What small variations exist, such as the slightly earlier rise onset in 0PN, is not likely to be due to the anacrusis, as one would expect a later rise in this condition if the lack of anacrusis were to cause a shift.

In absolute terms, the values of both *al-L* and *al-H* show only little variability (Figure 5.23 and Table 5.13). As to *al-L*, a slight rightward drift can be observed in 1PN and 2PN, but *al-*

H is stable across the three conditions with only minor variation. As to *LH interval*, results suggest a reduced distance for 1PN and 2PN compared to 0PN. On average, al-L occurs at 128ms from the onset of the accented syllable.

Looking now at the proportional measures (Figure 5.22, right), we can observe that L is timed relatively later relative to the accented syllable going from 0PN to 1PN to 2PN. In other words, the longer anacrusis is not causing an earlier rise in the accented syllable. This trend is less prominent for *al-H* in 1PN and 2PN where H is proportionally aligned at the same location in relation to the duration of the accented syllable.

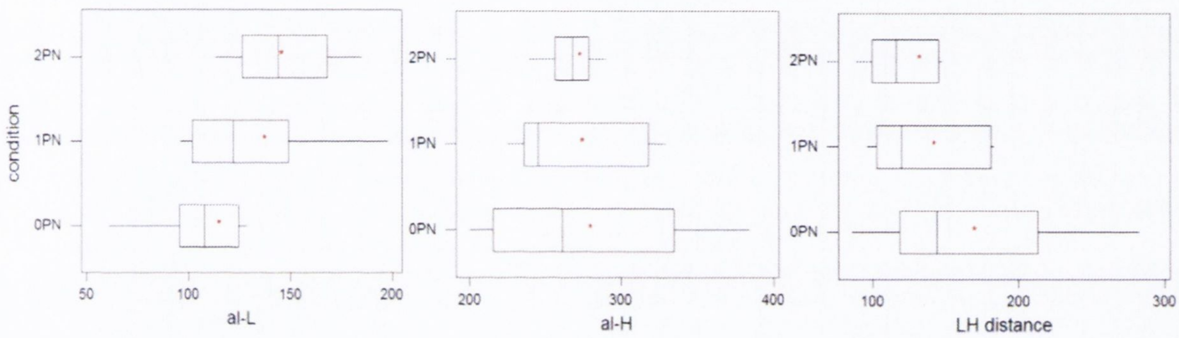


Figure 5.23: RG: Box plots of absolute values of *al-L*, *al-H* and *LH interval* by condition (0PN, 1PN, 2PN). The group means are indicated by red stars, outliers by black stars. The vertical lines inside the boxes denote the median and whiskers show the inter-quantile range.

Table 5.13: RG: Token numbers (n) per condition, mean absolute durations (ms) and standard deviations (st.dev.) for *al-L*, *al-H* and *LH interval* in 0PN, 1PN and 2PN, along with the average (AVG) alignment of *al-L*.

	al-L			al-H			LH interval	
	n	**means**	**st.dev.**	**n**	**means**	**st.dev.**	**means**	**st.dev.**
0PN	5	111	34.3	5	274	64.1	163	61.2
1PN	6	133	35.2	6	269	42.0	136	35.4
2PN	5	141	34.3	5	267	25.6	126	35.5
AVG		**128**	34.6					

Overall, the findings on the anacrusis effects on tonal alignment are less than satisfactory, for a number of reasons, sparseness and variability of the data, uncertainty over the syllabification of 2PN, and particularly the unanticipated occurrence in 0PN of an additional pre-nuclear accent. Despite these shortcomings, there are some trends that emerge. Neither the L nor the H targets appear to be influenced by the anacrusis size. As in the nuclear case, the timing of the L elbow tends to be rather constant relative to the syllable onset (see Table 5.14). It is a little earlier than the nuclear (pre-nuclear (PN) *al-L* averages ca.170ms compared to nuclear (N) 190ms from syllable onset) so that it occurs a little earlier in the accented syllable (middle or later part of the vowel) in the varieties RF, BF and GCC. In the RG nuclear data, the *al-H* timing was earlier still, ca. 128ms from syllable onset, - a value very like found for the nuclear accent.

Table 5.14: Overall mean absolute alignment of *al-L* relative to the onset of the accented syllable in milliseconds (ms)

al-L	**RF**	st.d.	**BF**	st.d.	**GCC**	st.d.	**RG**	st.d.
0PN	150	77.3	172	18.7	184	59.9	111	34.3
1PN	190	55.2	166	36.3	156	28.8	133	35.2
2PN	183	53.4	154	65.9	148	41.4	141	34.3
Average (ms)	**173**	(61.9)	**164**	(40.3)	**163**	(43.4)	**128**	(34.6)

H did not appear affected by anacrusis size either, its timing, relative to the onset of the accented syllable was rather constant, and the *LH* interval was also rather constant. H did This was very different from the nuclear pattern, where H moved rightwards with increasing tail length. The H typically is reached in the post-accent unstressed material, not linked in any consistent way with a particular syllable. The exception is RG, where the H is reached in the accented syllables. As has been mentioned, there were problems with the right hand context of the PN data set, and there are indications that the timing of the trailing H tone may be affected by the right context. This is something that will need future investigation.

5.5 Summary

In this chapter the alignment of low (L) and high (H) targets of rising pitch accents (L*+H) was discussed. Rhythmic conditions were varied by adding an anacrusis of up to two unstressed syllables before the IP-initial pre-nuclear (PN) target syllable (0PN, 1PN, 2PN). Similarly, rhythmic conditions were varied after the nuclear (N) target syllable by adding a tail of up to two unstressed syllables after the last accented syllable in the phrase (N0, N1, N2). The alignment of the elbow (*al-L*), the end of the rise (*al-H*) relative to the onset of the accented syllable was investigated, as well as the distance between these two targets (*LH interval*) were calculated in absolute terms (ms) and as a percentage of the duration of the accented syllable. The following sections present a summary of the main findings across the four varieties for nuclear and pre-nuclear alignment conditions respectively.

Figures 5.24 for N and Figure 5.25 for PN conditions summarise the findings for the different dialects, bringing together the data presented before in sections 5.3.1 – 5.3.4 for N accents and sections 5.4.1 – 5.4.4 for PN accents.

Before proceeding to a summary of the findings, we would remind the reader that due to the small sample size, which did not lend itself to statistical testing, due to some uncertainty about the syllabification of the accented syllable in N2 and PN2, and due to the degree of variability in the data, some of the findings should be seen as tentative.

5.5.1 Nuclear (N) alignment of L and H tones as a function of tail length

Figure 5.24 shows a summary of the proportional and absolute alignment of *al-L* and *al-H* in N0, N1 and N2 for each variety. Note the two panels (a) and (b) for the RG variety, where the four speakers were split into two groups in terms of alignment. In all panels in Figure 5.24, *al-L* and *al-H* are shown as proportional alignment (%) in relation to the duration of the accented syllable beneath the absolute measures given in milliseconds (ms). As indicated in the literature, (Knight & Nolan, 2006) absolute duration measures and proportional alignment are worth considering separately, as regularities in alignment might show up in terms of either type of measure.

Alignment of L*

Looking first at the alignment of L* across the four varieties, results of absolute measures show that L alignment is strikingly stable relative to the onset of the accented syllable across N0, N1 and N2. This has also been shown in Table 5.9 in section 5.3.5. On average, across the four Donegal Irish varieties analysed here (but excluding the older RG group), *al-L* occurs at ca.180ms from the onset of the accented syllable. For the older RG group, the L elbow is ca.134ms from the onset of the accented syllable.

As indicated by the absolute duration scale, the target syllable 'lán' gets shorter with the increased amount of the following unstressed material. Since in Irish, similar to English, syllables in IP-final accent groups are affected by final lengthening, this explains the relatively longer target syllable in N0, but increasing shortening in N1 and N2. Such possible effects of lengthened prosodic units (i.e. syllables or feet) have been pointed out by Silverman & Pierrehumbert (1990) and Steele (1986).

Given the variability in the duration of the accented syllable, the low L*, given its relatively constistant timing relative to the syllable onset is when measured as a proportion of the syllable's duration located at different points in the syllable across the three conditions. It always occurs in the vowel, but, depending on the length of the syllable, can range from close to the mid point to the very end of the vowel.

In proportional terms (%) L* is aligned earlier in N0, later in N1, and later still in N2. The RG variety differs slightly from the other three (RF, GCC and BF) in that the nuclear tune is somewhat different (L*+H L%). Furthermore, the four speakers of RG were divided into two groups of two, with somewhat different timing patterns. Yet even in RG, the L* seems rather consistently located relative to the syllable onset in both groups.

Overall, it appears to be the case that the starred L* tone of the nuclear L*+H is fixed or time-locked to the onset of the accented syllable across all these Donegal dialects. Effectively therefore, there is no shifting, depending on the presence or length of a tail.

Alignment of H

As regards the alignment of the tailing H tone in the RF, BF and GCC varieties, a different trend is found. The H peak drifts rightwards as a function of tail length, and this is the case for both the absolute and proportional measures. Similarly, the absolute distance between the

L and H targets (*LH interval*) is affected by tail length, and increases going from N0>N1>N2. The rise is thus spread over the tail in a way that is proportional to its duration. Thus the H can be located either within the accented syllable (N0), in the post-accented syllable (N1) or in the second post-accented syllable (N2). This finding accords with the suggestion in Dalton & Ní Chasaide (2007a) that the default 'rise-time' is two post-accented syllables, provided they are available, and that the shorter rise time in N1 and N0 represent "compressed" rises.

The RG variety, is different as regards the concept of default 'rise-time' of two post-accented syllables. For both groups of speakers, the trailing H peak seems rather fixed (like the L* tone) and does not shift rightwards, going from N0 to N1 to N2. The final low boundary tone L% (indicated by the light blue dashed arrow), is, as one would expect at the phrase end. So, to sum up, in absolute terms, both L* and H appear to be anchored in a stable way to the syllable onset across the three conditions.

The two speaker groups exhibit some differences in tonal timing in the L*+H tone. For the younger speakers (group a), the L* is timed similar to that of the other three Donegal varieties (ca. 190ms from the onset of the accented syllable). The trailing H peak occurs outside of the accented syllable (note the N0 values are missing for the younger group (a)). For older speakers (group b), both L* and H occur earlier, with the rise completed within the accented syllable in N0 and N1. We believe that this observed difference in the two RG groups is one of phonetic realisation rather a difference in phonological form, and that we are dealing with different realisations of the same tune type (L*+H L%), in both groups. It would be interesting to explore through perception tests to what extent listeners are aware of the timing difference, if so, how they interpret the difference.

To sum up: in all Donegal varieties the onset of the rising tone (L*) appears to be stably anchored to the onset of the accented syllable in terms of absolute measures. It occurs approximately 190ms into the accented syllable (in these data) for all but the older RG speakers, where it occurs somewhat earlier. The realisation of the rise varies across the dialects. In RF, GCC and BF the rise takes longer, the longer the tail. This systematic variability in the *LH interval* militates against the widespread understanding that the trailing tone retains a relatively constant timing relationship with the leading tone. Such a regular timing relationship between the L and H targets was however found in the RG rise, where the rise onset (L*) and the H appear, in absolute terms, to have a rather consistent timing relationship to the onset of the accented syllable and to each other. This differences in timing between RG and the other varieties is of course likely related to the somewhat different nuclear tune of the RG variety, which includes a low boundary tone L%.

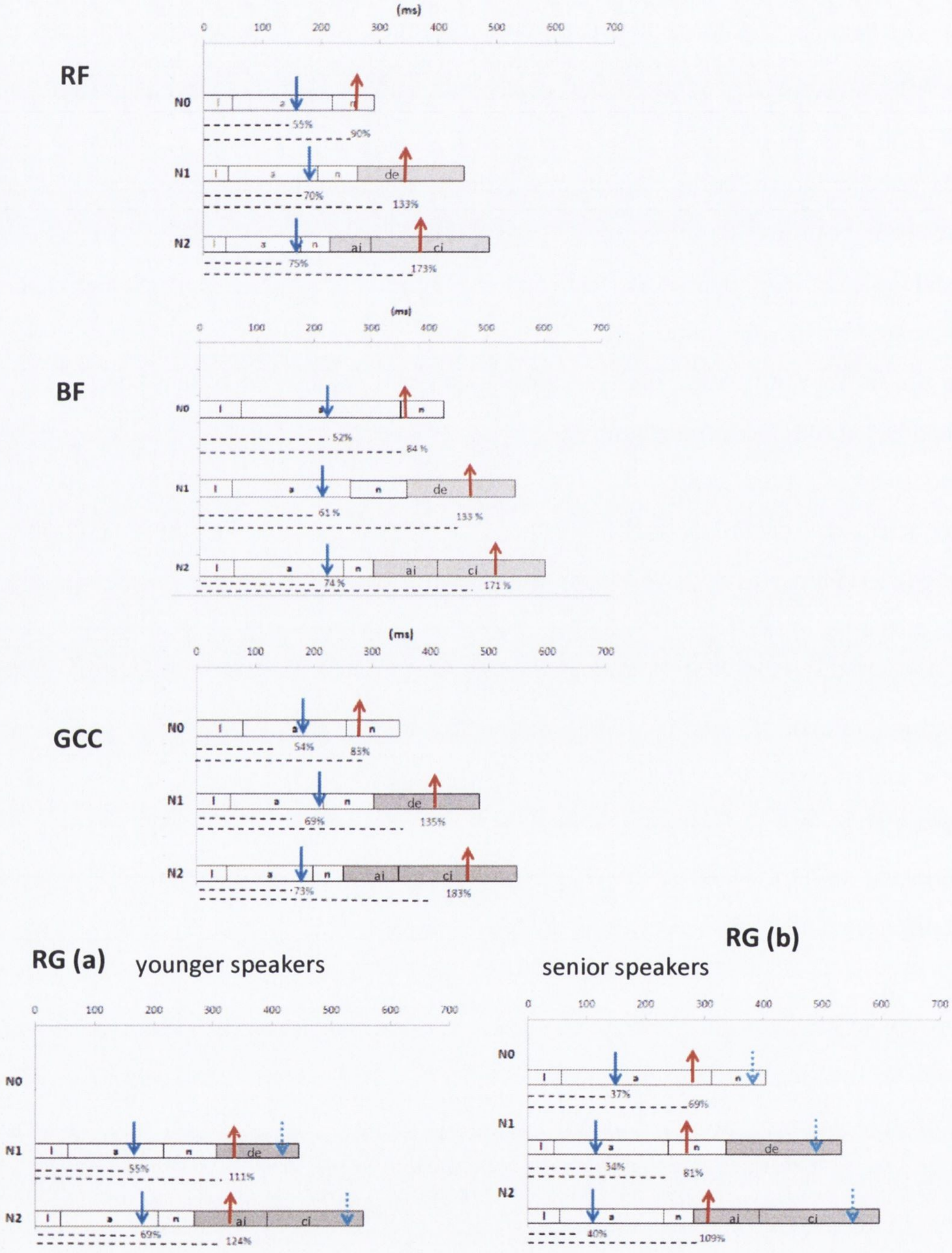


Figure 5.24: Nuclear (N) alignment across the four Donegal varieties. For the main tune type, durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in ms. The nuclear alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) are shown in the three varying rhythmic conditions N0, N1 and N2. (For RG, the L% boundary = dashed blue arrow) Beneath boxes for each condition the timings are shown as % of the duration of the accented syllable. Details on speaker numbers etc, are given in the relevant sections.

5.5.2 Pre-nuclear (PN) alignment of L and H tones as a function of anacrusis

Figure 5.25 shows a summary of proportional and absolute alignment of *al-L* and *al-H* in 0PN, 1PN and 2PN for each variety respectively.

Looking first at the absolute values, L* is again aligned at a relatively stable distance from the onset of the accented syllable across the three conditions in the RF, BF and GCC varieties. The timing of L* in the pre-nuclear accent is marginally earlier than in the nuclear accents (157ms) across the four varieties. Studies on the alignment of pre-nuclear peaks have reported a left-ward pulling effect of increased anacrusis size in English (Nolan & Farrar, 1999), but this is not the case in the Donegal Irish varieties. The trailing H peak is also mostly stably located, relative to the onset of the accented syllable. Where it departs most from this is N0 in RF and BF, most likely due to (unplanned) changes in the right context where an additional accent was realised. Since no left-ward pulling effect of increased anacrusis size was observed on L, it is concluded that it is the right context that influences the precise alignment of the H targets, as was found to be the case in the nuclear accent. In these sentences the syllable structure and composition of the syllables following the initial pre-nuclear accent was not controlled, and it is difficult to make any strong suggestion here, but this is an area that would be interesting to explore further.

As to the RG variety, the presented analysis is shown for only three speakers, since speaker AML showed alignment characteristics that were different from the other three speakers. Nonetheless, the RG results were somewhat similar to the other varieties in that the absolute values suggest again a rather stable alignment for both low and high targets. Overall, both L* and H occur earlier than in the other varieties, and the rise is completed with the accented syllable.

Since the alignment of the starred element of the bi-tonal pitch accent L*+H shows a rather stable alignment in absolute terms and rather minor differences in proportional measures, it is questionable whether the alignment of L and H is influenced by anacrusis size. Such timing differences as we observe are more likely to reflect the influence of the structure and number of the following unstressed material. In the literature it has been argued before, for example, by Silverman and Pierrehumbert (1990) that the alignment of pre-nuclear peaks is influenced by the following environment where the target syllable is affected by lengthening effects of the following context material.

Absolute measures suggest that in 2PN the accented syllable is shortened compared to 0PN and 1PN. Since syllable structure and lengthening factors were not controlled for following material in this experiment, this would be an interesting point to carry out future experiments. With regard to the absolute *LH interval,* results showed very similar values for 0PN conditions on the one hand and 1PN and 2PN on the other across the three varieties.

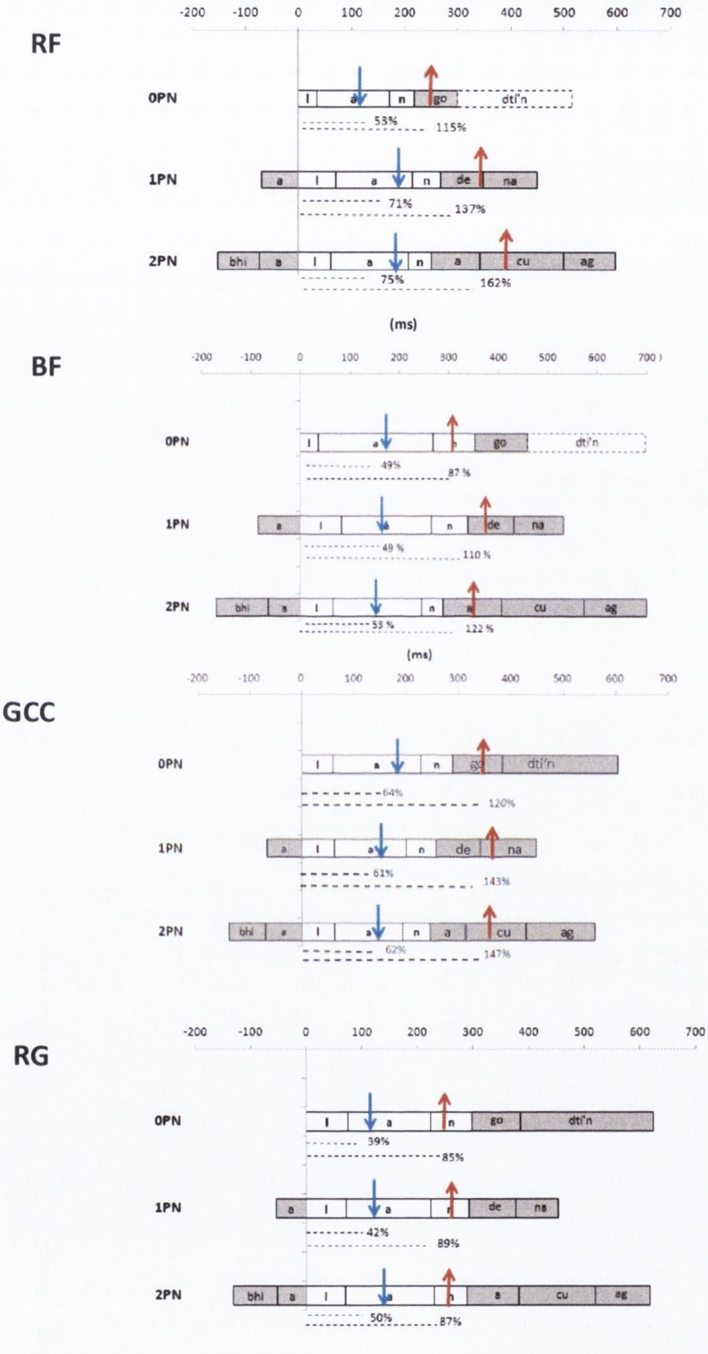


Figure 5.25: Prenuclear (PN) alignment across the four Donegal varieties. Right: for the main tune type, durations of accented syllable segments (white boxes) and of the following unstressed syllables (grey boxes) are shown in ms. The syllable (dashed line) in 0PN shows the additional third accent found in RF & BF. The alignment of low elbows *al-L* (blue arrow) and high peaks *al-H* (red arrow) of the pre-nuclear accent are shown in the three varying rhythmic conditions 0PN, 1PN and 2PN: for each condition % values beneath the boxes show these timings as a % of the duration of the accented syllable. Details on speaker numbers etc are provided in the relevant sections.

5.6 Conclusion

Returning now to the research questions addressed at the beginning, this chapter aimed to answer the following questions:

Q1: How does an increased
a) tail length b) anacrusis size
affect the alignment of L and H turning points relative to the accented syllable?

✓ **a)** tail length

As to Q1a), In terms of absolute alignment from the beginning of the accented syllable, results showed that L* is aligned relatively stably, at about 190ms from the syllable onset. As the accented syllable varies in duration across the three conditions (N0>N1>N2), it follows that the L* occurs at an increasingly late point in the syllable, going from N0 to N1 to N2 (in proportional terms). The trailing H tone drifts increasingly rightwards the more unstressed material follows. So the length of the tail does not affect the absolute timing of the rise onset, but does affect the duration of the rise, so that it is longer, the longer the tail.

✗ **b)** anacrusis size

As to Q1b) Results suggest that neither L* nor H alignment seem to be affected by anacrusis size in the same way as by tail length. Rather, both L* and H seem to be rather fixed in timing, with L being anchored to the onset of the accented syllable. Where small differences in timing emerged, they appeared to be rather more likely to be occasioned by the inadvertent variation in the accentuation pattern in the phrase following the initial pre-nuclear accent, and perhaps also by the duration of the post-accented material in the foot. We tentatively suggest that the left context may not exert much influence on the timing or the leading tone (L*), but that the right context exerts an influence on the trailing peak (H). This would be interesting to explore further, particularly for the right context in the initial pre-nuclear accent, which was not examined in this study.

Q2: Are there sub-dialect differences with regard to Q1 (a) and/or Q1 (b)?

Yes. Results showed differences between varieties. Where RF, BF and GCC showed similar behaviour in the alignment of L and H, RG showed a different trend: First of all, as was already noted in Chapter 4, nuclear tunes ended overall with a final low boundary (L*+H L%) which was not the case in the other varieties. Two of the four speakers in the RG variety aligned earlier than the others. More precisely, the two more mature informants (AML, SMO) were inclined to align earlier than the two younger informants (FP, MM), whose alignment patterns were more similar to the other three varieties. This applies to the N conditions. In the PN conditions there was again variability in RG with regard to the tune inventory. In PN, speaker AML had the tendency to align earlier and was therefore excluded from the analysis. Results suggest a stable alignment in absolute time for both L* and H, but with both elements occurring earlier than in the other dialects. Overall, we would treat these results with caution due to the variability among the speakers, and feel that this variety would warrant a more extensive study. For this reason, the conclusions drawn about tonal alignment characteristics in the RG-variety should be seen as tentative.

In Chapter 2.8 the question was raised whether the timing of the L and H targets in PN conditions would mirror that of the Gaoth Dobhair variety where the elbow of the L occurs towards the end of the vowel in the accented syllable (Dalton & Ní Chasaide, 2005b), or if it would be more similar to the early alignment of L reported for prenuclear rises in English and the two German varieties reported on in Atterer and Ladd (2004), where the low elbow (L) aligns to the beginning of the syllable. Results have shown, that the Donegal Irish varieties are have similar to what has been reported for Gaoth Dobhair Irish in terms of L alignment, see Figure 5.26.

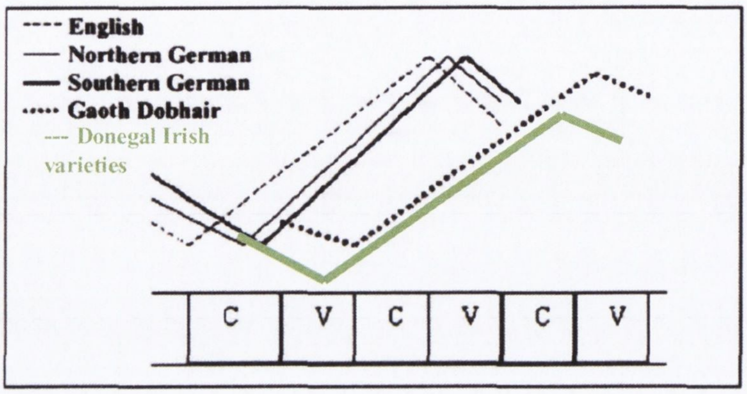


Figure 5.26: Schematic illustration of the rise (L*+H) in the Donegal Irish varieties (green line), in Gaoth Dobhair Irish, dotted black line (Dalton & Ní Chasaide, 2005b) compared to rising tones in English (dashed black line), Northern (thin black line) and Southern German (bold black line) as in Atterer & Ladd (2004). Figure adapted from Dalton & Ní Chasaide (2005b, p.460).

On average the low elbow is aligned around the middle of the vowel, around 157ms, in the accented syllable and occurs much later in the syllable than in English or the Northern and Southern German varieties. In this respect it is more similar to Gaoth Dobhair Irish, where the low elbow is typically realised at the end of the accented vowel.

As to *LH interval,* the findings from this study showed that this measures is affected by tail length, and increases going from N0>N1>N2, and similar observations were made for the PN conditions. The rise is thus spread over the tail in a way that is proportional to its duration. Claims in the literature about the maintenance of a constant rise duration, where leading and/or trailing tones are described to occur at a stipulated distance in time before or after the starred tone (e.g., Grice, 1995), are thus not supported by our findings for nuclear tonal alignment. Our pre-nuclear data however showed a less variable temporal relationship, although there are, we speculate that the trailing tone would vary here too as a function of the following material, something that was not controlled for in the present study.

5.7 Comparison to southern Irish dialects

Earlier studies of southern dialects (Dalton & Ní Chasaide 2003, 2005a, 2005b, 2007a, 2007b; Ní Chasaide & Dalton, 2006), show that they have rather different tunes from the Donegal dialect: predominantly H*+L in nuclear accents and H* or H*+L in pre-nuclear accents. They also suggest that southern varieties, even very closely related ones can vary considerably in terms of alignment, when the size of the anacrusis or tail is varied. The Connaught variety of Cois Fharraige was found to have a very fixed H* peak in each of these cases, whereas the near-neighbour variety of Inis Oírr, on the Aran Islands, was found to have a variable H* alignment, reflecting a strong effect of anacrusis or tail size.

The present study, while dealing with a very different accent type (L*+H), our findings are rather reminiscent of the Cois Fharraige variety, in that the alignment of the starred element seems fixed, regardless of anacrusis or tail size. However, the trailing H was found to vary systematically with tail length.

5.8 Similarities and differences to alignment in UNB English varieties

Having examined the alignment of the low elbow and the end of the rise in rising pitch accents in the Donegal Irish varieties, we can now look at similarities and differences described for UNB (Urban Northern British) English varieties with rising tunes for which alignment has also been investigated or commented on.

The most recent study includes that of Belfast and Glasgow English by Sullivan (2011), who investigated alignment in short and long utterances of statements and questions. In a similar manner, Sullivan also investigates variability of the low plateau in Belfast English (Sullivan, 2006, 2007b) nuclear accents. Sullivan (2006), looking at read and semi-spontaneous speech in Belfast English from the IViE Project (Grabe et al 2001), indicates variability of the valley (L) in alignment due to a number of different factors such as segmental properties, gender and the number of unstressed syllables. Her findings show that the low elbow in Belfast English is in general aligned on the vowel of the accented syllable, but with some room for variation depending on factors such as gender, syllable structure and position in the IP, sentence type as well as anacrusis size and tail length. She concludes that in this respect Belfast English is not like Liverpool or Glasgow English, given that Ladd (1996) observed for Glasgow English that the rise starts before the accented syllable. A similar observation was made by Mayo et al. (1997) also for Glasgow English. In a way, the Donegal Irish varieties are more similar to Belfast than to Liverpool or Glasgow English. In none of the Donegal varieties was the low elbow aligned outside/before the accented syllable in the nucleus. Although the data showed speaker specific alignment differences where individual speaker tended to align L earlier than others, it was never outside of the accented syllable.

Sullivan's (2007b) study also looked at the previously reported leftward pulling effect of anacrusis size on peaks in Belfast English (F. Nolan & Farrar, 1999). Both studies (Sullivan, 2007; Nolan & Farrar, 1999) showed that H peaks and also L valleys were subject to this trend in pre-nuclear accents. Such observations are less clear in the Donegal Irish varieties investigated here.

In this chapter the tonal alignment characteristics of the four Donegal Irish sub-dialects were investigated. As results from chapter 4 have shown, the rise L*+H was the most common nuclear and pre-nuclear accent type across the different conditions in all varieties, except for RG where rise-falling nuclear tunes were realised more often. Similar to previous studies on tonal alignment in the Donegal Gaoth Dobhair variety Irish (Dalton, 2008; Dalton & Ní Chasaide, 2005b; 2007b), our results largely correspond to the earlier findings, and showed a stable L* timing, and a trailing peak that is influenced by the length of the tail. The timing in prenuclear accents appeared to be somewhat earlier that of the Gaoth Dobhair variety. Only RG showed differences in alignment. In the case of the nuclear accent, this difference in timing could be due to the different predominant nuclear tune, a rise fall.

Additionally, no leftward pulling effect of anacrusis size was found as had been described for English by Nolan & Farrar (1999). It would thus be the case that the following context may influence the alignment of pre-nuclear tones as has been noted by Silverman & Pierrehumbert (1990). This hypothesis, however, still needs to be tested.

6 Focus

6.1 Introduction

This chapter describes the prosodic correlates of focus in the four Donegal Irish varieties. We look at the effects of focus on two features, pitch (f_0) and length (duration), which are together with loudness (amplitude) the assumed primary prosodic prominence markers following the work of Cruttenden (1997), Ladd (1996) or Gussenhoven (2004). As was discussed in Chapter 2.9, languages differ greatly in the mechanisms they use to mark focus, and usually a combination of grammatical and prosodic means are employed. In that chapter (section 2.3) we discussed how focus in Irish can be marked syntactically (e.g., through clefting), morphologically (e.g., with emphatic pronouns) or prosodically. This study explores the latter.

To recap, this chapter seeks answers to the following specific research questions:

> **Q1:** What are the pitch effects of focus, both narrow and contrastive (compared to broad focus) on the
>
> c) tonal patterns
> d) f_0 excursions of the potentially accented items ($f_0$exA1, $f_0$exA2, $f_0$exA3)
>
> **Q2:** What are the duration effects of focus, both narrow and contrastive, (compared to broad focus) on the
>
> c) duration of the potentially accented syllable (dursA1, dursA2, dursA3)
> d) duration of feet (durftA1, durftA2, durftA3)
>
> **Q3:** Are there sub-dialect differences with regard to Q1 and/or Q2?

As discussed in Chapter 2.9, languages can differ considerably in the prosodic marking of focus. There can be a difference in emphasis in how linguists view prosodic focus. Some, like Ladd (1996, 2008), emphasise the fact that languages can differ, and take the view that the realisation of focus depends on the intonational phonology of a particular language. Other linguists such as Xu & Xu (2005), emphasise that focus in very different languages appears to be marked by specific phonetic pitch adjustments, affecting different regions of the utterance (see below) and speculate that such adjustments may apply to all languages.

In this respect it is of interest to investigate in this study what the prosodic correlates of focus are in these Donegal Irish varieties, and where they show similar trends to what has been observed for other languages. Might the Donegal Irish varieties show a preference for specific tones in focal accentuation, similar to what has been found in certain Romance languages? Alignment differences, leading to differences in tunes between broad and contrastive focus have been noted, for example, in European Portuguese (Frota, 2002), Neapolitan Italian (D'Imperio, 1997) or Florentine Italian (Avesani & Vayra, 2003). If, as is widely reported, the f_0 excursion size is a major aspect of prosodic focus signalling, it is also of interest to see how this would be realised on L* + H tones: does the change involve a raising of H, a lowering of L* or a combination of both of these? It is also of interest to see these Donegal Irish varieties might show a 'tri-zone pitch range adjustment' as reported by Xu & Xu (2005) for English and claimed for many languages, very different from English, such as tone languages (see discussion in Chapter 2.9).

In durational terms, we also wondered, whether focus will have an effect on the duration not only on the focal constituent, but also on the preceding and following constituents in the phrase. Such duration effects of focus have been noted by Xu et al (2004) for Mandarin, who observes that all elements in the phrase are affected. These findings, however, have been challenged in studies on other languages such as Swedish (Heldner & Strangert, 2001) or German (Kügler, 2008). Given the various focus markers found for other languages, we seek to establish which might apply to the Donegal Irish varieties, and whether there might be differences in how the different varieties mark focus.

The materials used in the present study are outlined below in section 6.2, along with details concerning the analysis methodology. Pilot studies of focus which included some of the present data (Dorn & Ní Chasaide, 2011; O'Reilly et al., 2010) and are discussed in section 6.3. The subsequent sections of this chapter present the analysis of tonal patterns and accents excursion (section 6.4), as well as results for the analysis of the effect of focus on syllable and foot duration (section 6.5) across the four Donegal Irish varieties. Finally, in section 6.6, a summary is provided of the main findings and the specific research questions posed above are revisited. A conclusion is given in section 6.7.

6.2 Materials and Methodology

6.2.1 Materials

This section of the corpus (see also Appendix 3) was designed to investigate the effects of focus on f_0 and duration in the Donegal Irish varieties. The target sentence on which differing types of focus were elicited was *Bhí Méabh 'na luí ar a'leabaí* /vʲi 'mʲew nˠə 'lˠi ərˠ ə 'ʎabˠi/ 'Méabh was lying on the bed', a sentence with three potentially pitch accentable syllables (**A1**: Méabh /mʲew/, **A2**: luí /lˠi / and **A3**: lea /ʎa/). Then, narrow and contrastive focus were elicited on each of the accentable syllables respectively. Table 6.1 shows an overview of the focus types, the target phrase and the coding for each condition as referred to in the study. Table 6.2 presents the target phrases in context along with the IPA transcription and glosses.

Table 6.7: Target sentences *Bhí Méabh 'na luí ar a'leabaí* /vʲi 'mʲew nˠə 'lˠi ərˠə 'ʎabˠi/ '*Méabh was lying on the bed*' for the analysis of broad, narrow and contrastive focus, shown by focus type (left), focal element in the target phrase (underlined) with the terminology (coding) used for reference (right).

focus type	**target phrase** /vʲi 'mʲew nˠə 'lˠi ərˠ ə 'ʎabˠi/ '*Méabh was lying on the bed*'	**coding**
broad focus	Bhí <u>Méabh</u> 'na <u>luí</u> ar a' <u>lea</u>baí.	bf
narrow/contrastive focus A1	Bhí <u>Méabh</u> 'na luí ar a' leabai.	nf A1 / cf A1
contrastive focus A2	Bhí Méabh 'na <u>luí</u> ar a' leabaí.	cf A2
narrow/contrastive focus A3	Bhí Méabh 'na luí ar a' <u>lea</u>baí.	nf A3 / cf A3

Broad focus (**bf**) was prompted by a general question, not giving any information about the focusable elements in the phrase. Narrow focus (**nf**) was elicited by a wh-question where the trigger word was replaced with a question word and provided new information in the response. Finally, contrastive focus (**cf**) was triggered by a yes/no question where the target word was replaced by an alternative. Note, that no narrow focus (nf) on A2 (luí) was elicited. It was unnatural for Irish speakers to produced narrow focus on this element and that's why this condition was excluded from the data set. The complete set of target phrases in their contexts are also included in Appendix 3.

Table 6.2.: Target sentence *Bhí Méabh 'na luí ar a'leabaí* /vʲi 'mʲew nˠə 'lˠi ərˠ ə 'ʎabˠi/ '*Méabh was lying on the bed*' in the context sentences in broad focus (bf), narrow focus (nf) and contrastive focus (cf) conditions

Broad focus

Q:	Ar	tharla	gach ar bith	inné?							
	did	*happen*	*anything*	*yesterday*							
	/ərʲ	'harˠlˠə	gah ərˠ bʲi	ɪ'nʲe/							
	'Did anything happen yesterday?'										
bf:	Níor	tharla	mórán.		Bhí	Méabh	'na	luí	ar	a'	leabaí.
	not	*happen*	*much*		*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/nʲirˠ	'harˠlˠə	'mˠorˠanˠ/		/vʲi	'mʲew	nˠə	'lˠi	ərˠ	ə	'ʎabˠi/
	'Nothing much happened'.				'Méabh was lying on the bed.'						

Narrow focus conditions

Q:	Cé	a bhí	ina	luí	ar	a'	leabaí?
	who	*was*	*in her*	*lying*	*on*	*the*	*bed*
	/ce	ə vʲi	inˠə	lˠi	ərʲ	ə	'ʎabˠi/
	'Who was lying on the bed?'						
nf A1:	Bhí	Méabh	'na	luí	ar	a'	leabaí.
	was	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ vʲi	'mʲew	nˠə	'lˠi	ərˠ	ə	'ʎabˠi/
	'Méabh was lying on the bed.'						

Q:	Cá	raibh	Méabh	ina	luí?
	what	*was*	*Méabh*	*in her*	*lying*
	/ka	rˠo	mʲew	nˠə	lˠi/
	'What was Méabh lying on?'				

nf A3:	Bhí	Méabh	'na	luí	ar	a'	leabaí.
	was	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ vʲi	'mʲew	nˠə	'lˠi	ərˠ	ə	'ʎabˠi /
	'Méabh was lying on the bed.'						

Contrastive focus conditions

Q:	An	raibh	Bríd	ina	luí	ar	a’	leabaí?	
	Q-part	*was*	*Bríd*	*in her*	*lying*	*on*	*the*	*bed*	
	/ənˠ	ɾˠo	bʲɾʲidʲ	inˠə	'lˠi	əɾˠ	ə	'ʎabˠi/	
	‘Was Bríd lying on the bed?’								

cf A1:	Cha raibh/ Ní raibh.	Bhí	Méabh	‘na	luí	ar	a’	leabaí.
	not was	*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ xa ɾˠo/ /nʲi ɾˠo/	/vʲi	'mʲew	nˠə	'lˠi	əɾˠ	ə	'ʎabˠi/
	‘No.’	‘Méabh was lying on the bed.’						

Q:	An	raibh	Méabh	ina	seasamh	ar	a’	leabaí?
	Q-part	*was*	*Méabh*	*in her*	*standing*	*on*	*the*	*bed*
	/ənˠ	ɾˠo	'mʲew	nˠə	ʃasˠu	əɾˠ	ə	'ʎabˠi
	‘Was Méabh standing on the bed?’							

cf A2:	Cha raibh./Ní raibh.	Bhí	Méabh	‘na	luí	ar	a’	leabaí.
	not was	*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ xa ɾˠo/ /nʲi ɾˠo/	/vʲi	'mʲew	nˠə	'lˠi	əɾˠ	ə	'ʎabˠi/
	‘No.’	‘Méabh was lying on the bed.’						

Q:	An	raibh	Méabh	ina	luí	ar	an	urlár?
	Q-part	*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*floor*
	/ənˠ	ɾˠo	'mʲew	nˠə	'lˠi	əɾˠ	ənˠ	'uɾˠlˠaɾˠ/
	‘Was Méabh lying on the floor?’							

cf A3:	Cha raibh /Ní raibh.	Bhí	Méabh	‘na	luí	ar	a’	leabaí.
	there wasn’t	*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ xa ɾˠo/ /nʲi ɾˠo/	/vʲi	'mʲew	nˠə	'lˠi	əɾˠ	ə	'ʎabˠi/
	‘No.’ ‘Méabh was lying on the bed.’							

As a first step in the data analysis for each variety, careful auditory analysis and inspection of the f_0 contours showed some degree of variation in tunes within and across the speakers. As expected from our results in chapter 4, there was not a single dominant tune, but overall, the auditory analysis showed that focal accents (narrow and contrastive), regardless of which position in the phrase (A1, A2 or A3), were almost always produced with a rising pitch pattern L*+H across the varieties, with the exception of focal A1 in the RG variety where the fall H*+L occurred more often. There was however, a high degree of variation as to the pre-focal tonal patterns which varied even across speakers within individual varieties. Therefore, the preferred tunes (for the sentence) was initially analysed for each focal condition in each variety. Where there was a frequent second tune, it was also included in the analysis. The less frequent tunes where thus not included.

A number of utterances were excluded for other reasons. Utterances which were not produced with focus on the intended accent were discarded. Furthermore, as the recordings were carried out in pairs, and as the subjects often became amused at the frequent repetitions, there were rather frequent bouts of laughter which unfortunately yielded unanalysable data. Cases with creaky voice and coughs were also excluded.

Thus, although a total of 480 tokens across the different focal conditions were collected, for all the reasons just mentioned, 175 tokens were excluded from the analysis, leaving a total of 305 utterances. The details are provided in Table 6.2.

Table 6.2: Overview of the number of tokens collected, analysed and excluded across the different focal conditions.

	#	repetitions	no. of speakers	varieties	total no. of tokens	tokens excluded	tokens analysed
bf	1	5	4	4	80	-24 (30%)	56 (70%)
nf_A1	1	5	4	4	80	-30 (37%)	50 (63%)
cf_A1	1	5	4	4	80	-25 (31%)	55 (69%)
cf_A2	1	5	4	4	80	-32 (40%)	48 (60%)
nf_A3	1	5	4	4	80	-36 (45%)	44 (55%)
cf_A3	1	5	4	4	80	-28 (35%)	52 (65%)

6.2.2 Annotation of tunes and measurements of phonetic and duration features

All utterances were labelled manually in the same manner in Praat (Boersma & Weenink, 2008) using IViE labelling (Grabe, 2001). Then, values were extracted automatically using adapted Praat scripts (Welby, 2008). Figure 6.1 gives an illustrative example of an annotated utterance, and Table 6.3 provides the inventory of annotation labels and calculations carried out. To begin with, the target utterance was transcribed orthographically to facilitate the transcription of stressed syllables and tone labels. Then, the potentially accented syllables in each group were marked (sl, s2, s3) as was the unstressed material preceding and/or following accented syllables (spl, sp2, sp3, sp4). Further, the absolute f_0 minimum (L) and maximum (H) in each of the three accent groups (A1, A2 and A3) were annotated as was the beginning (B) and end (E) of each phrase. See Table 6.3 for the full inventory of annotated f_0 points and derived measures.

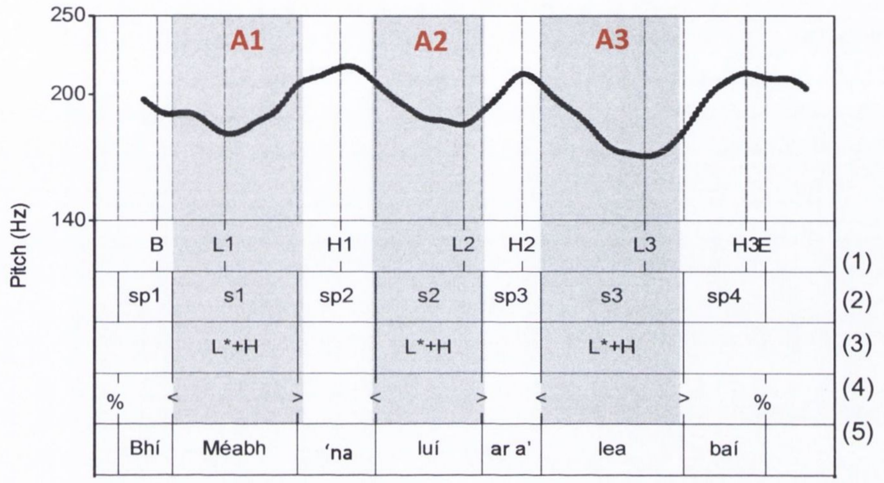


Figure 6.1: Annotation and segmentation points with three potentially pitch accentable syllables (A1, A2, A3) in grey. Orthographic transcription (tier 5), annotation of stressed syllables and boundary tones (tier 4); transcription of tonal patterns (tier 3); marking of accentable syllables (s1, s2, s3) and preceding unstressed material (sp1) and following unstressed material (sp2, sp3, sp4) for duration measurements (tier 2); annotation of low (L) and high (H) f_0 turning points for each of the three accent groups as well as the beginning (B) and end (E) points of the pitch contour (tier 1). For the full set of terms used for annotation and transcription see Table 6.3. (Soundfile: DI-GCC-SNC-bf-2)

Table 6.3: Labels of direct acoustic annotations, extracted values and there of derived measures

Labelled intervals	
sp1	unstressed material preceding the first accentable syllable
s1	1st accentable syllable (A1)
sp2	unstressed material preceding the second accentable syllable
s2	2rd accentable syllable (A2)
sp3	unstressed material preceding the third accentable syllable
s3	3rd accentable syllable (A3)
sp4	unstressed material following the third accentable syllable
Extracted durations in milliseconds (ms)	
dursp1	duration of the unstressed material preceding the first accentable syllable
durs1	duration of the 1st accentable syllable (A1)
dursp2	duration of unstressed material preceding the second accentable syllable
durs2	duration of the 2nd accentable syllable (A2)
dursp3	duration of the unstressed material preceding the third accentable syllable
durs3	duration of the 3rd accentable syllable (A3)
dursp4	duration of the unstressed material following the third accentable syllable

f_0 target timepoint labels		
B	beginning of the utterance	
L1	absolute low target in the 1st accent group	
H1	absolute high target on the 1st accent group	
L2	absolute low target in the 2nd accent group	
H2	absolute high target on the 2nd accent group	
L3	absolute low target in the 3rd accent group	
H3	absolute high target on the 3rd accent group	
E	end of the utterance	
Extracted f_0 values in Hz		
f0B	beginning of the utterance	
f0L1	absolute low target in the 1st accent group	
f0H1	absolute high target on the 1st accent group	
f0L2	absolute low target in the 2nd accent group	
f0H2	absolute high target on the 2nd accent group	
f0L3	absolute low target in the 3rd accent group	
f0H3	absolute high target on the 3rd accent group	
f0E	end of the utterance	
Derived f_0 excursion measures in semi-tones (st)		
$f_0$exA1	excursion of the first focal pitch accent	H1 – L1
$f_0$exA2	excursion of the second focal pitch accent (st)	H2 – L2
$f_0$exA3	excursion of the third focal pitch accent	H3 – L3

6.2.3 Duration measurements

For calculating the durations of accentable syllables (A1, A2 and A3) and of the remaining unstressed chunks in each phrase, utterances were segmented in the following way:

	A1		A2		A3	
Bhí	Méabh	'na	luí	ar a'	lea	baí

It was important to be able to compare durations for A1, A2 and A3 regardless of whether they were in fact accented, as the durational consequences of de-accentuation could turn out to be as important as the durational consequences of focal accentuation. Durations of accentable syllables and unstressed chunks were pooled across all speakers for the main tune type only. In this way the effect of focus on the durations of all elements in the target phrase was shown and offered comparable analysis across the different focus conditions.

We also looked at the foot, to see whether focal accentuation would alter the relative duration of feet in the sentence. The target sentence in the broad focus condition has three rhythmic feet and we refer to these as potentially focused rhythmic feet. Foot durations were calculated by adding up the extracted duration values for the potentially accented syllable and following unstressed material.

6.2.4 F_0 measurements

Figure 6.2 shows an example of the specific f_0 (pitch) target points, annotated for calculating the derived measures (f_0 excursion) from the extracted f_0 points: the absolute f_0 minimum (L) and maximum (H) in each of the three accent groups (A1, A2, A3) were annotated as was the beginning (B) and end (E) of each phrase.

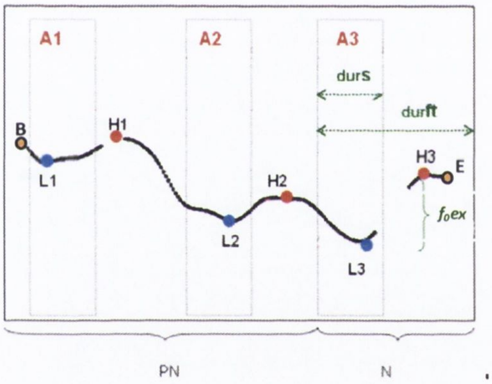


Figure 6.2: Figure showing the f_0 contour for a sentence with an L*+H L*+H L*+H % intonation contour in Donegal Irish. The annotated pitch points measured for illustrating the pitch contours and for deriving the f_0 excursion measurements for A1, A2 and A3 are shown. Reproduced from Dorn & Ní Chasaide (2011).

As with the duration measurements, it was of interest to capture the extent to which the pitch excursions associated with the accentable syllables differed when a syllable carried focal accentuation, or indeed when it was de-accented. As regards the calculation to allow comparisons of pitch excursions associated with A1, A2 and A3 ($f_0$exA1, $f_0$exA2, $f_0$exfA3, in Table 6.3), we restricted ourselves to the tunes that had the rising accents type L*+H, and therefore the excursion is calculated by subtracting the lower value (L) from the higher (H) which yields a positive number. F_0 excursions (or the lack of them) are also calculated for the pre-focal and post-focal contexts. In cases of the post-focal material in focal A1 and A2 conditions we are dealing with likely de-accentuation, where instead of a low elbow followed by a high peak, a falling f_0 trajectory is typical. In these cases, the comparable f_0 measures for $f_0$exA2, $f_0$exA3 were taken to be the highest f_0 points in the vowel of the accentable item and its following unaccented vowel. In these cases the calculated f_0 excursion measures yield a negative value, due to the gradually declining pitch slope and the fact that in those instances the higher value is being subtracted from the lower. This issue did not arise with the pre-focal material.

Mean representations of the f_0 contours of target phrases were generated from the measured pitch points, as illustrated in Figure 6.2. For each speaker, f_0 values were converted to semitones (st) with the individual speaker's minimum as the reference value, using the same formula as was employed in Chapter 4.2.2. For the illustration, values were then averaged across the speakers of a given variety. The illustration below (Figure 6.3) is of the primary (preferred) tune. However, where a secondary tune was very frequent, it is also illustrated with a dashed line using the same colour coding.

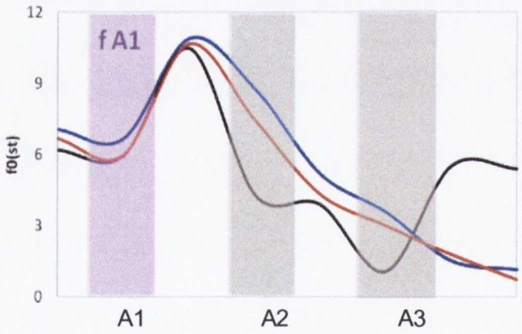


Figure 6.3: mean f_0 contours in semitones (st) of sentences produced by all speakers of a given variety for the three focal conditions: broad focus (bf=black line); narrow focus (nf=blue line) and contrastive focus (cf=red line). The three accentable syllables A1, A2 and A3 are shaded and the focally accented syllable (fA1) is shaded in pink.

6.3 Pilot studies -- preliminary observations

Two pilot studies were carried out on the phonetic effects of focus in Donegal Irish and Donegal English by O'Reilly, Dorn & Ní Chasaide (2010), and by Dorn & Ní Chasaide (2011).

The first of these, O'Reilly, Dorn & Ní Chasaide (2010), compared broad and contrastive focus in two groups of Donegal speakers, five Irish and five English. The speakers from each of the two individual groups were bilingual, and were from Gaoth Dobhair (this variety is geographically the closest to our Rann na Feirste (RF) variety). We investigated the role of f_0 in the realisation of focus in both languages in terms of tunes and f_0 excursion. Since the reported default tonal pattern in pre-nuclear and nuclear accents in both of these varieties of English and Irish is the rise (L*+H) (see Dalton (2008) for Donegal Irish and Dorn (2006) for Donegal English), it was of interest to investigate if the effect of focus would bring about a lowering of the L* or a raising of the H tone or possibly a different tonal pattern altogether in the case of contrastive focus, as is the case in European Portuguese, for example (Frota, 2002).

The results from the 2010 study are reproduced in Figure 6.4, left panel. For the stylised contours shown in Figure 6.4, the absolute low and high f_0 points in each of the three accent groups (A1, A2 and A3) were annotated as was the beginning and end of the phrase. This was done for each utterance manually. The stylised contours shown in Figure 6.4 were derived by connecting the mean values of the measured f_0 points for the main contour type across all speakers for Irish (L*+H L*+H L*+H 0%) and English (L*+H !H* L*+H 0%) separately. Graphs were produced in Excel. No statistical tests were carried out in this study.

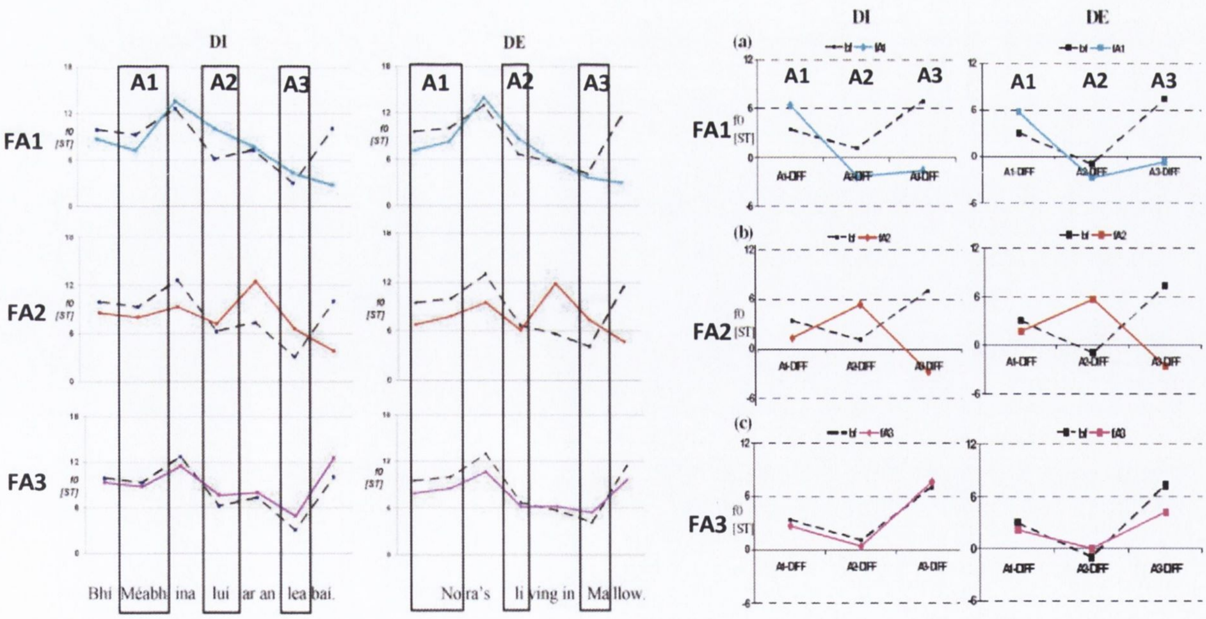


Figure 6.4: Broad and contrastive focus in Donegal (Gaoth Dobhair) Irish (DI) and Donegal English (DE). Left panel: stylised f_0 contours across the focus conditions. Right panel: f_0 excursion of focal accents together with pre-focal and post-focal accents. In both panels broad focus = dashed lines; contrastive focus on A1 (condition FA1) = blue line; contrastive focus on A2 (condition FA2) = red line; contrastive focus on A3 (condition FA3) = pink line. Figures reproduced from O'Reilly, Dorn & Ní Chasaide (2010).

Our results from O'Reilly, Dorn & Ní Chasaide (2010) showed that focus is produced by largely the same means in both languages. In both Donegal Irish and Donegal English the contour structure is very similar with rising pitch accents in the nuclear and the initial pre-nuclear positions in the phrase in broad focus. For both languages, the rise is also the pattern used in contrastive focus accents. For non IP-final focal conditions, the major changes in f_0 dynamics largely mirrored those reported for English by Xu & Xu (2005): f_0 range boost on the focal accent, as well as post-focal de-accentuation and a gradually falling trajectory. As to the excursion of the focal accent (Figure 6.4, right panel), the results showed that the boosting is mostly brought about by raising the H peak of the L*+H rising accent, except for focal accents in the IP-initial accent group (A1) where both turning points are affected: L is lowered and H is raised. Note that the negative values in the f_0 excursion in the post-focal accentable syllables when the focal accent is on the initial or medial pre-nuclear accents, i.e. FA1 and FA2 in Figure 6.4, right panel, are due to the gradually declining f_0 slope where no excursion is produced due to de-accentuation.

The second pilot study, Dorn & Ní Chasaide (2011) examined the effects of different focus types, broad (*bf*), narrow (*nf*) and contrastive focus (*cf*) focus on f_0 excursion and on duration in Donegal Irish, drawing on some of the data from six speakers (from three locations in the present study, RF. BF and GCC). Results showed that the different focus types, narrow (*nf*) and contrastive focus (*cf*), were realised by largely the same means: the default tonal pattern is the rise (L*+H) in all focal conditions. Results are illustrated in Figure 6.5 below. The focal accent ranges are reported in semitones (st). Both *nf* (nfA1: 5st, nfA3: 6.6st) and *cf* (cfA1: 5.6st, cfA2: 5.9st, cfA3: 6.3st) were considerably larger than in broad focus (*bf*) (bfA1: 3.6st, bfA2: 1.5st, bfA3: 4.9st) (see Figure 6.5, lower panel left). No substantial differences in the f_0 excursion between *nf* and *cf* were noted. Note again, that no narrow focus was elicited on the phrase-medial accent group (A2) similar to the previous pilot study by O'Reilly, Dorn & Ní Chasaide (2010), due to unnaturalness in the elicitation of focus in this instance. As a result, *nf* A2 is omitted from the presentation of focal accent excursion in Figure 6.5, left panel, and the duration measures in Figure 6.5, right panel. There were no statistical tests carried out on the f_0 excursion data, but a series of one-way ANOVAs with focus-type as the dependent variable was run on each of the focal conditions separately, along with Tukey's post hoc tests. Further, the effect size, eta squared (η^2) was calculated, to determine the effect size of focus on the differences found. Syllables and feet in narrow and contrastive focus were on average significantly longer than in the respective neutral rendering (syllables: ($F_{(2,58)}$=7.26, p=0.002, η^2=0.21; feet: ($F_{(2,58)}$=3.54, p=0.036), η^2=0.11). Duration effects on these units, however, depended on sentence position: in IP-final position (A3) focal syllables ($F_{(2,56)}$=0.36, p=0.702, η^2=0.013) and feet ($F_{(2,56)}$=0.09, p=0.911, η^2=0.003) across the three conditions were on average not significantly longer, which can be attributed to the already present final lengthening effect on pre-boundary constituents.

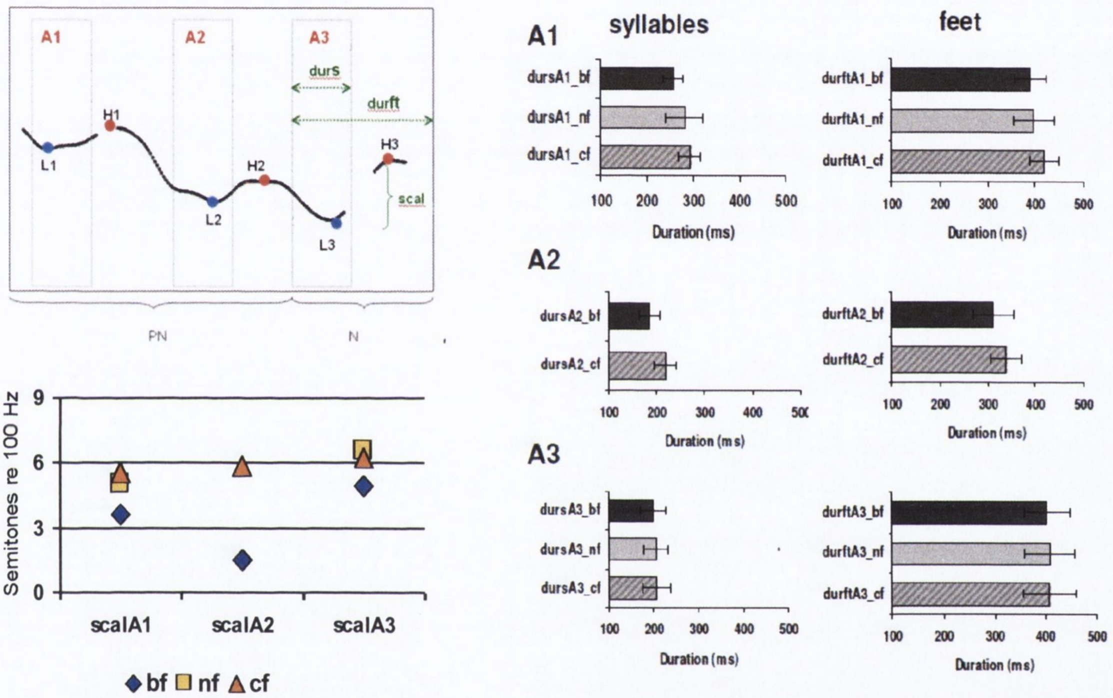


Figure 6.5: Figures illustrating how the f_0 and durational measures were made (top panel, left), and for the three accent groups A1, A2 and A3, showing the scale of the f_0 excursion for differing focal conditions (lower panel, left) and average syllable and foot duration (right panel) in ms). Reproduced from Dorn & Ní Chasaide (2011).

6.4 Tonal patterns and f_0 excursion measures in the four Donegal varieties

The following sections discuss the effects of the differing focal conditions on the tonal patterns and on the f_0 excursions for each regional variety. The choice of pitch accent type for the focal conditions is discussed as are the pre-focal and post-focal realisation.

The figures in the following sections were produced in Excel and show superimposed, but not time-normalised f_0 contours for the different focal conditions. The f_0 contours were derived from the averaged extracted f_0 annotation points (see tier 1 in Figure 6.1, measurement method in Figure 6.2 and the *f0 target labels* in Table 6.3). Broad focus is shown with a black line and serves as a reference line for the other focal conditions in each of the figures.

As pointed out in Chapter 3, section 3.4.2, for each variety separately, a one-way ANOVA was conducted to test the effect of *focus type* (3 levels: broad, narrow, contrastive) on the focal f_0 excursion measures. The alpha level was set to 0.05. Where the results yielded significant results, Tukey's HSD post-hoc tests were conducted. Eta-squared (η^2) was calculated to determine the effect size on the differences found. Results for post-hoc tests are reported in the text together with eta-squared.

6.4.1 Rann na Feirste (RF)

This section discusses the tonal patterns and f_0 excursions associated with the different focal conditions in the Rann na Feirste (RF) variety. The f_0 contours are illustrated in the left part of Figure 6.6, and on the right is shown the f_0 excursion measure for each of the potentially accented accents in the differing focal conditions: FA1, where A1 carries the focal accent, FA2, where focal accent falls on A2, and FA3, where the final accentable syllable A3 carries the focal accent,

In both panels of Figure 6.6 broad focus is shown with black solid lines, narrow focus with blue lines and contrastive focus with red lines. The black (narrow focus) contour is always included and serves for baseline comparisons with narrow and contrastive focus in the three focal conditions FA1, FA2 and FA3. The solid lines show contours for the dominant, preferred tunes, but where there was a frequent secondary tune, its contour is also shown in the left part of the figure with dashed lines, using the same colour coding to show whether narrow or contrastive focus in involved. Thus in panel (b) for the FA2 condition, on the left part of figure 6.6, the red dashed line shows a secondary tune, which differs from the dominant tune in terms of the tone of the initial accent. Note also that for the FA2 condition there is no narrow focus (blue) line: as was mentioned above, narrow focus was not elicited for FA2 in these recordings. In Figure 6.6 note also that the focal condition FA3 (focus on A3) is shown with two panels, one (c) comparing broad and narrow focus, and the other (d) comparing broad and contrastive focus. This was done to make the figures more readable. In the right part of the figure, f_0 excursion for only the dominant tunes are presented.

Also, to make the figure easier to read, in the contour figures on the left side of Figure 6.6, the three accentable syllables are highlighted in grey or in pink: in pink when the focal accent falls on that particular syllable; in grey when it does not. In a similar way, in the right side of the figure, pink boxes surround the location of the focal accent in each condition.

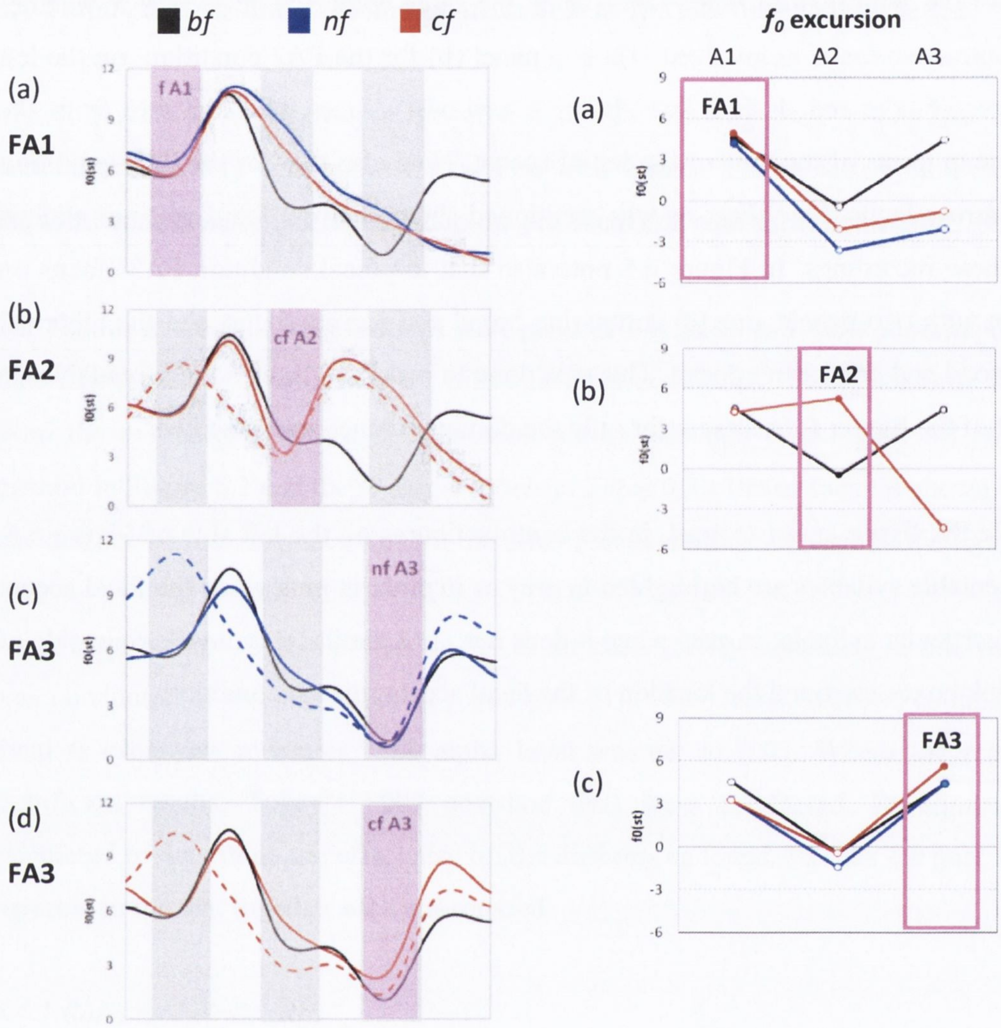


Figure 6.6: Focus in Rann na Feirste (RF). Left figure: mean f_0 contours in semitones (st) of sentences produced by all speakers, comparing broad focus (bf=black line) with narrow focus (nf=blue line) and contrastive focus (cf= red line) in each of the three possible accentable items A1, A2 and A3 (panels a-d). Dashed lines indicate secondary tunes, using the same colour coding.
Right figure: f_0 accent excursion in each focal condition (FA1 (panel a), FA2 (panel b), FA3 (panel c)) comparing broad focus (bf=black line) with narrow focus (nf=blue line) and contrastive focus (cf=red line) in each of the three possible accentable items A1, A2 and A3.

Looking first at the realisation of broad focus (black line) (n=14), results show that in the RF variety the preferred tonal pattern involves rising tones in the nuclear and the initial pre-nuclear pitch accents. The middle accent is most typically realised as a down-stepped high tone, yielding a pattern of L*+H !H* L*+H %. Across all conditions, the rise L*+H is the tonal pattern used in all focal accents.

FA1 Comparing first the realisation of narrow (*nf*) (n=11) and contrastive focus (*cf*) (n=13) on the first accent group (A1) with the broad focus (*bf*) rendition (shown in panel (a) on the left of Figure 6.6, we note that there is only a very slight increase in range of the rise in A1 compared to the realisation in broad focus. Where in *nf* both L and H are very slightly raised, in *cf* only H is somewhat higher in register. What is more striking is that post-focal material is typically deaccented and shows a falling slope. As to the f_0 excursion of A1 accents (Figure 6.6, panel (a) right) the excursion in *cf* (4.95st) is somewhat wider than *bf* (4.54st), whereas the excursion of *nf* (4.22st) is even slightly reduced compared to *bf*. This appears to be due to the raising of both the L and H targets in the *nf* case. The overall f_0 excursion of the three conditions is, however, virtually identical. Tukey's post hoc tests showed, that the difference was not found to be statistically significant ($F_{(2,33)}$=0.38; p< 0.69, η^2=0.03). Therefore, we note again that when focus (narrow or contrastive) occurs in A1, the principal effect shows up on A2 and A3, which become deaccented.

FA2 Looking next at focus on the second element (A2) we now compare *bf* (n=14) and *cf* (n=9) (Figure 6.6, panel b, left). Note that no narrow focus was elicited for this condition as mentioned before in section 6.2.1. First of all we note variation in the pre-focal tunes for *cf*: approximately 50% of the data in this condition was realised with a rise (L*+H), but the other 50% with a high tone (H*), see Figure 6.7 for examples.

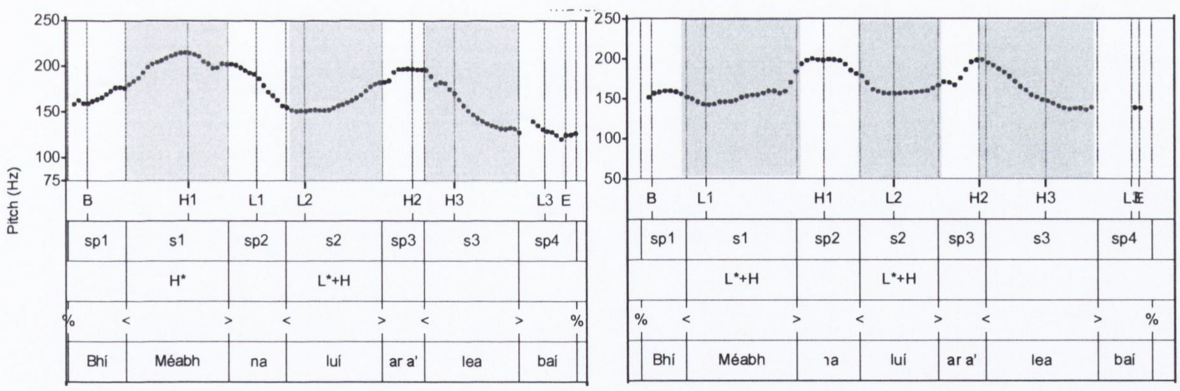


Figure 6.7: Pitch traces and annotations of examples of H* and L*+H accents as possible pre-focal options when *cf* falls on A2. Soundfiles: DI-RF-SMR-cf-lui-2 (left panel), DI-RFMG-cf-lui-4 (right panel)

In the focal accent A2 there is a strong increase in the pitch range of the rise, whereas in broad focus no excursion is present due to the !H* accent type. The pre-focal (A1) accent is very slightly reduced and in the post-focal material (A3) we can again observe deaccentuation. This is mirrored in the f_0 excursion measures (Figure 6.6, panel (b) right). The f_0 excursion of the focal accent A2 (5.24st) is considerably boosted compared to broad focus (-0.43st). The difference was found to be statistically significant ($F_{(2,18)}$=105,97; $p< 0.0001$, η^2=0.9). The pre-focal accents are almost identical in this measures and the post-focal accent excursion is noticeably reduced compared to broad focus, showing even a falling slope.

FA3 Looking next at focus on A3, the narrow (n=6) and contrastive (n=9) conditions were plotted separately for visual ease (Figure 6.6, panels c and d), we can again observe tune variation with regard to the pre-focal patterns in both *nf* and *cf*: where in IP-initial position L*+H and H* are options, the medial accent is mostly deaccented but could also be realised as !H*. As regards the overall preferred contours, they largely resemble broad focus (L*+H !H* L*+H %, L*+H L*+H L*+H %). The phrase-final A3 accent in contrastive focus is more prominently raised compared to broad focus than is the same accent under narrow focus. The pre-focal accents are generally reduced. This trend is also mirrored in the f_0 excursion measures (Figure 6.6, panel c, right). The f_0 excursion of the focal A3 shows that *nf* (4.4st) and *bf* (4.54st) are almost identical, whereas *cf* (5.7st) shows a wider excursion that is different from *bf* ($F_{(2,21)}$=3.86; $p<0.06$, η^2=0.16), but not significantly. On the whole, however, utterances with focal A3 largely resemble broad focus, and the effect of focus on the constituents in this condition is minimal ($F_{(2,26)}$=0.87; $p< 0.43$, η^2=0.06).

6.4.2 Baile na Finne (BF)

In this section, we discuss the tonal patterns and the pitch accent excursions associated with the differing focal conditions in the BF variety. A summary of superimposed f_0 contours of broad focus (black), narrow focus (blue) and contrastive focus (red), including preferred tunes (solid lines) and secondary tunes (dashes lines) is shown in Figure 6.8 (panels a-d, left) below, to present the results the same way as in Figure 6.6. Pitch accent excursion pertaining to the preferred tunes for each focal condition (FA1, FA2, FA3) is presented. On the right of Figure 6.8, in panels a-c, for direct comparison.

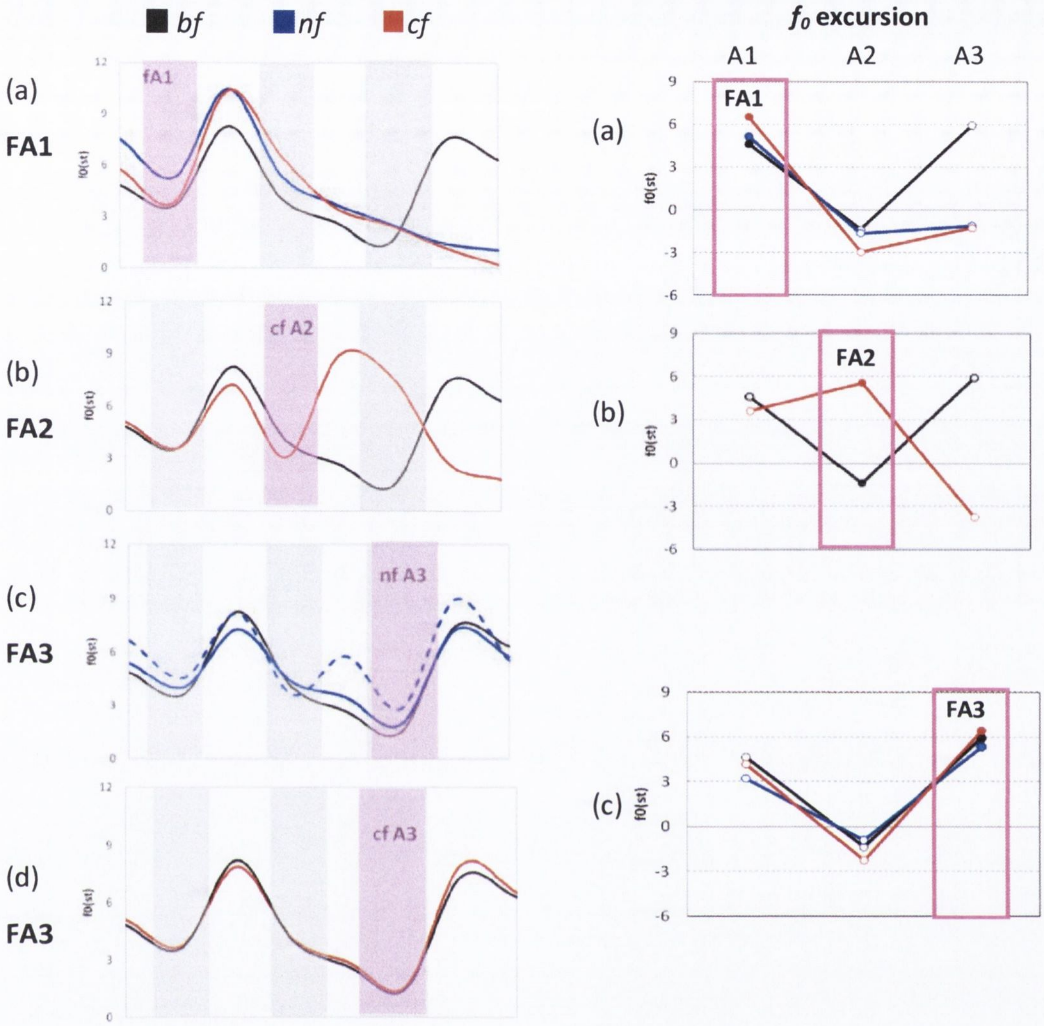


Figure 6.8: Focus in Baile na Finne (BF). Left figure: mean stylised f_0 contours in semitones (st) of sentences produced by all speakers, comparing broad focus (bf=black line) (n=13) with narrow focus (nf=blue line) and contrastive focus (cf=red line) in each of the three possible accents A1, A2 and A3 (panels a-d). Dashed lines indicate secondary tunes, using the same colour coding..
Right figure: accent excursion in each focal condition (FA1 (panel a), FA2 (panel b), FA3 (panel c)) comparing broad focus (bf=black line) with narrow focus (nf=blue line) and contrastive focus (cf=red line) in each of the three possible accentable items A1, A2 and A3.

In broad focus (black line) (n=13) the overall preferred contour is again the rising tune L*+H !H* L*+H% similar to the RF variety. In about a third of the data the medial accent is deaccented and in around 20% it is realised as a rise (L*+H). The focal accent across all conditions is again realised as a rise L*+H.

FA1 Comparing first focus on the IP-initial stress group (A1) with broad focus (*bf*) (n=13) (Figure 6.8, panel a, left), we can observe a boosting of the focal accent for both narrow focus (*nf*) (n=15) and contrastive focus (*cf*) (n=16). This is brought about by mainly raising of H in *nf*, but raising of both L and H in *cf*. The following post-focal accents are deaccented and show a falling slope. This is mirrored in the f_0 excursion measures (panel a, right), where both focal accents show wider excursion than in broad focus (bf: 4.6st, nf: 5.2st, cf: 6.5st) ($F_{(2,41)}$=2.67; p< 0.081, η^2=0.11), although this difference is not significant in *nf* ($F_{(2,26)}$=0.28; p<0.6, η^2=0.01), but only in *cf* ($F_{(2,27)}$=12.56; p< 0.001, η^2=0.32). As for the RF variety, the most dramatic correlate of both *nf* and *cf* appears to be the de-accentuation of A2 and A3.

FA2 When focus is realised on the phrase medial (A2) accent group (n=16) (Figure 6.8, panel b, left, the focal accent is again considerably boosted compared to broad focus. Note, that no narrow focus was elicited for this condition, as was pointed out in section 6.2.1. The pre-focal accents are reduced in excursion size and the post-focal accents are de-accented. Similarly, in panel (b) on the right of the figure, we see that the phrase-medial accent excursion is substantially higher on the focal accent (5.6st) compared to broad focus (-1.4st) ($F_{(2,23)}$=207.76; p<0.0001, η^2=0.9), somewhat reduced in the pre-focal accents and the deaccenting of the post-focal accent shows up in the very low negative value.

FA3 Finally comparing *nf* (n=16) on the IP-final stress group (A3) to broad focus we note two tune options for pre-focal accents in *nf* (Figure 6.8, panel c, left): the preferred tune yielded L*+H !H* (in 31% of instances, shown as the blue solid line in *nf*A3 in Figure 6.8, panel c) whereas L*+H L*+H occurred in around 25% of the data in this condition (shown as blue dashed line in *nf*A3 in Figure 6.6 panel c). Overall, however, the preferred as well as the secondary tune largely resemble broad focus. A somewhat boosted final accent occurs in the secondary tune. The same trend holds for contrastive focus (n=15) in this condition (panel d, left), which is almost identical to *bf*, but with a very small boosting of the H in A3. As to the f_0 excursions in the FA3 conditions (Figure 6.8, panel c, right), we can again observe a more narrow excursion in pre-nuclear accents. Focal excursion in A3 is very much like broad focus, with *nf* having a slightly reduced (5.3st) and *cf* (6.4st) having a slightly wider excursion than *bf* (5.9st). The differences between the three focal conditions, however, are not significant ($F_{(2,34)}$=0.45; p<0.644, η^2=0.03).

6.4.3 Gleann Cholm Cille (GCC)

In this section, the tonal patterns and the pitch excursions associated with the different focal conditions, FA1, FA2 and FA3, are described for the GCC variety. A summary of superimposed f_0 contours of broad focus (black), narrow focus (blue) and contrastive focus (red), including preferred tunes (solid lines) and secondary tunes (dashes lines) is shown in

Figure 6.9 (panels a-d, left) below. The f_0 excursions for A1, A2 and A3 of the preferred tunes for each focal condition are presented on the right of the figure in panels a-c, for direct comparison.

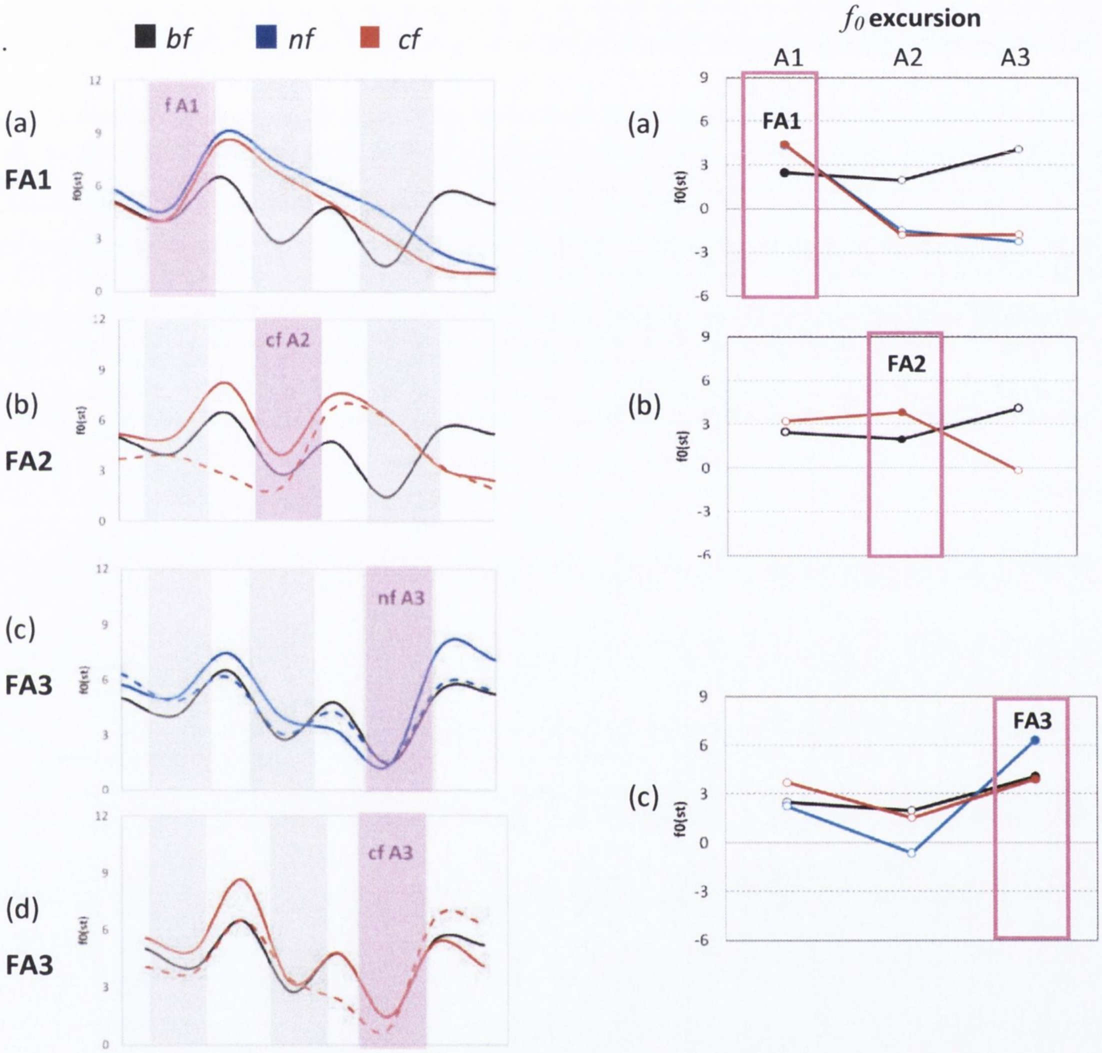


Figure 6.9: Focus in Gleann Cholm Cille (GCC). Left figure: mean stylised f_0 contours in semitones (st) of sentences produced by all speakers, comparing broad focus (bf=black line) with narrow focus (nf=blue line) and contrastive focus (cf=red line) in each of the three possible accents A1, A2 and A3 (panels a-d). Dashed lines indicate secondary tunes, using the same colour coding.
Right figure: accent excursion in each focal condition (FA1 (panel a), FA2 (panel b), FA3 (panel c)) comparing broad focus (bf=black line) with narrow focus (nf=blue line) and contrastive focus (cf=red line) in each of the three possible accentable items A1, A2 and A3.

The results of the auditory analysis and visual inspection of stylised contours showed that the rising pattern L*+H L*+H L*+H % is the overall preferred tune in broad focus (black line) in the GCC variety. Only about 20% of tunes were realised with an IP-initial high H* or a downstepped !H* medial accent. Across all focus conditions, L*+H is the tonal pattern used in all focal accents.

FA1 Looking first at the realisation of focus on the first accent group (A1) (Figure 6.9, panel a, left) accents under both narrow (*nf*) (n=11) and contrastive focus (*cf*) (n=13) are substantially boosted compared to broad focus (*bf*) (n=12). This is brought about by a raising of the H peak in both conditions and also raising of L in *nf*. All following material is deaccented resulting in a falling pitch slope. These findings are also mirrored in the f_0 excursion measures (panel a, right). Both *nf* (4.4st) and *cf* (4.4st) accents in A1 show wider excursion than does *bf* (2.5st) and these differences are significant ($F_{(1,31)}=3.74$; $p<0.035$, $\eta^2=0.2$). The post-focal accents have negative f_0 excursion values due to deaccentuation.

FA2 Moving on to the focal A2 (Figure 6.9, panel b, left) (n=11) the data showed some variation with regard to the IP-initial tonal pattern. In around 55% of the data it was realised as a rise (L*+H), whereas the other 45% were flat high accents (H*) (see Figure 6.10 for examples). Note that even though the H* in A1 does not seem visually obvious, (Figure 6.10 left panel) auditory analysis confirmed that it was indeed accented.

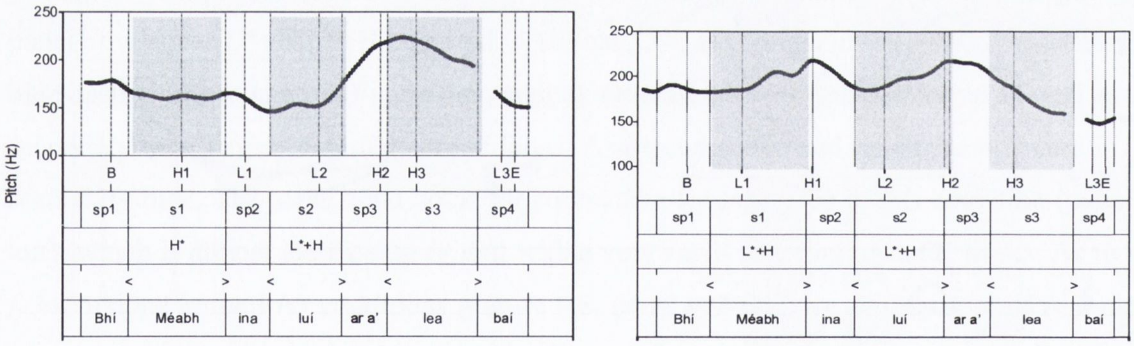


Figure 6.10: Examples of annotated f_0 contours with IP-initial H* and L*+H in when contrastive focus falls on A2. Soundfiles: DI-GC-MNC-cf-lui-4 (left), DI-GCC-SNC-cf-lui-3 (right).

In the preferred tonal contour, both L and H of the pre-focal and focal accents are raised. This is reflected in the accent excursion measures (Figure 6.9 panel b, right), where both the pre-focal and focal accent (3.8st) show wider f_0 excursion than the same in broad focus (1.9st). There is effectively no post-focal f_0 excursion on A3, reflecting the deaccentuation of the final accent. Tukey's post hoc test showed that the difference between *bf* and *cf* was significant, which was also confirmed by the relatively large effect size ($F_{(2,18)}=27.26$; $p<0.000$, $\eta^2=0.6$).

FA3 When narrow focus was elicited on the phrase-final accent group (A3) (n=10) (Figure 6.9, panel c, left), we can again observe greater tune variation in pre-focal accents (H* !H*; L*+H L*+H) and this is also the case for the utterances with realisations of contrastive focus on A3 (n=11) (Figure 6.9, panel d, left).

In the preferred tune in narrow focus (L*+H !H* L*+H%) (n=5), the focal accent is substantially boosted due to the raising of the peak. In this case the IP-initial pre-focal accent also (curiously) shows raising of both L and H targets, relative to their values in *bf*. Looking at the f_0 excursions (blue line in panel c, on the right) we see that there is a substantial boosting of A3, of 6.3st in *nf* compared to *bf* (4.1st). In the case of the initial pre-focal accent, despite the raising of the L and H targets, in *nf*, the excursion size is not greater than for *bf*.

In the preferred contrastive focus tune (L*+H L*+H L*+H %) (n=5) the phrase initial L and H are both noticeably raised whereas the phrase-medial and the focal accent are virtually the same as for broad focus. As to the size of the f_0 excursion in A3 (panel c, right), the focal *nf* is significantly boosted (6.3st) ($F_{(2,15)}$=8.58; p<0.01, η^2=0.4), whereas the same accent in contrastive focus *cf* (3.9st) is virtually identical to that of *bf* (4.1st) ($F_{(2,14)}$=0.05; p<0.832, η^2=0.003).

6.4.4 Ros Goill (RG)

In this section, the tonal patterns and pitch excursions associated with the different focal conditions, FA1, FA2 and FA3, are described for the RG variety. A summary of superimposed f_0 contours of preferred broad focus (black), narrow focus (blue) and contrastive focus (red), including preferred tunes (solid lines) and secondary tunes (dashes lines) is shown in Figure 6.14 (panels a-c, left) below. Pitch accent excursion of A1, A2 and A3 are shown on the right, of the preferred tunes for the focal conditions FA1, FA2. There was high variability in tune realisations when focus was elicitated on the phrase final accents (A3). The high degree of variability of pre-nuclear as well as nuclear tunes did not permit one to see any clear trend as to the preferred or secondary tunes, and therefore, this condition was excluded from the present analysis.

Looking first, however, at the realisation of **broad focus** alone, the data for this variety of Irish was highly variable something that was discussed in Chapter 4. In terms of pre-focal pitch accents and there were a number of problematic cases. First of all, there are already a number of different tunes used in broad focus, which share the nuclear rising pattern L*+H % (n=17) but vary in pre-nuclear accents (H* !H* (30%) (preferred pattern) (n=6), L*+H !H* (24%) (secondary pattern) (n=4). The preferred tune is H* !H* L*+H %. Figure 6.12 shows the f_0 contours of the preferred tune for broad focus (solid line) as well as the secondary tune (dashed line).

Looking first, however, at the realisation of **broad focus** alone, the data for this variety of Irish was highly variable in terms of pre-focal pitch accents and showed a number of problematic cases. First of all, there are already a number of different tunes used in broad focus, which share the nuclear rising pattern L*+H % (n=17) but vary in pre-nuclear accents (H* !H* (30%) (preferred pattern) (n=6), L*+H !H* (24%) (secondary pattern) (n=4). The preferred tune is H* !H* L*+H %. Figure 6.12 shows the f_0 contours of the preferred tune for broad focus (solid line) as well as the secondary tune (dashed line).

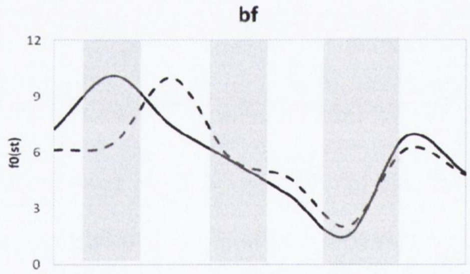


Figure 6.12: F_0 contours of preferred (solid line) and secondary tune (dashed line) in broad focus in the RG variety.

As concerns the initial pre-nuclear rising tone there was also an issue concerning the timing of the rise, and whether there were two variants (see Chapter 4). As is illustrated in Figure 6.13, top panel, in the more typical rise (L*+H) the L elbow tends to be aligned on the accented syllable with a trailing H (This could be regarded as the archetypical realisation of Donegal rises, and as was discussed in Chapter 5, it is rather different from rises described in some other languages, where the rise happens rather early. There were, however, a number of instances of initial pre-nuclear rises across all focal conditions (24%) (n=5) where the L elbow does occur relatively early, before or at the very beginning of the accented vowel, and where the H peak is reached towards the end of the vowel in the accented syllable(Figure 6.13, middle panel), rather more like what was described for these languages (see Figure

5.26). Perceptually, both the rise as well as the high target are prominent on the accented syllable. For now we label these instances as L*H. Although we have argued in Chapter 4 that this L*H pattern is likely to be a variant of L*+H, we have not pooled them in the present treatment, as it seemed wiser to restrict comparisons to items which we felt reasonably certain to be precisely the same tunes. For comparison the initial high tonal accent (H*) is also illustrated in Figure 6.13, lower panel. Here the peak is most typically aligned on the accented syllable with a high onset, and sounds quite distinct from the other two.

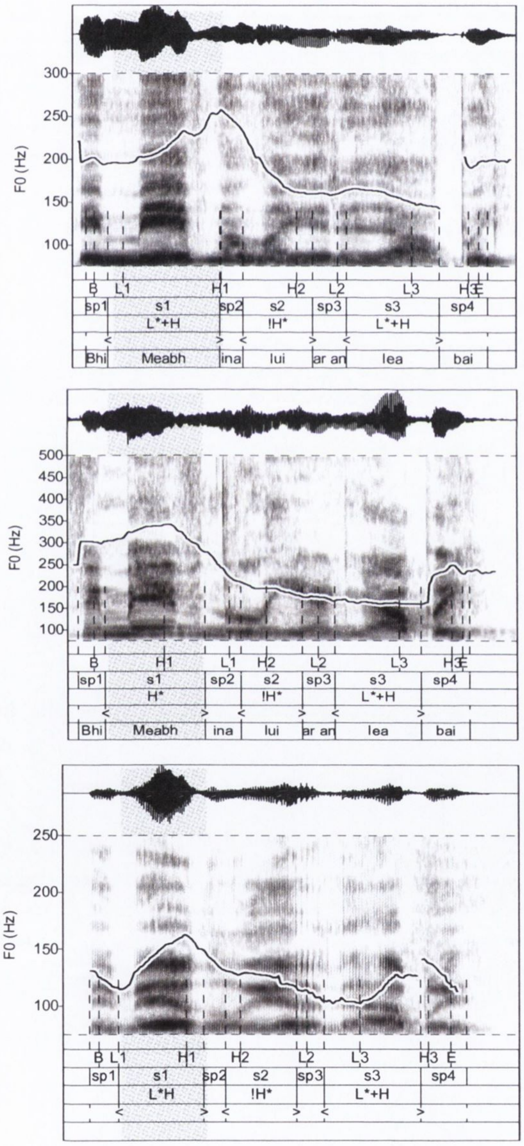


Figure 6.13: Examples of differences in IP-initial pitch accents in the broad focus utterances *Bhí Méabh ina luí ar a'leabaí* /vʲi 'mʲew nˠə 'lˠi ərˠ ə 'ʎabˠi/ 'Méabh was lying on the bed'. Soundfiles: DI-RF-RMD-bf-Meabh-3 (top panel), DI-RG-FP-bf-4 (mid panel), DI-RG-AML-bf-1 (lower panel).

In the following figures, only the preferred tune for broad focus is referred to. Note again, that no focal A3 condition is presented due to the high tune variability (as explained above).

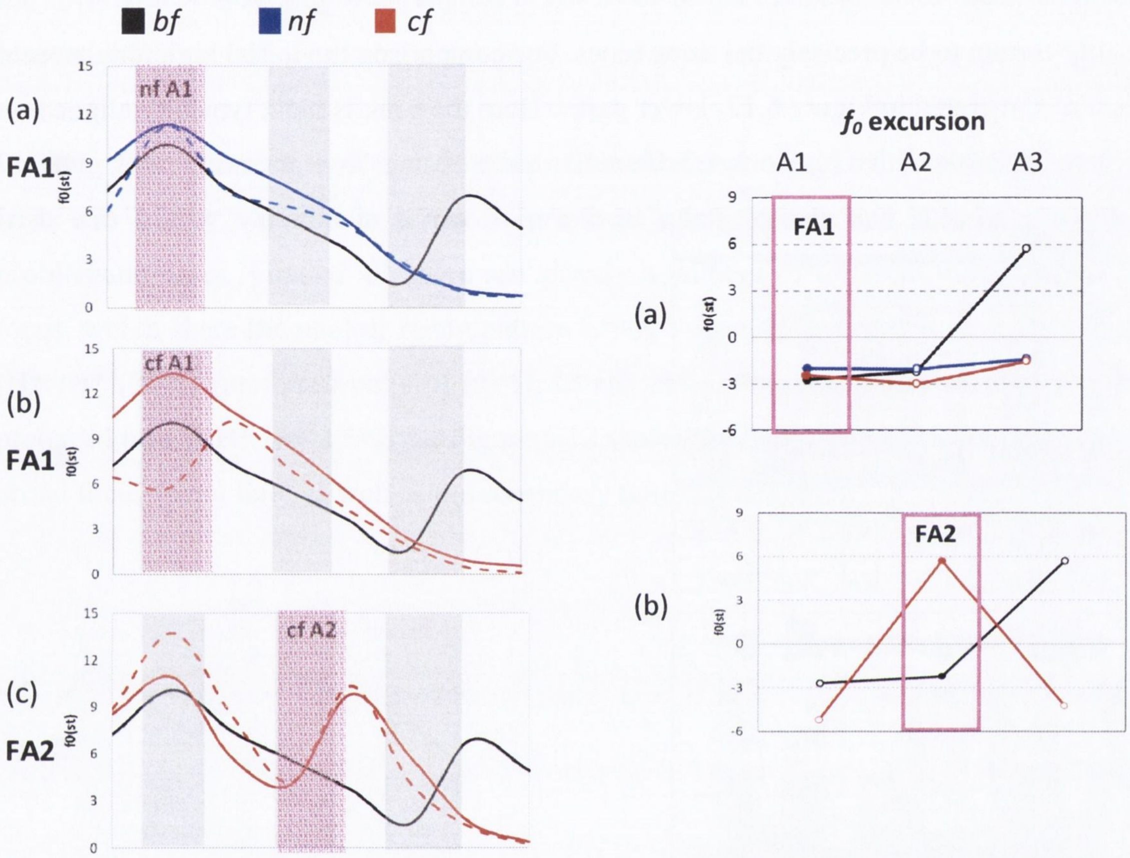


Figure 6.14: Focus in Ros Goill (RG). Left figure: mean stylised f_0 contours in semitones (st) of sentences produced by all speakers, comparing broad focus (bf=black line) with narrow focus (nf=blue line) and contrastive focus (cf=red line) in each of the three possible accents A1 and A2 (panels a-c). Dashed lines indicate secondary tunes, using the same colour coding.
Right figure: accent excursion in each focal condition FA2 (panel a), comparing broad focus (bf=black line) contrastive focus (cf=red line) Focal A3 conditions were excluded from the analysis (see text).

FA1 Looking first at the realisation of **narrow focus** on **A1** (n=13) (Figure 6.14, panel a, left) we can observe a striking difference compared to the other varieties in terms of the tune in the phrase-initial focal accent. The preferred tune in this variety is the fall H*+L (70%) (n=9), see Figure 6.15 for an example. The secondary tune features L*H (30%) (n=3) in the same accent position. Similar to previous observations, all post-focal material is deaccented and the pitch slope shows a steep fall. In **contrastive focus** on the same accent group (Figure 6.14, panel b, left) (n=13) the preferred tune is again the fall H*+L (70%) (n=9), the secondary tune in this case is realised as a rise L*+H (30%) (n=4). In both *nf* and *cf,* the focal accent is substantially boosted compared to broad focus. The post-focal accents de-accented. Looking at the f_0 excursion measures for A1 (panel (a) on the right of Fig 6.14) it is clear that the excursions size is only very slightly wider for *cf* and *nf* relative to *bf,* but not significantly (bf:-2.7st, nf:-2.0st, cf: -2.4st). This draws attention to the fact that it is a raising of the register of A1 and of the initial portion of the sentence rather than a rescaling of the accent that is happening here.

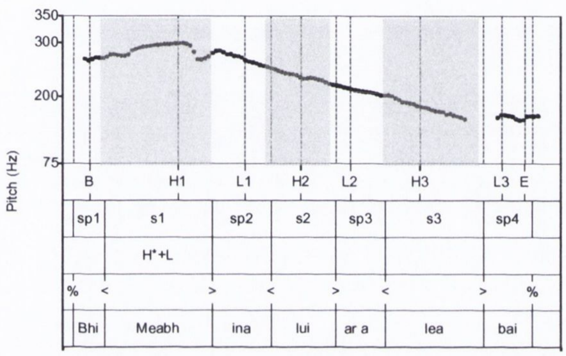


Figure 6.15: Example of an annotated phrase with a typically falling f_0 contour (H*+L) in focal A1. Soundfile: DI-RG-FP-cf-Meabh-4

FA2 Looking next at focal **A2** (Figure 6.14, panel c, left) the rise (L*+H) is the preferred focal accent tune in all utterances (n=12). There is, however, again variability as to the pre-focal patterns: high pitch accents (H*) occur in around 66% (n=8) and L*H in 33% (n=4) of cases. (As previously pointed out, with regard to the timing of L and H targets in L*H it is not clear if we are dealing with timing differences of the rise or a different type of high accent). The focal accent is substantially boosted compared to broad focus. As to accent excursion (Figure 6.14, panel a, right), the focal accent is substantially increased (5.8st) compared to broad focus (-2.2st) and the difference is significant ($F_{(2,12)}=75.56$; $p<0.0001$, $\eta^2=0.9$). The pre-focal H* accent is relatively raised relative to that of the *bf* condition. The post-focal accents show deaccentuation.

FA3 For the reasons mentioned, focal realisations on the phrase-final accent (**A3**) were excluded for the Ros Goill variety, due to the high variability in tunes across the narrow and contrastive focus renditions and, due to the fact that, it was not clear if focus was in fact produced on the phrase-final item.

Overall, for the RG variety the data were not only different from the other varieties (as was found in the other analytic chapters) but the degree of variability in the data meant that we cannot provide a clear picture. It stands out as a variety that is interesting for the differences with the other ones, and would merit further investigation in the future.

Having so far looked at the pitch effects of focus on the tonal patterns and accent excursion, we now turn to the duration effects on focal syllables and focal feet.

6.5 Duration correlates of focus

The following sections discuss the effects of focus on the duration of accentable syllables and on the duration of the foot containing the accentable syllables, for each of the four Donegal varieties. The durations for the accentable syllables and for the unstressed material in the feet are averaged across speakers for each condition regardless of tune types, since duration differences of the measured intervals were not found to vary with the difference in tune. The following figures show the mean durations of the measured elements as percentages of each entire utterance, comparing broad focus to narrow and contrastive focus. Note that in focal A2, no narrow focus was elicited in this condition. The token numbers for the durations of each focal condition are summarised in Table 6.4

Table 6.4: Overview of the number of tokens analysed for duration correlates across the different focal conditions in each of the four Donegal Irish varieties (RF, BF, GCC, RG).

	RF	BF	GCC	RG
bf	14	13	12	17
nf_A1	11	15	11	13
cf_A1	13	16	13	13
cf_A2	9	16	11	12
nf_A3	6	16	10	12
cf_A3	10	15	11	15

We look at the influence of focus type on the duration of the potentially accentable syllable (which for ease of reference we will refer to as the **'focal syllables')**, as well as on the foot in which a potentially accented syllable occurs (which for ease of reference will be referred to in the following as the **'focal feet'**), The foot comprises one accentable syllable plus any unstressed material up to the following accentable syllable: where the foot does receive focal accentuation, it is produced on the foot-initial syllable.

Similar to the previous section, a one-way ANOVA was conducted for each variety separately, to test the effect of *focus type* (3 levels: broad, narrow, contrastive) on each, syllables and feet. The alpha level was set to 0.05. Where the results yielded significant results, Tukey's HSD post-hoc tests were conducted. Eta-squared (η^2) was calculated to determine the effect size on the differences found. Results for post-hoc tests are reported in the text together with eta-squared.

6.5.1 Rann na Feirste (RF)

Figure 6.16 shows the average duration for focal syllables (in bold) and the remaining unstressed material in each phrase across the three focal conditions. When focus is elicited on the first accent group (Figure 6.16, **A1**, left panel) Tukey's post hoc tests showed that the focal syllables in *nf* and *cf* are on average significantly longer compared to broad focus (*bf*: 279 ms, *nf*: 327 ms, *cf*: 326 ms) ($F_{(2,35)}$=4.93 p=0.013, η^2=0.22). This is also the case for focal **A2** (mid panel) (*bf*: 186 ms, *cf*: 234 ms) ($F_{(2,21)}$=7.64 p=0.012, η^2=0.27). Focal syllables in the phrase-final accent group (Figure 6.16,**A3**, right panel) show a different trend: although they are on average longer in contrastive focus than in broad focus, this is not the case for narrow focus, where the average is somewhat less than in broad focus (*bf*: 253 ms, *nf*: 246 ms, *cf*: 273 ms), and these differences between them are not statistically significant, which is also shown by the very small effect size η^2 ($F_{(2,26)}$=0.69 p=0.511, n.s., η^2=0.05).

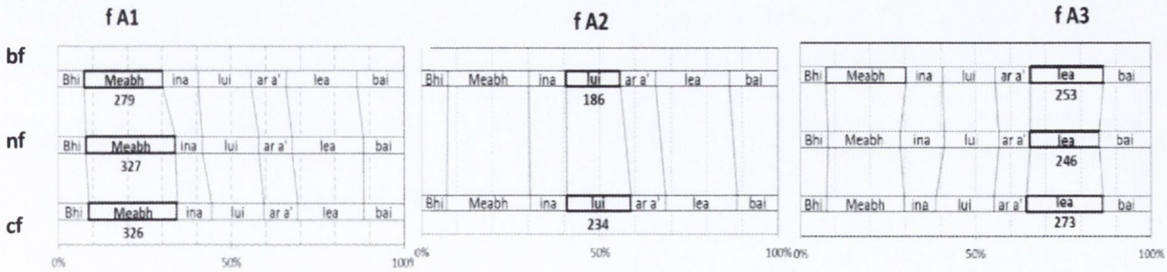


Figure 6.16: RF mean duration of focal syllables (outlined in bold) and of all other measured intervals averaged across all speakers shown as a percentage of the average length of the IP

As to the average durations of focal feet (Figure 6.17) we can observe a similar pattern across the three conditions. In focal A1 (Figure 6.17, **fA1**, left panel), rhythmic feet are on average longer in *nf* and *cf* than in broad focus (*bf*: 405 ms, *nf*: 425 ms, *cf:* 454 ms).The differences are only significant *cf* compared to *bf*, ($F_{(2, 26)}$=4.78 p=0.038, n.s., η^2=0.16), but not between bf and nf ($F_{(2, 24)}$=0.79 p=0.384, n.s., η^2=0.03). A similar trend can also be observed for phrase medial focal feet, which were only slightly longer (Figure 6.17, **fA2**, mid panel) (*bf*: 308 ms, *cf*: 329 ms) ($F_{(2,21)}$=1.25 p=0.275, n.s., η^2=0.06).When focus is realised on the phrase final accent group (Figure 6.15, **fA3**, right panel) focal feet in narrow and contrastive focus are again somewhat longer than in broad focus (*bf*: 418ms, *nf*: 431 ms, *cf*: 447 ms), but not significantly ($F_{(1,26)}$=0.65 p=0.532, n.s., η^2=0.05).

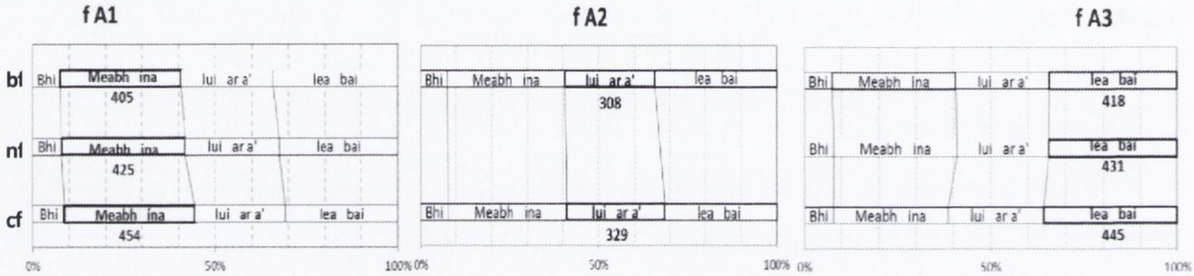


Figure 6.17: RF mean duration of focal feet (outlined in bold) and of the other measured feet, averaged across all speakers, shown as a percentage of the average length of the IP.

6.5.2 Baile na Finne (BF)

Figure 6.18 shows the average duration for focal syllables (in bold) and the remaining unstressed chunks in each phrase across the three focal conditions. When narrow and contrastive focus is realised on the phrase initial accent group (Figure 6.18, A1, left panel), syllables are on average significantly longer than in broad focus (*bf*: 284 ms, *nf*: 346 ms, *cf*: 343 ms) ($F_{(2,41)}$=4.51 p=0.017, η^2=0.18). This is also the case for contrastive focus realised on the phrase medial accent group (Figure 6.18, A2, mid panel) (*bf:* 205 ms, *cf*: 255 ms) ($F_{(2,27)}$=14.10 p=0.001, η^2=0.34). Focal syllables in A3 (Figure 6.18, right panel), are also on average longer in *nf* and *cf* compared to *bf* (*bf*: 231 ms, *nf*: 245 ms, *cf*: 251 ms,) ($F_{(2,41)}$=1.43 p=0.252, η^2=0.17), but not significantly.

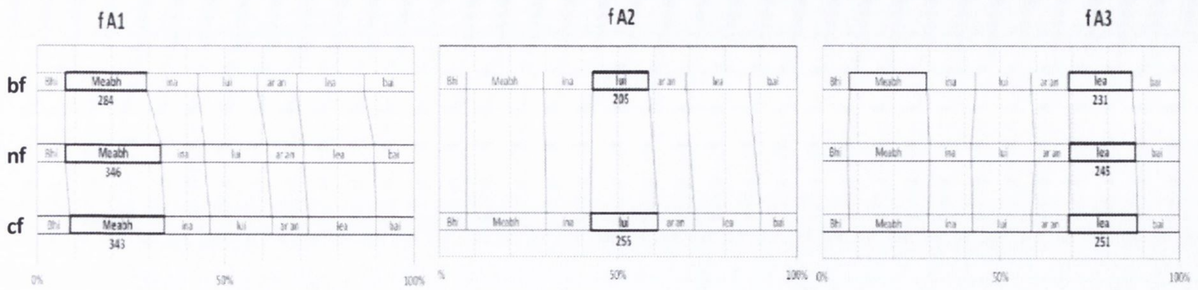


Figure 6.18: BF mean duration of focal syllables (outlined in bold) and of all other measured intervals, averaged across all speakers, shown as a percentage of the average length of the IP.

As to the durations of focal feet (Figure 6.19), we can again observe similar trends as seen in the previous sections: feet in *nf* and *cf* are longer than in the broad focus condition in **A1** (Figure 6.19, left panel) (*bf*: 461 ms, *nf*: 503 ms, *cf*: 507 ms), but not significantly ($F_{(2,41)}$=0.66 p=0.523, η^2=0.03). When contrastive focus is realised on the phrase medial foot (Figure 6.19, **A2**, mid panel) we observe a significant lengthening effect (*bf*: 341 ms, *cf*: 396 ms) ($F_{(2,27)}$=6.61 p=0.016, η^2=0.2). Similarly, focal feet in **A3** (Figure 6.19, right panel) are only minimally longer than on broad focus and the difference is not significant, something that is also shown by the very small effect size (η^2) of focus (*bf*: 404 ms, *nf*: 407 ms, *cf*: 409 ms) ($F_{(2,41)}$=0.04 p=0.961, η^2=0.001).

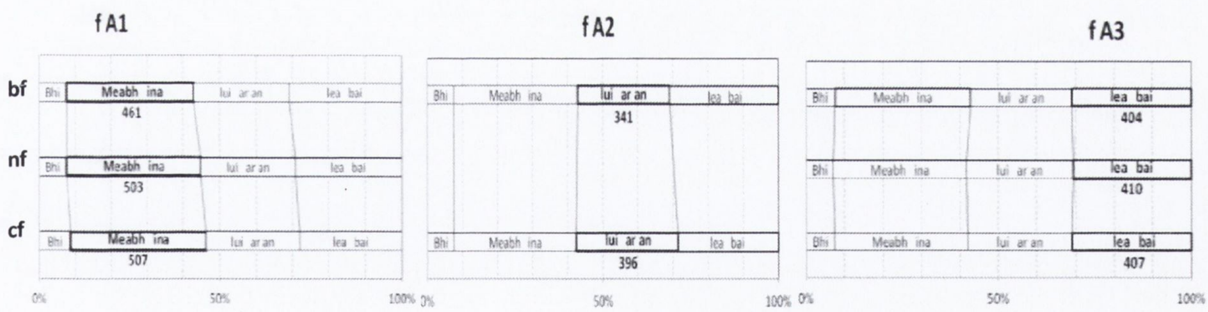


Figure 6.19: BF mean duration of focal feet (outlined in bold) and of the other measured feet, averaged across all speakers, shown as a percentage of the average length of the IP.

6.5.3 Gleann Cholm Cille (GCC)

Looking next at the effect of focus on the duration of syllables in the GCC variety, Figure 6.20 shows the average duration for focal syllables (in bold) and the remaining unstressed material in each phrase across the three focal conditions. When both narrow and contrastive focus are realised on the phrase-initial accent group (Figure 6.20, **A1,** left panel) we can observe a significant lengthening effect compared to broad focus (*bf*: 261 ms, *nf*: 284 ms, *cf*: 304 ms) ($F_{(2,33)}$=10.40 p=0.000, η^2=0.39). This is also the case for syllables with contrastive focus elicited on **A2** (Figure 6.20, mid panel) (*bf*: 194 ms; *cf*: 253 ms) ($F_{(2,21)}$=8.83 p=0.007, η^2=0.42). Focal syllables in the phrase-final accent group (Figure 6.17, **A3**, right panel), however, are only marginally longer than in broad focus (*bf*: 274 ms, *nf*: 278 ms, *cf*: 277 ms) ($F_{(2,30)}$=0.05 p=0.952, η^2=0.003).

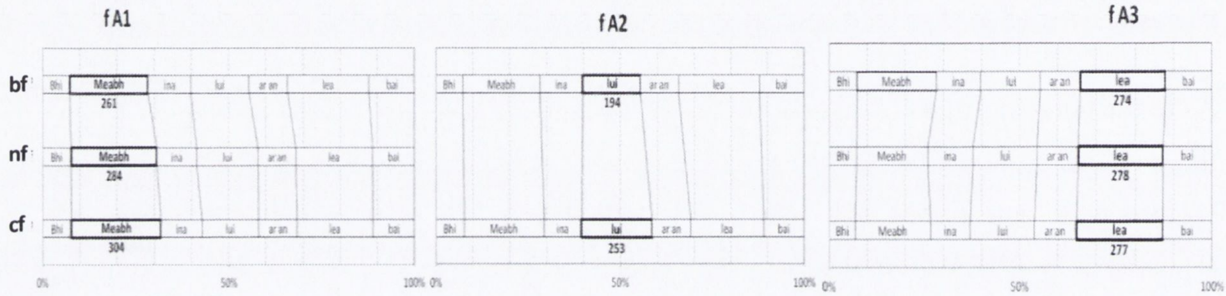


Figure 6.20: GCC mean duration of focal syllables (outlined in bold) and of all other measured intervals, averaged across all speakers, shown as a percentage of the average length of the IP.

Looking next at the effects of focus on the duration of rhythmic feet (Figure 6.21), we can make the following observations: in focal **fA1** (left panel), feet in *nf* and *cf* are longer than in *bf* (*bf*: 406 ms, *nf*: 417 ms, *cf*: 445 ms) ($F_{(1,33)}$=4.40 p=0.020, η^2=0.39), but only significantly longer for *cf* ($F_{(2,23)}$=10.90 p=0.003, η^2=0.47), not *nf* ($F_{(2,21)}$=0.45 p=0.509, η^2=0.02). This is In **fA2** the focal foot is significantly longer in *cf* than in *bf* (Figure 6.21, mid panel) (*bf*: 323 ms, *cf*: 391 ms) ($F_{(1,21)}$=4.69 p=0.042, η^2=0.18). Similar to previous observations, focal feet in the phrase-final accent group (Figure 6.21, **fA3**, right panel) are only marginally longer than in broad focus (*bf*: 426 ms, *nf*: 443 ms, *cf*: 438 ms) ($F_{(2,30)}$=0.38 p=0.689, η^2=0.02) and these differences were not significant.

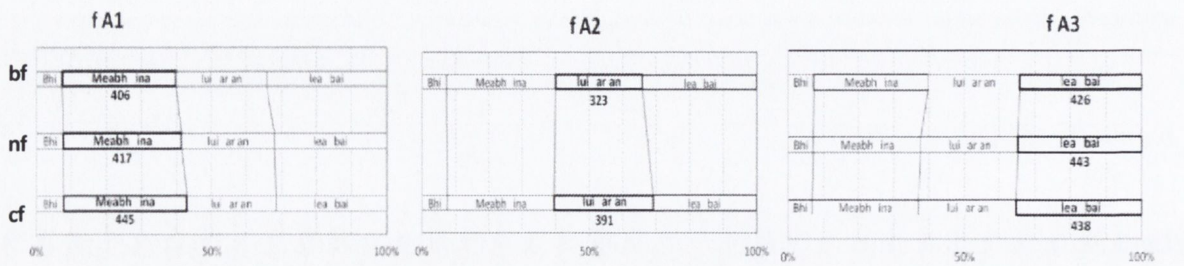


Figure 6.21: GCC: mean duration of focal feet (outlined in bold) and of the other measured feet, averaged across all speakers, shown as a percentage of the average length of the IP.

6.5.4 Ros Goill (RG)

Finally, the duration results for the RG variety are presented. Figure 6.22 shows the average duration for focal syllables (in bold) and the remaining unstressed material in each phrase across the three focal conditions.

Similar to the three varieties already discussed we can again observe significantly longer syllables in narrow and contrastive focus in **A1** (Figure 6.22, left panel) (*bf*: 285 ms, *nf*: 312 ms, *cf*: 302 ms) ($F_{(2,40)}$=6.40 p=0.004, η^2=0.24). In **A2** the constrastively focussed syllable is longer, but not significantly (Figure 6.22, mid panel) (*bf*: 206 ms, *cf*: 215 ms) ($F_{(2,27)}$=0.85 p=0.365, η^2=0.03). Focal syllables in the phrase-final accent group (Figure 6.22, **A3,** right panel) are only marginally, but not significantly longer than in broad focus (*bf*: 290 ms, *nf*: 293 ms, *cf*: 297 ms) ($F_{(2,41)}$=0.31 p=0.738, η^2=0.02).

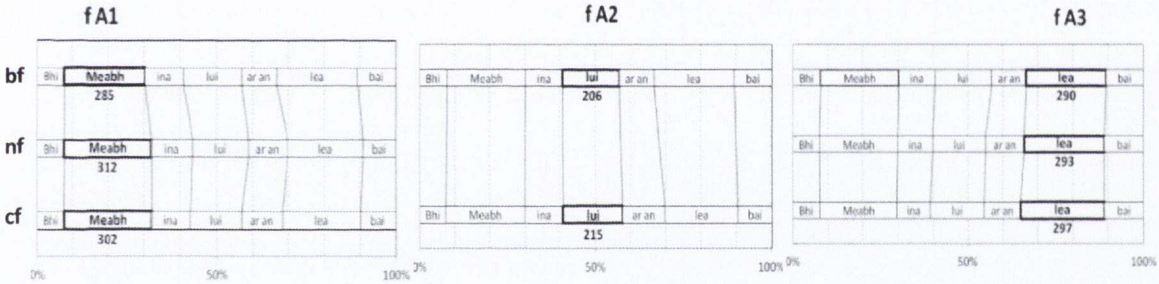


Figure 6.22: RG mean duration of focal syllables (outlined in bold) and of all other measured intervals, averaged across all speakers, shown as a percentage of the average length of the IP.

As to the duration effects of focus on rhythmic feet (Figure 6.23) we can observe that in focal **A1** (left panel) both *nf* and *cf* are longer than *bf*. Unusually, focal feet with narrow focus were somewhat longer than those in contrastive focus (*bf*: 418 ms, *nf*: 459 ms, *cf*: 436 ms) ($F_{(2,40)}$=3.47 p=0.041, η^2=0.15). Similarly, in focal **A2** (Figure 6.23, mid panel) feet are longer than in broad focus (*bf*: 331 ms, *cf*: 369 ms) ($F_{(2,27)}$=7.41 p=0.011, η^2=0.21), and the difference is significant, even though the difference in the durations of the accentable syllables was minimal and not significant (see above). In the IP-final accent group (Figure 6.23, **A3**, right panel) the marginal duration differences across focal feet are not significant (*bf*: 425 ms, *nf*: 437 ms, *cf*: 435 ms) ($F_{(2,41)}$=0.34 p=0.712, η^2=0.02).

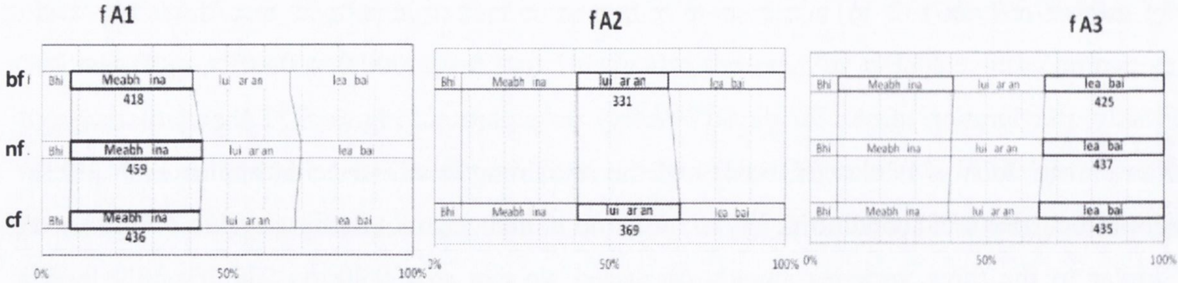


Figure 6.23: RG mean duration of focal feet (outlined in bold) and of the other measured feet, averaged across all speakers, shown as a percentage of the average length of the IP.

6.6 Summary

In this chapter we have so far discussed the effects of focus on f_0 (tunes and focal accent excursion) and duration (focal syllables feet) for each of the four Donegal Irish varieties. Now a summary of the main findings is presented for direct comparison of the varieties.

6.6.1 Tonal patterns and f_0 excursion

Figure 6.24 gives an overview of all the preferred tonal patterns in stylised f_0 contours across the three focal conditions (*bf, nf* and *cf*) on each accent group (A1, A2 and A3) for each of the four Donegal Irish varieties. While the previous sections have discussed the pitch effects of focus in variety separately, we now take a look at the preferred tunes and focal tonal patterns across the four varieties.

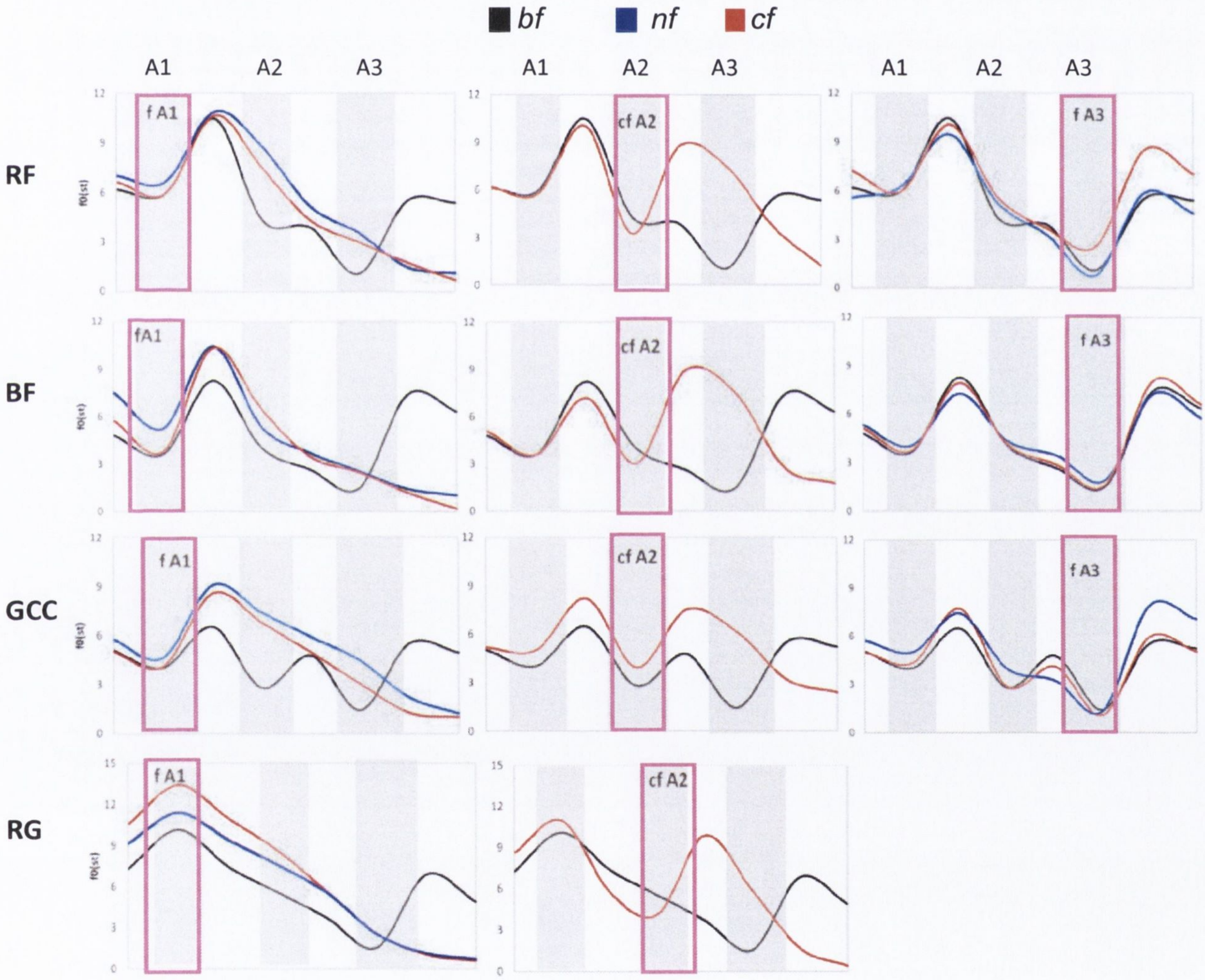


Figure 6.24: Mean f_0 contours in semitones (st) of sentences produced by all speakers, comparing broad focus (bf =black line) with narrow focus (nf=blue line) and contrastive focus (cf= red line) in each of the three possible focal accent groups fA1, fA2 and fA3 for each variety (RF, BF, GCC, RG) respectively.

There does not appear to be a tonal correlate of focus in the sense that focal accentuation would exploit a different tonal accent, as was reported for some romance languages (Frota, 2002; Avesani & Vayra, 2003; Face, 2002). What did emerge however, was that the focal accent was much more invariant than the non-focal realisations, particularly for the pre-nuclear accents. Regarding the tonal patterns in the focal accent for narrow and contrastive focus, the data shows no differentiation between these two different focus types. The rise (L*+H) is used in all focal conditions, except in the RG variety in phrase-initial focus (A1) where the fall (H*+L) occurs more frequently, but even here, L*+H is a second most frequent option.

In contrast, considerably more variability was found both in the tonal accents associated with broad focus utterances and in the realisation prefocal accents when a later constituent carries focal (*nf* or *cf*) accentuation.

Looking first at the realisation of **broad focus**, the differences in pre-nuclear tonal patterns are noted across the four varieties. The IP-initial accent is most typically a rise (L*+H) in the RF, BF and GCC varieies, but a high accent (H*) in RG. The middle accent is highly variable and is realised as a rise, a high or downstepped high (!H*) or in some cases becomes deaccented. In terms of the nuclear accent a more uniform pattern emerged across the dialects. The overall preferred pattern is the rise (L*+H %) and only few instances of rise plateau slumps (L*+H L%) are noted.

The f_0 excursion measurements show that focal accents in **A1** and **A2** are most typically higher compared to their equivalent in broad focus. Across the four varieties, f_0 excursion on A1 was significantly different between *cf* and *bf* (t=0, pMCMC=0.0001), but not between bf and nf, although it neared significance(t=0.0004, pMCMC=0.0010). In A2, the differences between *bf* and *cf* were also significant (t=0, pMCMC=0.0001). This, for the L*+H accent involves a raising of the peak (H) or a raising of the entire accent in register, (raising of both L* and H targets). There was rarely any additional lowering of the L* target as a means of focally extending the f_0 excursion. Post-focal accents are most commonly de-accented and show a steeply falling pitch slope. This trend is observed across all varieties. The pre-focal patterns are either slightly reduced (RF and BF varieties), but can also be boosted and/or raised in register (GCC and RG varieties).

In phrase-final focus (**A3**) this trend is less consistently present and the focal accents often resemble those in the neutral rendering. Significantly greater boosting of the accent was observed in RF for contrastive focus (but not for narrow focus) and in GCC for narrow focus (but not for contrastive focus). It is difficult to make a definitive statement on these data. Overall, however, no significant effects of focus on the phrase-final f_0 excursion were found between bf and nf (t=0.0557, pMCMC=0.0520) or bf and cf (t=0.0426, pMCMC=0.0622). It is possible on the one hand that focal accentuation, along similar lines to A1 and A2 occurs, but that it has not been consistently elicited in this study. On the other hand, the data here are very like what was reported in the pilot study on Gaoth Dobhair Irish by O'Reilly, Dorn & Ní Chasaide (2010). They looked at similar measures for broad and contrastive focus in the three accent groups, in both Irish and English produced by bilingual speakers. Their findings for Gaoth Dobhair Irish are very similar to what we are finding here for the RF variety: there was a register shift an a greater f_0 excursion in *cf* compared to *bf* , along with a slight reduction in the scaling of the initial pre-nuclear accent. All in all, we tentatively conclude that focal accentuation is less dramatically and less consistently signalled when it falls on the final constituent of the phrase.

On the whole, these varieties show many of the effects of focus on f_0 which have also been reported for English (Xu & Xu, 2005) and claimed as universal (Xu & Xu, 2005) in terms of the 3-zone pitch range adjustments. The boosting of the focal accent was found, at least for A1 and A2, but not consistently for A3. De-acccentuation was found to be a major correlate of focus, in that the post-focal material showed a steep decline in f_0.. The pre-nuclear material did not always remain unaffected, as was found by Xu & Xu (2005). Rather, there was a tendency for some reduction in the scaling of the accent, and at times even boosting and/or an increase in register. There appears to be some variation here among these varieties in what happens to the pre-focal material

6.6.2 Duration effects: focal syllables

Figure 6.25 presents a summary of mean duration of focal syllables and other measured intervals, as % of the IP durations, across the three focal conditions in each variety. Results of the statistical analyses carried out on the pooled data for focal syllable duration, to test for cross-variety differences (see Chapter 3.4.2), are reported in the text. A summary of these analyses is also included in Appendix 3, Table C3.1.

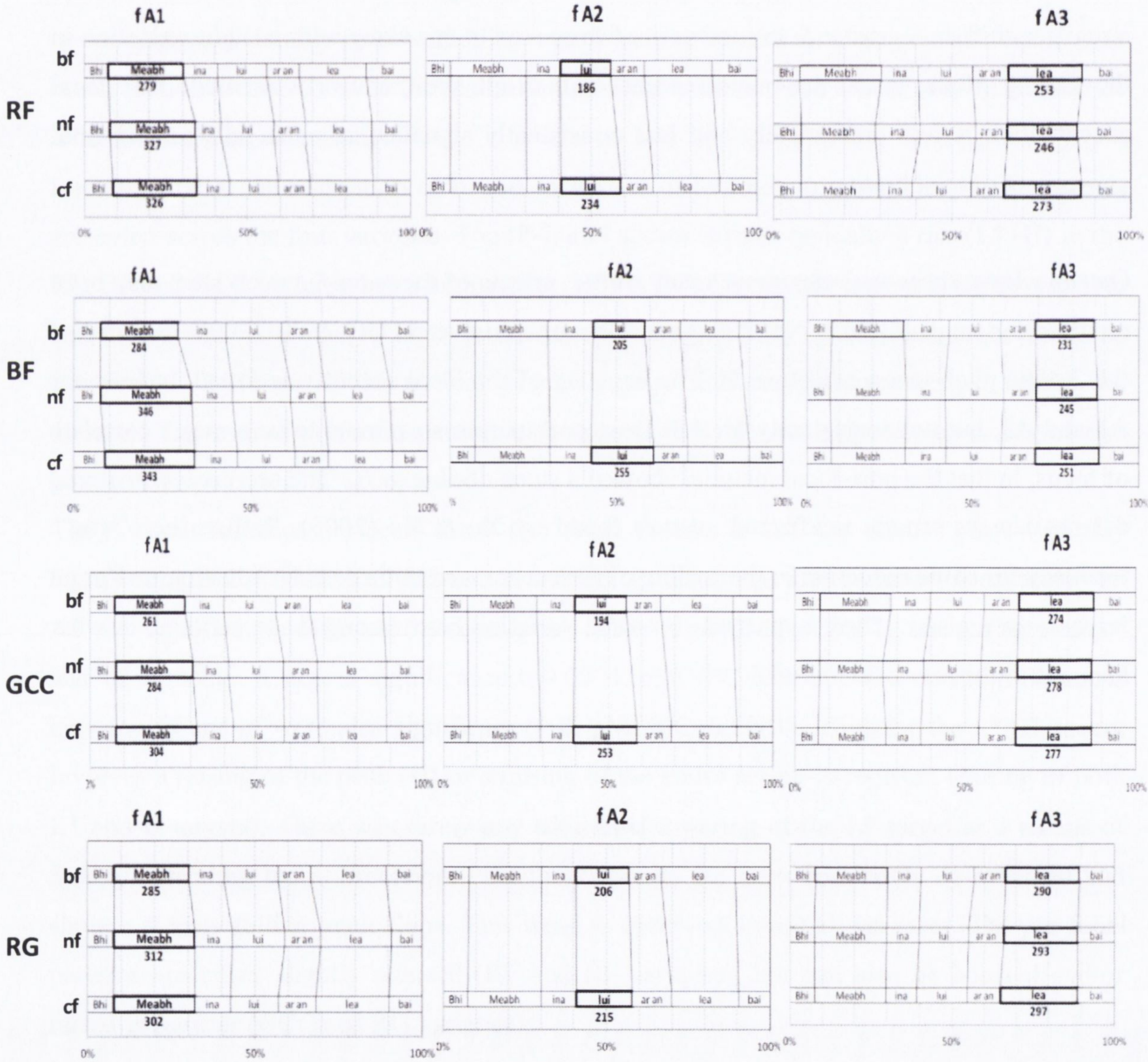


Figure 6.25: Cross-variety comparison of mean duration of focal syllables (outlined in bold) and of all other measured intervals, averaged across all speakers, shown as a percentage of the average length of the IP.

Summarising we can make the following observations across the varieties: In focal **A1** (Figure 6.25, left panels), both narrow and contrastive focus syllables are on average significantly longer than in broad focus (t=0, pMCMC=0.0001). Across the four varieties, narrow and contrastive focus have the same significant lengthening effect on these syllables compared to broad focus, and the differences between *nf* and *cf* were not significant (t=0.9950, pMCMC=0.93). As to focal **A2** (Figure 6.25, mid panels), syllables in contrastive focus are on average also significantly longer than in broad focus (t=0, pMCMC=0.0001), excepting the RG variety were no significance was reached. Finally, in focal **A3** (Figure 6.25, right panels), syllables in narrow (t=0.0435, pMCMC=0.0862) and contrastive focus (t=0.0359, pMCMC=0.0528) are somewhat longer than in broad focus, but these differences are not significant. The lack of consistent lengthening of A3 has been observed for other languages and it has been suggested that in phrase-final position the lengthening effect of the following prosodic boundary has more effect than that of focus. Nevertheless, given the lack of consistent *f0* correlates of focal accentuation in A3, one could also argue that the lack of lengthening is simply a further indication that focal accentuation in A3 is not consistently indicated in the prosody of these Irish varieties.

6.6.3 Duration effects: focal feet

Figure 6.26 presents a summary of mean focal feet durations across the three focal conditions on each of the accent groups in each variety. Results of the statistical analyses carried out on the pooled data for focal foot duration, to test for cross-variety differences (see Chapter 3.4.2), are reported in the text. Summary of these analyses is also included in Appendix 3, Table C3.1.

Looking now at the effect of focus on rhythmic feet (Figure 6.26) we can observe that focal **A1** feet (Figure 6.26, left panels) are overall longer in narrow (t=0, pMCMC=0.0001) and contrastive focus (t=0, pMCMC=0.0001) compared to broad focus. Overall, no systematic difference between *nf* and *cf* emerged. Differences in significant lengthening effects were noted in the RF and GCC varieties, where the *cf* constituent was longer than the *nf*, and in RG where the *nf* constituent was longer than the *cf*. In the BF variety, both *nf* and *cf* were longer than *bf,* but the differences were not significant. As regards focus on the phrase-medial accent group **A2** (Figure 6.26, mid panels), feet under contrastive focus are again on average significantly longer than in broad focus (t=0, pMCMC=0.0001), and these differences are significant across all four varieties. In focus in the phrase-final accent group (Figure 6.26, **A3**, right panels), feet under narrow (t=0.0014, pMCMC=0.0054) and contrastive focus (t=0.1502, pMCMC=0.2070) were again longer than in broad focus, but never significantly. This finding goes hand in hand with the previous observations.

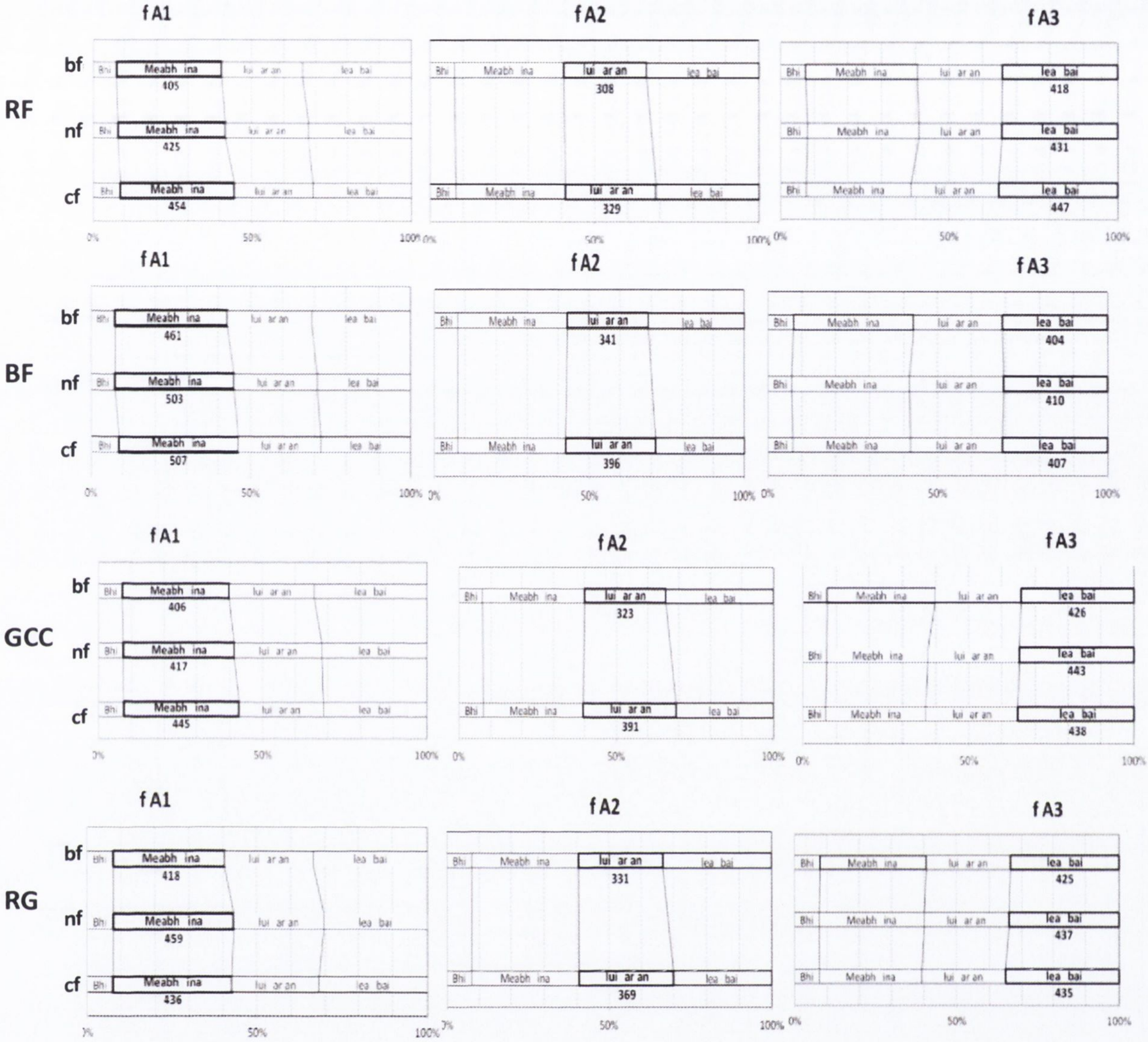


Figure 6.26: : Cross-variety comparison of mean duration of focal feet (outlined in bold) and of the other measured feet, averaged across all speakers, shown as a percentage of the average length of the IP.

6.6.4 Some other observations

In the course of the analysis for this experiment a number of interesting and unexpected findings emerged which we wish to comment on here as they provide additional insights into the characteristics of the realisation of focus in the varieties of Donegal Irish.

During the visual and auditory inspection while annotating the f_0 contours, we noted a difference in the realisation of the post-focal pitch slope when focus was produced on the IP-initial accent group (A1). Where in the majority of cases across the four varieties the pitch dropped relatively steeply on the post-focal material (Figure 6.27, left panel), we noted that this was not the case for all speakers. Two speakers of the RF variety and one speaker of the BF variety repeatedly realised the contour as a rise with a following long plateau stretching until the end of the phrase (Figure 6.27, right panel).

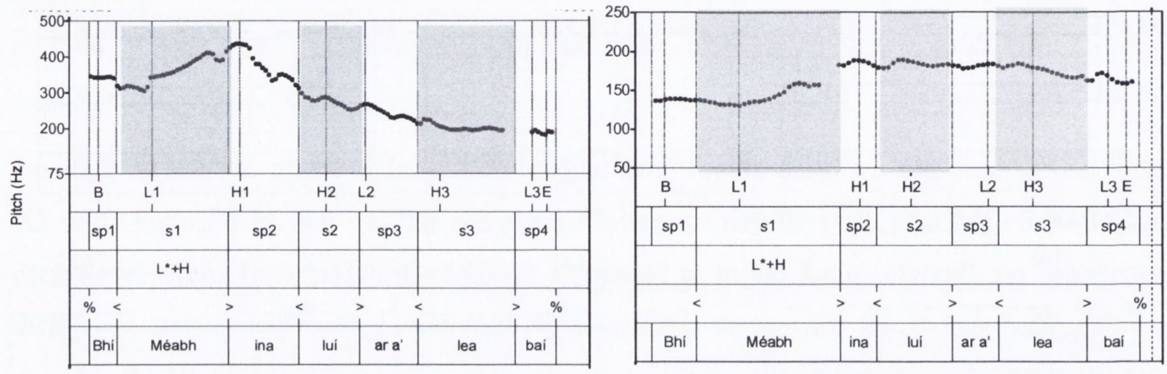


Figure 6.27: Realisation of focal A1 with a post-focal falling slope (left) or a post-focal plateau (right). Soundfile: DI-RG-SMO-nf-Meabh-1 (left panel), DI-RF-MNG-nf-Meabh-2 (right panel)

A widespread phenomenon, when focus was produced on the phrase-initial accent group A1 and, in a small number also in A2, was the frequent devoicing of the phrase-final syllable (see Figure 6.28). This phenomenon, which is auditorily quite striking, does not appear to be speaker specific as it applies to almost all speakers across the four varieties and was observed in around 30% of cases with focus in A1.

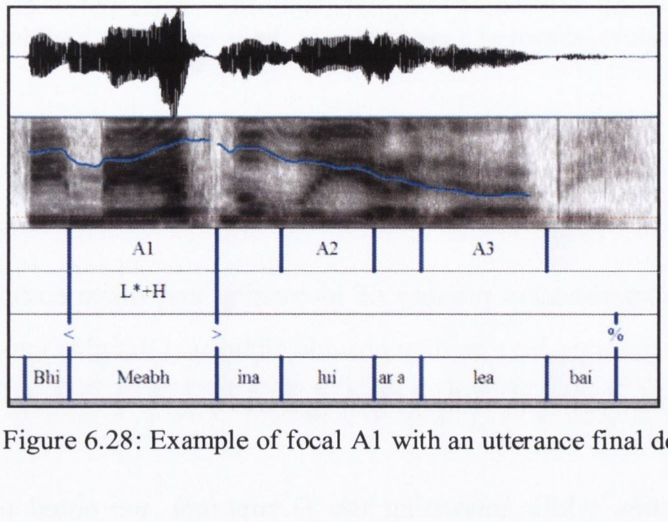


Figure 6.28: Example of focal A1 with an utterance final devoiced syllable.

This suggests that extensive final devoicing is a frequent correlate of deaccentuation, along with the steeply falling pitch of the postfocal material. It is worth noting in this context that recent analysis of the voice source correlates of focal accentuation (in Irish-English utterances) suggests that, along with the sharp drop in f_0 with deaccentuation, the phonatory quality shifts, becoming increasingly breathy (Yanushevskaya et al., 2010). It seems fairly likely that the extensive devoicing we are seeing here is an extreme manifestation of this effect, where the periodicity to noise ratio in the voice shifts, and the phonatory quality becomes increasingly breathy voice, then whispery voice, and eventually (voiceless) breath. We would speculate that this is what is happening here and that there may be substantial phonatory shifts occurring over the entire post-focal part of the utterance, before voicing decays completely. This is something that would be interesting to investigate further at some later time.

6.7 Conclusion

In this chapter the effects of focus on f_0 and duration in the four Donegal Irish varieties were discussed. As a first step, tunes in broad focus as well as in the two analysed focus types (narrow and contrastive) were outlined for each of the accent groups (A1, A2, A3) in each variety respectively. In addition, the tonal pattern used in focal accents was verified and focal accent excursion was calculated. From there, the discussion moved on to the analysis of the average duration of focal syllables and focal feet which was also discussed separately for each variety. Finally, an overview of the main results across the four varieties was presented and the differences and similarities between the analysed features were pointed out.

At the outset, the chapter aimed at answering the following questions:

Q1: What are the pitch effects of focus, both narrow and contrastive (compared to broad focus) on the

a) tonal patterns
b) f_0 excursions of the potentially accented items ($f_0$exA1, $f_0$exA2, $f_0$exA3)

a) tonal patterns

As to Q1a) from this study indicates that different tonal accents are not exploited as a mechanism for signalling focal accentuation. Unlike Romance languages, such as European Portuguese (Frota, 2002), Florentine Italian (Avesani & Vayra, 2003) or Spanish (Face, 2002), Irish does not mark contrastive focus by a categorically different pitch accent. Results confirm the findings of the pilot experiments: the overall preferred nuclear tonal pattern in broad focus is the rise L*+H and it is also the default tonal pattern in narrow and contrastive focal accents in the RF, BF and GCC varieties. As to the pre-focal tunes in these varieties, results showed a high degree of variability within and among speakers of the same variety and also across varieties. So, although L*+H is the preferred tonal pattern in RF, BF and GCC it is never the only possible choice. However, as there was in any case variability in broad focus (see Chapter 4) it is extremely unlikely that differences in pre-focal tonal patterns play a role in signalling focus. The RG variety differed from the other three, in that the fall H*+L occurred more frequently in focal accents on the phrase-initial accent group (A1), though the rise L*+H was again the preferred tune phrase-medially. Since this tune variability in RG had also been observed in the previous chapters, we can conclude that this is not an effect of focus.

b) f_0 excursions of the potentially accented items ($f_0$exA1, $f_0$exA2, $f_0$exA3)

As to Q1b), looking first of all at the f_0 excursion of focal accents, compared to the non-focal realisation in broad focus, the results from this study showed that, overall, focal accents have a wider f_0 excursion than in the broad focus rendering. In addition, accent excursion appears to depend on the position in the phrase: the most dramatic effect of excursion differences compared to broad focus is observed in phrase-medial focus (**A2**) with the most substantial boosting of the accent. This very large difference in A2 arises partially because of the tendency in these 3-accent phrases to realise the middle one (A2) with a downstepped H!*. In the phrase initial (**A1**) accent groups in both narrow and contrastive focus, accent excursion is overall higher than in broad focus, but the differences are much less clearly pronounced than in the phrase-medial accent. In the case of In focal **A3**, the situation was not clear-cut. In one variety, RF, contrastive focus (but not narrow focus) has considerably greater the f_0 excursion; in another variety, GCC, narrow focus (but not contrastive focus) has considerably greater the f_0 excursion; in a further variety, there are minimal differences in the three focal conditions. This may indicate unsuccessful or inconsistent elicitation of focus in A3 in this study, or it may simply be the case that A3 makes less prosodic marking of focus in these varieties. This will warrant further examination in the future.

The findings from this study also largely confirmed those findings of the pilot study of O'Reilly et al. (2010) in terms of focal tonal patterns. It should be noted that the boosting of f_0 on the focally accented syllable can be achieved either by raising the height of the H peak of the bitonal L* + H accent, or by raising the register of both the L* and the H targets. There was virtually never a lowering of L* to achieve the additional f_0 excursion.
More striking than what happens to the focally accented syllable in the utterance (compared to the broad focus rendition) is what happens to the post focal material. As in many languages the postfocal material was deaccentuated. This typically resulted in a sharp drop in f_0.
Broadly speaking, the effect of focus on f_0 of the focally accented syllable (expanding the f_0 range), and on the post-accented material (compressing the post focal f_0 range) is similar to the results for English as reported in Xu, & Xu (2005). That study also found that f_0 range of the pre-focal material was not affected by the focal accent, and this latter finding was not found in the present data. Instead, there appeared to be various possibilities here: reduction, expansion or indeed, minimal change to the f_0 range.

A rather different correlate of de-accentuation, which was seen frequently when focal accentuation occurred on A1, and less often when it occurred on A2, was the devoicing of the final syllable of the utterance. It is hypothesised that this indicates that de-accentuation is likely to be also signalled by a shift in phonatory quality towards increasing breath voicing → whispery voicing → and eventually devoicing.
One other less common finding concerning de-accentuation for some of the speakers in these varieties was the realisation of de-accentuation of a high tail, where the high trailing f_0 of the L*+H tone was maintained for the post-focal part of the utterance.

We now turn to the second research question.

> **Q2:** What are the duration effects of focus, both narrow and contrastive, (compared to broad focus) on the
>
> a) duration of the potentially accented syllable (dursA1, dursA2, dursA3)
> b) duration of feet (durftA1, durftA2, durftA3)

The results show that focal syllables (narrow and contrastive) are on average longer phrase-initially (A1) and phrase-medially (A2), but not in the phrase final position (A3). The same can be observed for the duration of focal feet. No systematic differences between narrow and contrastive focus are found in terms of length. Some minor differences emerged in terms of constituent lengthening between narrow and contrastive focal accents, but these were not systematic.

These results largely corroborate the findings of duration effects of focus in the previous pilot study on Donegal Irish (Dorn et al., 2011). The reduced lengthening effect in IP-final syllables and feet that is observed in the present data, has previously been observed for English and has been attributed to the already present final lengthening in pre-boundary constituents (P. J. Price et al., 1991; Wightman et al., 1992). This factor may also explain the lack of lengthening effects found for A3 in the Irish varieties studied here. However, given the rather limited or inconsistent evidence of f_0 differences in focus signalling for A3, it may simply also be that either focus was not successfully elicited in this position, or that there is little consistant marking of focus in A3 for these Donegal Irish varieties.

> **Q3:** Are there sub-dialect differences with regard to Q1 and/or Q2?

Sub-dialect differences did emerge with regard to tonal patterns used in focal accents (the RG variety differing from the other three), but we can conclude that they are not an effect of focus as such. Variability in the tonal patterns were already noted in Chapter 4, and in alignment features in Chapter 5, and it seems most likely that the focal data is simply reflecting that variability.

Overall, however, the varieties show largely the same effects of focus on f_0 and duration with some differences due to cross-speaker variation. Narrow and contrastive focus are also largely realised by the same means: overall, there are no differences in tonal patterns between the different focus types and they also show similar trends in terms of accent excursion in distinguishing *bf* from *nf* and *cf*. So we can conclude that no major sub-dialect difference emerged in terms of the tonal accents or in the f_0 excursions used in the of marking of focal constituents. As regards the duration effects of focus the results appear to be consistent across these varieties. Our findings show that both narrow and contrastive focus have on average the same lengthening effect on syllables and rhythmic feet, both of which are longer than in broad focus, except in the phrase-final position. No systematic differences between narrow and contrastive focus emerged in the duration parameters. Lengthening effects, however, depend on the position of the focal constituent in the phrase: in the phrase-final position both focal syllables and focal feet were on average only marginally and not significantly longer than in broad focus as Tukey's post hoc tests have shown, which is the case in all four varieties.

As to duration results, we also observed similarities to findings reported by Xu et al. (2004): increased duration of focal syllables as well as duration adjustments of all elements in the phrase. The Irish varieties, similar to Swedish (Heldner & Strangert, 2001), English (Cooper, Eady & Mueller, 19985; Eady et al., 1986) or Dutch (Hanssen, Peters & Gussenhoven, 2008), show significant lengthening effects of focused constituents, at least in A1 and A2 conditions. These findings also correspond to the findings of our pilot studies (O'Reilly et al, 2010; Dorn & Ní Chasaide, 2011).

The following chapter is the final analytic chapter in this thesis and deals with rhythmic properties, the PVI measure, in the Donegal Irish varieties.

7 Rhythmic features – the PVI

7.1 Introduction

This chapter discusses rhythmic features, in particular the PVI (Pairwise Variability Index) measure, in the four Donegal Irish varieties. The analysis is based on Section D of the Corpus (see Appendix 4).

As outlined in Chapter 2.3, Irish has been described as having typical features of a 'stress-timed' language i.e., syllable complexity, distinction between long and short vowel, vowel-reduction in unstressed syllables and avoiding of stress-clash. In Chapter 2.10 the motivations for carrying out a small-scale study on rhythmic features using the PVI metrics (Low, 1998; Grabe & Low, 2002) were discussed. As discussed there, there is a layman's perception of differences in rhythm/tempo, illustrated by the Donegal expression,

> *"Bheadh na preátaí nite, bruite agus ite ag na hUltaigh san am a thógfadh sé ar na Connachtaigh fataí a rá"*
>
> *'The Ulster Folk would have the potatoes washed, boiled and eaten in the time it would take the Connaught folk to say the word potato.'*

which finds an echo in the frequent observation by southern Irish speakers that Donegal Irish is spoken fast. In conversations with linguists the suggestion has been made that the perceived difference may not so much be a matter of tempo, but a difference in the rhythmic patterning, and that Donegal Irish sounds more staccato – a bit like the syllable timed languages. Speakers of syllable-timed languages are often perceived by speakers of stress-timed languages as talking fast, or having a staccato delivery.
Recent studies aimed at measuring correlates of stress- and syllable timing and rhythmic differences among languages/dialects have indicated that whatever differences emerge, they are not categorical, but that languages can differ along a continuum. Thus, while one would not want to argue that Donegal Irish is not essentially 'stressed-timed', we start here with a tentative hypothesis that Donegal Irish, in comparison to the southern varieties, lies further

along towards the 'syllable-timed' end of the continuum. This is what this chapter sets out to explore.

As outlined in Chapter 2.10, The original PVI measure (Grabe, 2002; Grabe & Low, 2002; Low et al., 2000) calculates the durational difference between successive vocalic (nVPVI) and inter-vocalic intervals (rCPVI). In more recent work this measure has also been applied to syllables (nSPVI) and rhythmic feet (nFPVI) in English and Estonian (F. Nolan & Asu, 2009) to show that languages can also differ on these levels (for calculations and formulae, section 7.2.2). In terms of these measures, languages traditionally classified as 'stress-timed' would show a high vocalic PVI (nVPVI), i.e., a high variability in the duration of vocalic sequences, and this of course would be an expected consequence of the fact that that 'stress-timed' languages (e.g., British English, German) have a vowel length contrast and that they typically have full vowels in stressed, but reduced vowels in unstressed syllables. In 'syllable-timed' languages which do not exhibit these phonological features (e.g., Spanish, French) more similarity in successive vowel durations is expected and they would be characterised by a rather low vocalic nVPVI. The inter-vocalic rCPVI measure is indicative of syllable complexity and of the complexity of consonant clusters that occur in a given language. These two PVI measures target features that are typically seen as part of the segmental phonology of a language, but which have obvious repercussions on how the rhythm is likely to be perceived. As just mentioned, rather than a categorical classification, the PVI measures would put languages on a continuum of being more 'stress-timed' or 'syllable-timed' Grabe (2002).

The syllable and foot PVI metrics as suggested by Nolan & Asu (2009) complement the earlier PVI measures in targeting more directly the prosodic rhythmic dimension: traditionally 'stress-timed' languages would be expected to show higher variation in successive syllable durations, but a tendency towards foot isochrony.

Returning now to the specific research questions addressed in this chapter:

Q1: In terms of the PVI measure, do the Irish varieties group with languages traditionally described as

a) 'stress-timed' or r
b) 'syllable-timed'?
c) intermediate?

Note that our hypothesis is that the Donegal varieties are intermediate, in the sense that, on the stressed- syllable- timed continuum, they should belong with the stressed-timed group, but located further towards the syllable-timed end of the continuum than the southern Irish dialects.

Q2: Are there sub-dialect differences?

There is no prior expectation that the varieties we are looking at here would vary, and this is simply something that we look for in all aspects of the present analysis.

Since Irish has been described to have typically 'stress-timed' features (cf. O Siadhail, 1999), we would expect the Donegal Irish varieties to group broadly with 'stress-timed' languages such as German, Dutch or British English (BE) on a plot like that from Grabe & Low (2002, p. 7) reproduced here as Figure 7.1). However, as our hypothesis states, we speculate that the Donegal varieties would be located at a less extreme point in the stressed-timed end of the continuum in comparison to the southern Irish varieties, veering some distance towards the syllable- timed end of the continuum. A distinction between British and Singapore English showed up such a difference, and the difference is illustrated in Figure 7.1 from Grabe & Low (2002, p.7), for single speaker per language/variety, and materials similar to what is being used in the present study. While values for both British and Singapore English are in the upper right quadrant of the plot, where one would expect stressed-timed languages to be located, note that Singapore English (SE) is located further down than British English (BE), a shift which suggests that it is veering somewhat towards the syllable timed pattern (e.g., of Spanish and French). In our Irish data we would expect values similarly to lie in the upper right quadrant, but hypothesise that, in comparison to southern Irish varieties, they would be shifted relatively down and/or leftwards.

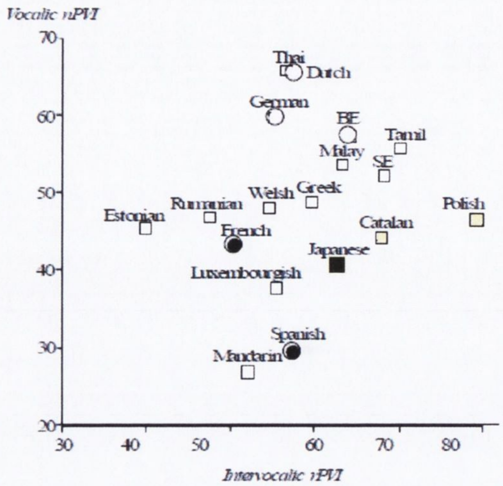


Figure 7.1: Graph reproduced from Grabe & Low (2002, p.7) showing inter-vocalic rPVI and vocalic nPVI metrics for languages classified as typically stress-timed (white circles), syllable-timed (black dots), mora-timed (black squares) or mixed/unclassified (white squares).

Similarly, we would expect Donegal Irish to broadly group with English regards the foot and syllable PVI measures from Nolan & Asu (2009, p.73), illustrated in Figure 7.2), given that Donegal Irish also has the array of phonological features typically associated with stressed-timed languages. Nonetheless, we would hypothesise that the Donegal varieties, in comparison to the southern dialects of Irish would be located relatively further towards the syllable timed end of the continuum, veering relatively to the left, and perhaps, upwards. Note that the data in Figure 7.2 is for five speakers per language investigated, and involved comparisons for a read story.

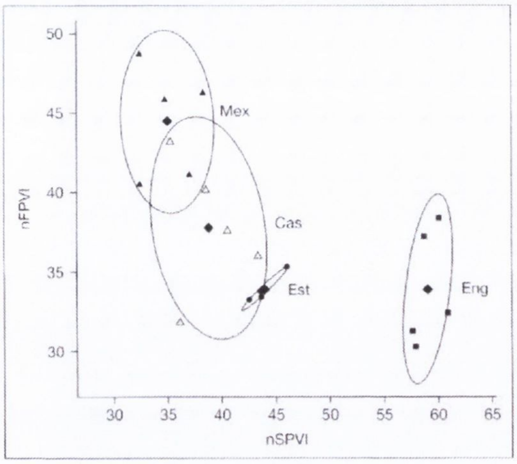


Figure 7.2: Graph reproduced and adapted from Nolan & Asu (2009, p.73) showing plots of syllable (nSPVI, x-axis) and foot PVI metrics (nFPVI, y-axis) for the five analysed speakers for each language including English, Mexican and Castilian Spanish and Estonian.

Our hypothesis requires the possibility of comparing the PVI measures for Donegal varieties with measures from the southern dialects. A small pilot study was carried out, on one speaker from the three major Irish dialects (Dorn, O'Reilly & Ní Chasaide, 2012). The southern Irish data used for comparisons in this study are taken from this pilot study. In the case of the Donegal data from the pilot study (a Gaoth Dobhair speaker), it is not used in the present analysis, but the results are included in some of the comparative plots presented below.

In sections that follow these PVI measures are applied to our data. The results are first plotted separately for each variety. Then they are plotted in graphs adapted from (Grabe, 2002) for nPVI and rPVI and from Nolan & Asu (2009) for the nSPVI and nFPVI measures to put the Donegal Irish varieties in the context of previously investigated languages/varieties.

As the primary focus in this thesis is on the intonation of the four Donegal varieties under investigation, the inclusion of some rhythmic analysis was intentionally kept limited in scale and scope. It was decided to limit the analysis to the PVI suite of measures, and to work with and limited subject numbers (eight subjects). The materials on which the analysis was based were readings of '*The North Wind and the Sun*' passage, also used in Grabe & Low, 2002 study.

As discussed in Chapter 2.10, there are many other proposed measures which have been judged as more or less successful in capturing rhythmic differences, see (Wiget et al., 2010) and the review in Chapter 2.10. The PVI metrics were chosen here since because it has been shown to be able to pick up on variation between varieties of the same language (British English, Singapore English (Low, 1998; Grabe & Low, 2002)) and because with the recent additions of direct syllable and foot variability measures, it offers a multidimensional perspective on the rhythmic characteristics – including measures that relate closely to features of segmental phonology and specifically rhythmic features. The previous studies, using PVI, present results for a range of other languages, and this has provided a useful comparative backdrop for the present measures. As was pointed out in Chapter 2, the choice of PVI metrics to be used in this study is not intended to imply that they are better than other proposed metrics for capturing rhythmic characteristics. Given the intentionally limited scale of the present investigation, and given the limited data particularly for the southern dialects we wish to compare present results with, this analytic study represents more a starting point for future work than an attempt at a definitive statement.

7.2 Materials and Methodology

7.2.1 Materials

The Irish translation of the story of the *North Wind and the Sun, 'An Ghaoth Aduaidh agus an Ghrian* (Ní Chasaide, 1999), taken from the Handbook of the International Phonetic Association (1999) served as the basis for analysis in this section of the corpus (see Appendix 4). This particular text was chosen, since it had been used in previous studies on rhythm with comparable metrics (Grabe & Low, 2002; Low et al., 2000), offers comparable data to the other papers on rhythm and is generally a preferred text for different types of phonetic studies. The text comprises of a total of 127 words.

The data reported here is obtained from two speakers per sub-dialect, not from four speakers as in the other data chapters. In the first field trip for pilot recordings, no read story was recorded and as a result no data is available from the informants who were recorded then. Note also that, for logistic reasons, concerning availability, the two RF informants recorded for this PVI study were not the same as those used for the intonation analyses of the other chapters – although ideally it would have been preferable to use the same speakers across the different sections in this study.

7.2.2 Annotation and calculation of PVI intervals

In this study, all individual phrases of the read story the *North Wind and the Sun* were manually annotated in Praat (Boersma & Weenink, 2008). Figure 7.3 shows an example of the annotated data. Utterances were transcribed orthographically (tier 5), individual sentences were segmented (tier 4), rhythmic feet (f) were segmented (tier 3) as were lexically stressed (s) and unstressed/weak (w) syllables (tier 2) as well as vocalic (v) and intervocalic/consonantal (c) intervals (tier 1). Note that by rhythmic foot we take the lexically stressed syllable (s) plus any number of following unstressed/weak (w) syllables until the next stressed one. Subsequently, the durations (milliseconds) for stressed (s) and unstressed (w) syllables, rhythmic feet (f) and vocalic (v) and intervocalic (c) intervals were extracted with a Praat script (Lennes, 2011). The extracted duration values were transferred and to an available Excel spreadsheet (White, 2010), which calculates the rhythm metrics.

Hesitations and pauses were excluded from the calculations of segment durations. The calculations were done for vocalic (v) and inter-vocalic (c) measurements to obtain the rPVI and nPVI measures. The same procedure was repeated for syllables (s,w) and feet (f) to calculate the syllable (nSPVI) and foot (nFPVI) measures. Results of the individual metrics for each speaker were subsequently averaged to yield four sets of values (rCPVI, nVPVI, nSPVI, nFPVI).

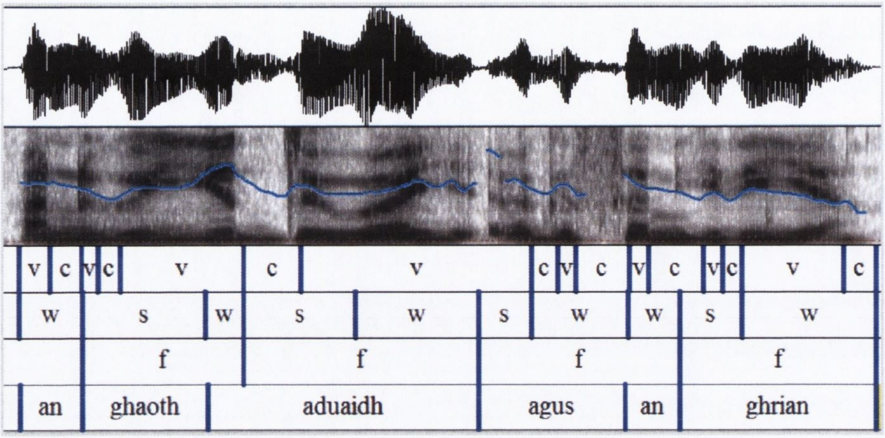


Figure 7.3: Example of annotation levels for PVI measurements in Praat: orthographic transcription (tier 5), annotation of utterances (tier 4), rhythmic feet (tier 3), lexically strong (s) and weak (w) syllables (tier 2) and vocalic (v) and inter-vocalic (c) segments (tier 1).

The different PVI calculations were carried out following the formulae taken from (Grabe & Low, 2002; Low et al., 2000; F. Nolan & Asu, 2009). Equations (1) and (2) are shown below. In equation (1), the raw PVI (rPVI), duration is not normalised for speech rate and is generally applied to intervocalic (c) segments. In this formula "the result of the rPVI calculation is a ratio of the sum of the absolute difference of successive pairs of intervocalic measurements divided by the total number of intervocalic measurements in the utterance minus one" (Rickard, 2006, p. 2), "*m* is the number of intervals, vocalic or intervocalic, in the text and *d* is the duration of the k^{th} interval" (Grabe & Low 2002, p.16).

Here we understand (*d*) as the duration of inter-vocalic segments. The inter-vocalic segments (d) in the formula correspond to label 'c' in the annotated data (see Figure 7.3). This formula is used to calculate the rCPVI measures.

(1) $$rPVI = \frac{100}{m-1}\sum_{k=1}^{m-1}\left|d_k - d_{k+1}\right|$$

The normalised PVI (nPVI) shown in equation (2) below is applied to successive vocalic intervals. The equation is the same as for the rPVI, but "the normalised equation takes the result and divides the difference by the mean duration of the pair. This is then divided by the total number of measurements in the utterance minus one and is multiplied by 100 as the normalisation produces fractional values" (Rickard 2006, p.2), "*m* is the number of items in an utterance and *d* is the duration of the k^{th} item" (Grabe & Low, 2002, p.16), Here (*d*) refers to the durations of vocalic segments which are labelled 'v' in the annotated data in this thesis (see Figure 7.3).

$$(2) \qquad nPVI = \frac{100}{m-1} \times \sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{\frac{d_k + d_{k+1}}{2}} \right|$$

For calculating the syllable (nSPVI) and foot PVI (nFPVI) the same formula as in (2) is applied, where the duration *d* is understood as the syllable duration or durations of rhythmic feet. In the annotated data syllables are annotated as 's' and 'w', and rhythmic feet are labelled 'f' (see Figure 7.3).

In sections 7.4 and 7.5, results are presented as numerical values and are also plotted in adapted graphs reproduced from Grabe & Low (2002, p.7) for rPVI and nPVI values (see section 7.6.1), and in a graph reproduced from Nolan & Asu (2009, p.73) for nSPVI and nFPVI values (see section 7.6.2).

7.3 Pilot study -- preliminary comments

A pilot study on three varieties of Irish (Donegal, Connemara and Kerry) was carried out by Dorn, O'Reilly & Ní Chasaide (2012) to investigate if perceived rhythmic differences between these dialects would show in the chosen metrics. In Donegal (DI) and Connemara Irish (CI), stress generally falls on the first syllable of a word. Munster (Kerry) Irish (KI), on the other hand, has undergone historical stress shift: in certain prosodic conditions, stress shifts to a word-medial or word-final syllable (cf. O'Rahilly, 1932; Blankenhorn, 1981; Ó Sé, 1989). There is more discussion of this in Chapter 2.3.

In the 2012 study (Dorn, O'Reilly & Ní Chasaide (2012)), the Irish version of the *North wind and the Sun* (*An Ghaoth Aduaidh agus an Ghrian*) was read by one speaker per variety. Five sentences per dialect were extracted and the four PVI metrics calculated for each speaker. Contrary to prior expectations, neither the vocalic and inter-vocalic PVI (see Figure 7.4) nor the syllable and foot PVI (see Figure 7.5) reflected any of the perceived differences between the dialects. In fact, the three dialects showed an overall similar grouping with 'stress-timed' languages (British English, Dutch) in terms of nVPVI and rCPVI, with high PVI values for both measures. The general grouping with 'stress-timed' languages is not in itself surprising.

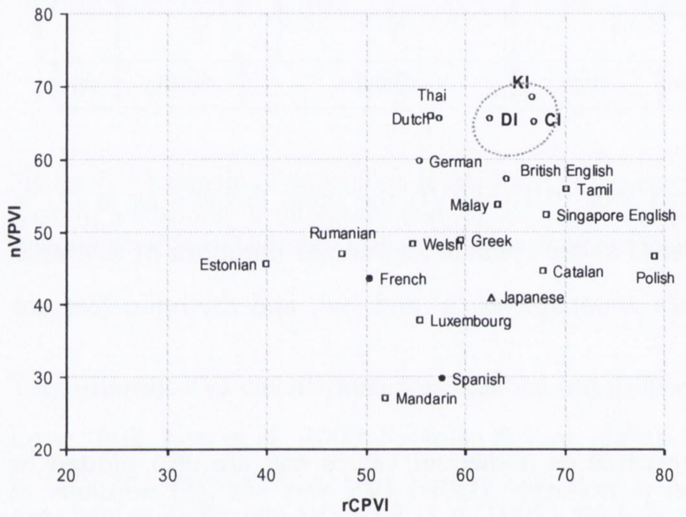


Figure 7.4: Plotted PVI measures for Donegal (DI), Kerry (KI) and Connemara (CI) Irish in a graph adapted from Grabe & Low (2002, p.7) showing inter-vocalic rPVI and vocalic nPVI metrics for languages classified as typically stress-timed (white circles), syllable-timed (black dots), mora-timed (black squares) or mixed/unclassified (white squares).

As to the syllable and foot PVI measures (Figure 7.5), again no differences emerged between the three dialects and they group together with the average measures calculated for English (Nolan & Asu, 2009, p.73). The high nSPVI suggests bigger durational differences which reflect the complex syllable structure possible in Irish. The lower nFPVI indicates that Irish, similar to English has a rather regular timing in the duration of rhythmic feet.

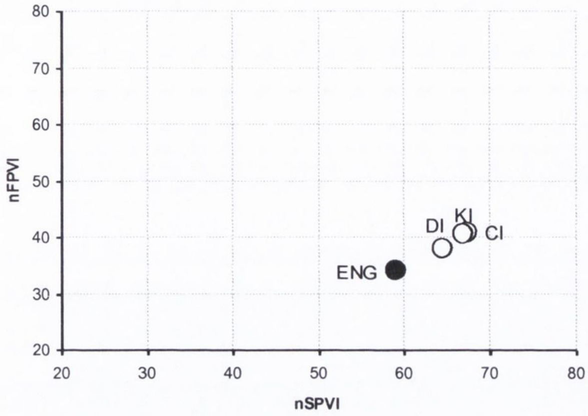


Figure 7.5: Plotted nSPVI and nFPVI measures for Donegal (DI), Kerry (KI) and Connemara (CI) Irish varieties, in a graph reproduced and adapted from Nolan & Asu (2009, p.73) showing mean plots of syllable (nSPVI, x-axis) and foot PVI metrics (nFPVI, y-axis) for English.

With data for only one speaker and only five sentences per dialect this pilot is very limited and findings are very tentative. Applying the PVI measures to the four Donegal Irish varieties extends the study in terms of speakers and materials.

The following sections now each discuss the calculated PVI measures for the four Donegal Irish varieties. First inter-vocalic rCPVI and the vocalic nVPVI measures are presented. Then the calculated syllable nSPVI and foot nFPVI measures are analysed. Finally, a summary of the pooled rhythm metrics across the four varieties is presented.

7.4 PVI measures of vocalic and inter-vocalic intervals (rCPVI, nVPVI)

In presenting vocalic and intervocalic (nVPVI and rCVPI), rather than showing pooled results only, we would like to show results for the individual dialects too, to provide a comprehensive overview.

The following sections now each discuss the calculated PVI measures for the four Donegal Irish varieties. First inter-vocalic rCPVI and the vocalic nVPVI measures are presented. Then the calculated syllable nSPVI and foot nFPVI measures are analysed. Finally, a summary of the pooled rhythm metrics across the four varieties is presented. Rather than showing pooled results only, we would like to show results for the individual dialects too, to provide a comprehensive overview.

7.4.1 Rann na Feirste (RF)

Figure 7.6 shows the plotted results of the calculated rCPVI (x-axis) and nVPVI measures (y-axis) for the two speakers of the RF variety (RF1, RF2). Note that the results presented here are from the two extra speakers recorded for this part of the thesis as explained in section 7.2.1). Results show relatively high values for both the inter-vocalic rCPVI (RF1: 58.9, RF2: 71.3) and also for the vocalic nVPVI (RF1: 56.5, RF2: 61.1). The rCPVI measure is slightly higher than the nVPVI, which suggests a somewhat higher variability in consonant than vowel duration. All in all, however the metrics suggest that RF shows relatively high variability in both vocalic and inter-vocalic sequences, and as such are clearly exhibiting 'stress-timed' characteristics.

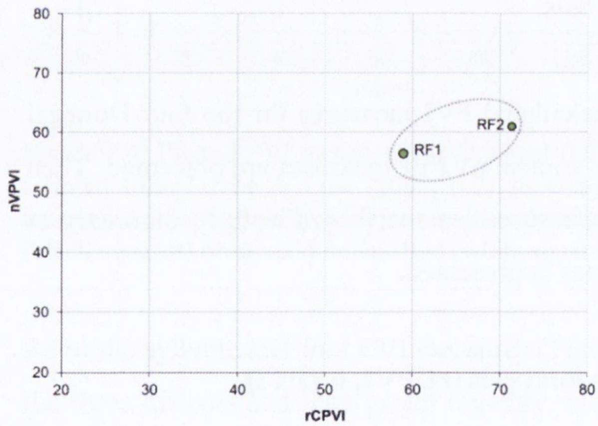


Figure 7.6: Calculated rCPVI (x-axis) and nVPVI metrics (y-axis) plotted for the RF variety.

7.4.2 Baile na Finne (BF)

Figure 7.7 shows the plotted results of the calculated rCPVI (x-axis) and nVPVI measures (y-axis) for the two informants of the BF variety (BF1, BF2). We can again observe relatively high values for the vocalic nVPVI (BF1: 67.8, BF2: 56.7) for both speakers. As to rCPVI

(BF1: 56.3, BF2: 54.8), the resulting measures are located around the upper middle of the scale. The BF variety is clearly showing 'stress-timed' characteristics.

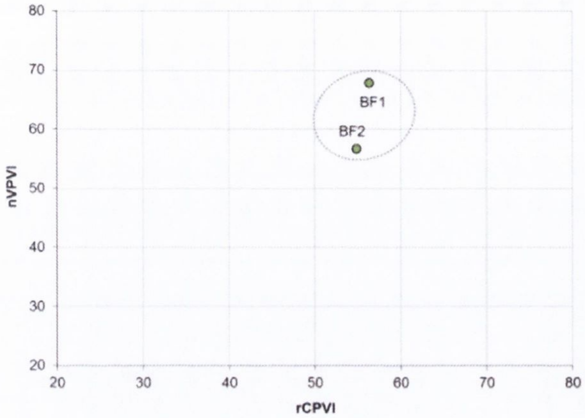


Figure: 7.7: Calculated rCPVI (x-axis) and nVPVI metrics (y-axis) plotted for the BF variety.

7.4.3 Gleann Cholm Cille (GCC)

The plotted results of the calculated rCPVI (x-axis) and nVPVI measures (y-axis) for the two informants of the GCC variety (GCC1, GCC2) are presented in Figure 7.8. Results for this Donegal variety show again relatively high rCPVI (GCC1: 67.2, GCC2: 74.6) values. The measured nVPVI (GCC1: 61.2, GCC2: 51.3) is, however, lower than the consonantal measure. On average, however, both measures are again located on the upper and upper-mid scale. Like RF and BF, the GCC variety clearly exhibits stress-timed characteristics.

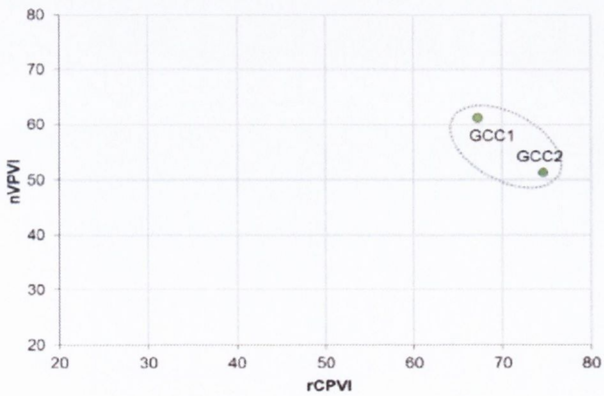


Figure 7.8: Calculated rCPVI (x-axis) and nVPVI metrics (y-axis) plotted for the GCC variety.

7.4.4 Ros Goill (RG)

As to the RG variety, Figure 7.9 shows the plotted results of the calculated rCPVI (x-axis) and nVPVI measures (y-axis) for the two informants (RG1, RG2). The resulting metrics for the RG variety are very similar to the other three dialects: the inter-vocalic rCPVI (RG1: 54.6, RG2: 55.2) and also the vocalic nVPVI (RG1: 67,4, RG2: 66.1) measure both show relatively high values. The rCPVI is somewhat lower than the nVPVI measure similar to the BF variety.

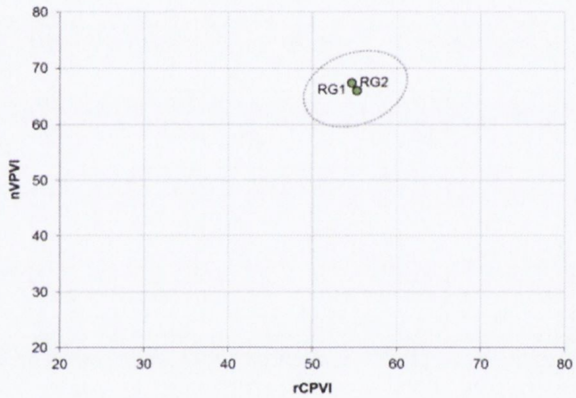


Figure 7.9: Calculated rCPVI (x-axis) and nVPVI metrics (y-axis) plotted for the RG variety.

7.5 PVI measures of syllables and rhythmic feet (nSPVI, nFPVI)

Having discussed the vocalic and inter-vocalic PVI metrics, we now move on the remaining related measures. The following sections look at the syllable (nSPVI) and foot (nFPVI) PVI for each of the four Donegal varieties.

7.5.1 Rann na Feirste (RF)

Figure 7.10 shows the plotted results of the calculated nSPVI (x-axis) and nFPVI measures (y-axis) for the two speakers of the RF variety (RF1, RF2). The nSPVI values (RF1: 58.3, RF2: 50.9) are located around the middle of the scale with a tendency towards the upper end. The nFPVI values are relatively low (RF1: 32.4, RF2: 29.4), and this suggests a regular foot structure. Overall, these results suggest a tendency to relatively equally timed feet in terms of duration, but higher variability in syllable durations.

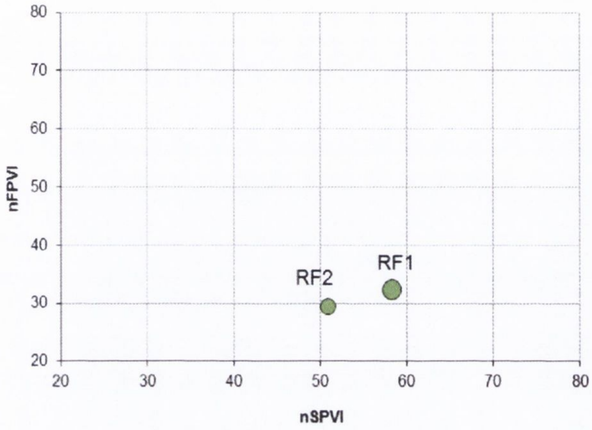


Figure 7. 10: nSPVI (x-axis) and nFPVI metrics (y-axis) plotted for the RF variety.

7.5.2 Baile na Finne (BF)

Figure 7.11 shows the plotted results of the calculated nSPVI (x-axis) and nFPVI measures (y-axis) for the two speakers of the BF variety (BF1, BF2). We can again make similar observations as to the RF variety: results show nSPVI values (BF1: 57.5, BF2: 54.5) around the middle of the scale, but relatively low nFPVI results (BF1:32.2, BF2: 33.5).

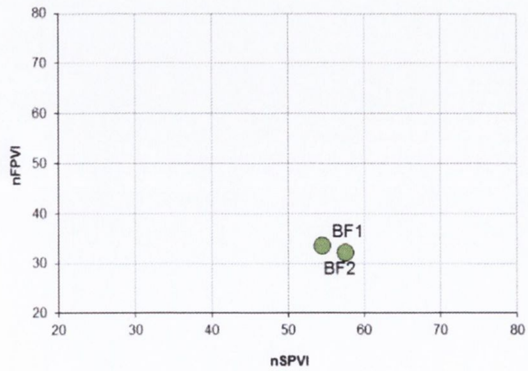


Figure 7.11: nSPVI (x-axis) and nFPVI metrics (y-axis) plotted for the BF variety.

7.5.3 Gleann Cholm Cille (GCC)

The plotted results of the calculated nSPVI (x-axis) and nFPVI (y-axis) measures for the two speakers of the GCC variety (GCC1, GCC2) are presented in Figure 7.12. Similar to the previously commented on varieties, the calculated PVI measures are higher for nSPVI values (GCC1: 56.0, GCC2: 47.9) than for nFPVI (GCC1: 33.0, GCC2: 34.1). Speaker 2 (GCC2) showed a somewhat lower syllable measures, but on average both speakers have a similar tendency.

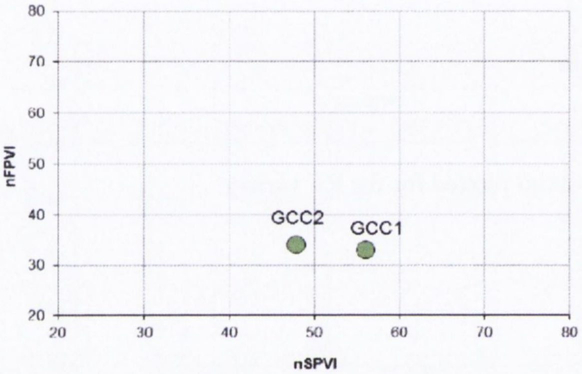


Figure 7.12: nSPVI (x-axis) and nFPVI metrics (y-axis) plotted for the GCC variety.

7.5.4 Ros Goill (RG)

Figure 7.13 then presents the plotted results of nSPVI (x-axis) and nFPVI (y-axis) measures for the two speakers of the RG variety (RG1, RG2). The results for both measures were very similar to the other three varieties, with higher nSPVI (RG1: 53.7, RG2: 47.7) than nFPVI values (RG1: 32.5, RG2: 36.2) and only minor differences between the speakers.

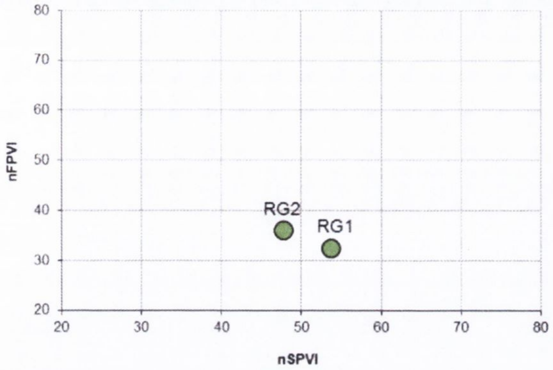


Figure 7.13: nSPVI (x-axis) and nFPVI metrics (y-axis) plotted for the RG variety.

7.6 Summary

The previous sections in this chapter have presented the results of the vocalic and inter-vocalic, as well as syllable and foot PVI measures for each of the four Donegal varieties. Now the pooled results are presented to provide an overview across the varieties. First rCPVI and nVPVI are plotted and discussed in relation to results obtained for the other Irish varieties in the pilot experiment by Dorn, O'Reilly and Ní Chasaide (2012), and also in relation to the other languages reported on by Grabe (2002) (section 7.4). Then, the calculated nSPVI and nFPVI measures are plotted and presented in a similar way (section 7.5): first with reference to the Irish varieties and finally in relation to the foot and syllable PVI measure for other languages, English, Mexican Spanish, Castillian Spanish and Estonian, as reported on by Nolan & Asu (2009).

7.6.1 PVI measures of vocalic and inter-vocalic intervals (rCPVI, nVPVI)

Figure 7.14 shows the results of inter-vocalic rCPVI (x-axis) and vocalic nVPVI (y-axis) for all speakers of the four varieties. The individual results are plotted together with those calculated for Donegal Irish (DI), Connemara (CI) and Kerry Irish (KI) from the pilot study (Dorn et al (2012)).

Looking at Figure 7.14 we can observe that, the Donegal varieties are located in the upper right quadrant of the graph, indicative of stress timing. There is some difference between the varieties of this study and the Kerry and Connemara dialects (data from the pilot study) in that values are on the whole show either lower values in rCPVI (BF1, BF2, RG1, RG2) or lower nVPVI (RF1, RF2, GCC1, GCC2).

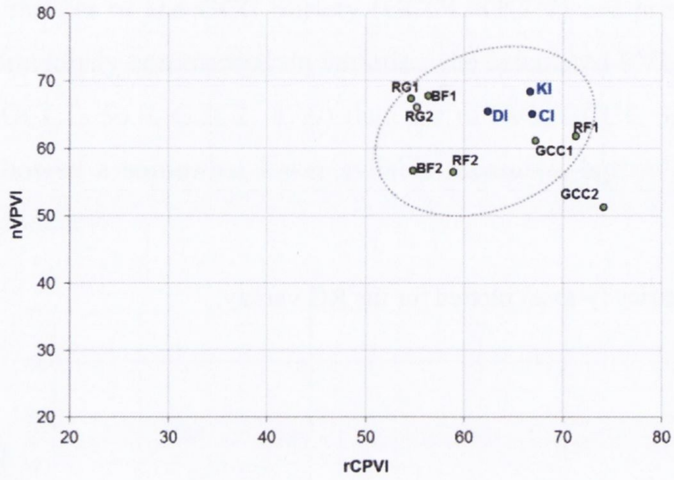


Figure 7.14: Plotted rCPVI (x-axis) and nVPVI metrics (y-axis) for the two speakers per variety (RF, BF, GCC and RG) (green dots), together with the metrics calculated for Donegal (DI), Kerry (KI) and Connemara Irish (KI) from the pilot study by Dorn, O'Reilly & Ní Chasaide (2012) (in blue).

Looking next at Figure 7.15, the Irish varieties are put into the context of languages previously reported for rCPVI and nVPVI (Grabe, 2002; Grabe & Low, 2002).

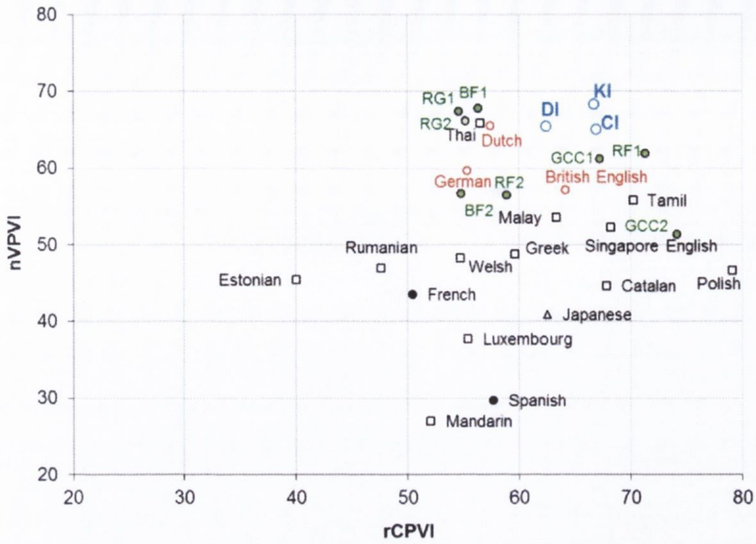


Figure 7.15: Plotted rCPVI (x-axis) and nVPVI metrics (y-axis) for the two speakers per Donegal variety (green dots), together with the metrics calculated for previously investigated languages by (Grabe, 2002; Grabe & Low, 2002) and the metrics calculated for Donegal (DI), Kerry (KI) and Connemara Irish (KI) (blue dots) from the pilot study by Dorn, O'Reilly & Ní Chasaide (2012). Graph reproduced and adapted from Grabe & Low (2002, p.7) showing inter-vocalic rPVI and vocalic nPVI metrics for languages classified as typically stress-timed (white circles), syllable-timed (black dots), mora-timed (triangles) or mixed/unclassified (white squares).

From the comparison we see that the the four Donegal varieties analysed here cluster around the same area as languages traditionally described as 'stress-timed' (German, Dutch and British English (Grabe & Low, 2002)).

There is, however, considerable variation between the varieties, and also considerable variation between the two speakers of an individual variety. For that reason we would be cautious not to over-interpret these data. A difference between the four Donegal varieties and the southern Irish KI and CI dialects is suggested, but one would clearly require more speakers, particularly for KI and CI to come to a conclusion on this.

7.6.2 PVI measures of syllables and rhythmic feet (nSPVI, nFPVI)

Figure 7.16 shows the plotted syllabic (x-axis) and foot (y-axis) PVI metrics for each of the speakers across the four Donegal varieties. In addition, nSPVI and nFPVI for the previously analysed DI, KI and CI dialects (Dorn et al (2012)) are included to provide a southern Irish comparison for the varieties investigated in this study.

Looking first at the individual measures across the four varieties of the present study, it is clear that they group together in a similar fashion with only minor differences. Across the four varieties it is clear that all share a relatively low foot PVI (nFPVI), indicative of a tendency towards a regular timing of foot duration. As to the nSPVI, the varieties group around the middle of the scale, which suggests an intermediate degree of variability in adjacent syllable durations.

Comparing these four varieties to the measures from the pilot study, the DI (Gaoth Dobhair), KI and CI dialects, it appears that they cluster quite some distance to the left of the latter, showing a lower nSPVI (i.e., less variability in syllable durations). The nFPVI is also a little lower (a slight tendency towards more regular foot timing).

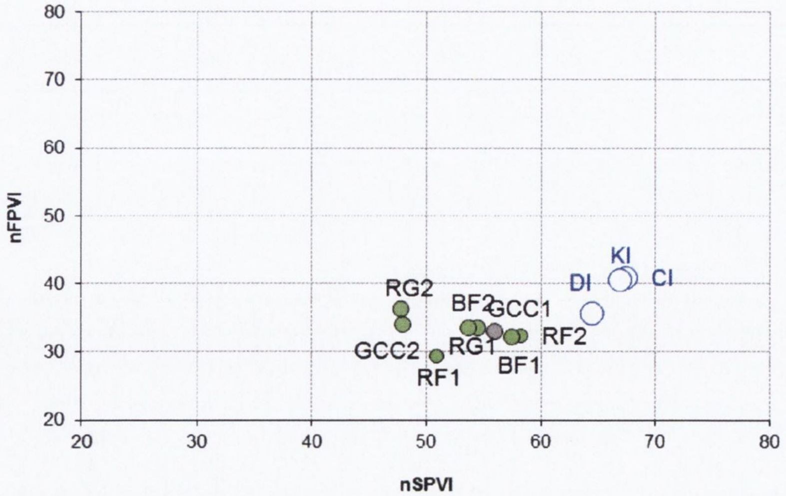


Figure 7.16: nSPVI (x-axis) and nFPVI metrics (y-axis) for the two speakers across the four varieties (green dots), together with the metrics calculated for Donegal (DI), Kerry (KI) and Connemara Irish (CI) from the pilot study by Dorn, O'Reilly & Ní Chasaide (2012) (in blue).

Figure 7.17 plots the measures for the Irish varieties (green points for the individual speakers and a larger black diamond for the overall average) for the four varieties of this study) as well as blue circles for the KI, CI and DI (Gaoth Dobhair) measures of the earlier pilot study. These are plotted in relation to the data presented for the languages (English, Castillian Spanish, Mexican Spanish and Estonian) reported on in Nolan & Asu, (2009, p.73). Figure 7.18 presents the same data, but shows average values for each of the four Donegal varieties, rather than the individual speaker averages.

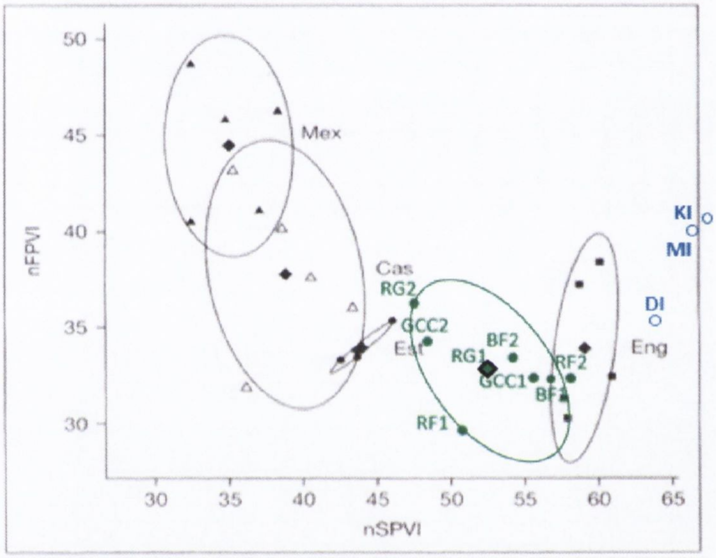


Figure 7.17: nSPVI (x-axis) and nFPVI metrics (y-axis) for the two speakers each across the four Donegal varieties (green dots), together with the results for English, Estonian, Mexican and Castillian Spanish by Nolan & Asu (2009, p.73) and the results for Donegal Irish (DI), Kerry Irish. (KI) and Connemara Irish (CI) from Dorn, O'Reilly & Ní Chasaide (2012) (blue dots).

As regards foot variability, the Irish data (from this study and the earlier pilot) pattern with English in having a rather regular foot. It is however striking that the four Donegal varieties are some distance from English in having a lower syllable variability index. In this measure they appear to occupy a location that is intermediate between English and Castillian Spanish – a clearly syllabic language. They are also even further from the KI and CI (and even the earlier Gaoth Dobhair DI) values on this measure: the differences are rather large, and do suggest that these varieties do indeed fall at a more intermediate point on the 'syllable-timed' 'stressed-timed' continuum than the southern Irish dialects. They are also clearly different from the British English values.

These results do offer support for the initial hypothesis that prompted this study. We would nonetheless point out that given the limited data for the southern Irish varieties, a definitive statement will require further work to be carried out.

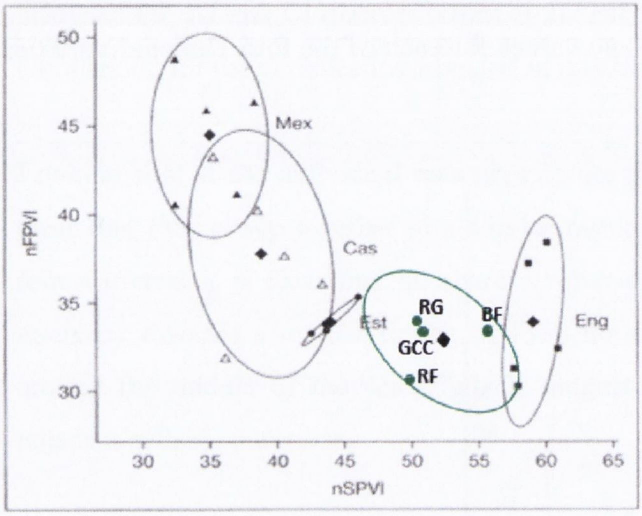


Figure 7.18: nSPVI (x-axis) and nFPVI metrics (y-axis) for the four Donegal varieties (green dots), together with the results for English, Estonian, Mexican and Castillian Spanish by Nolan & Asu (2009, p.73).

From Figure 7.19 we can see that there are also some differences among the four Donegal varieties. However we would be reluctant to come to any conclusion concerning the cross variety differences, given the considerable cross speaker differences that appear within a given language and even a given variety. Here again, further speakers would be needed to arrive at any conclusion.

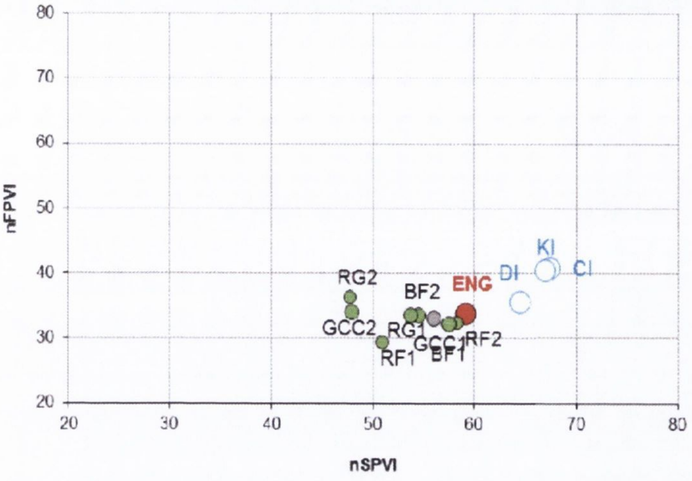


Figure 7.19: nSPVI (x-axis) and nFPVI metrics (y-axis) for the two speakers across the four varieties (green dots), together with the mean results for English by Nolan & Asu (2009, p.73) (in red) and the results for Donegal Irish (DI), Kerry Irish. (KI) and Connemara Irish (CI) from Dorn, O'Reilly & Ní Chasaide (2012) (blue dots).

7.7 Conclusion

This chapter discussed rhythmic features – the PVI metrics for the Donegal Irish varieties. First the normalised vocalic (nVPVI) and raw inter-vocalic (rCPVI) metrics were discussed for each variety, then the same was done for the normalised syllabic (nSPVI) and normalised foot (nFPVI) metrics. Summarising, the individual measures were pooled across the varieties for each group and presented in relation to a) the same measures for three Irish dialects from the pilot study, and b) the same metrics reported on for other languages in the literature.

Returning now to the specific questions addressed at the beginning of the chapter we can conclude as follows:

Q1: In terms of the PVI measure, do the Irish varieties group with languages traditionally described as

a) stress-timed or
b) syllable-timed?
c) intermediate?

The clearly intermediate value for nSVPI in the four Donegal varieties offer support for the initial hypothesis, that the Donegal Irish varieties, thought 'stress-timed' would occupy a somewhat more intermediate location on the 'stressed – syllable' timed continuum.

In most measures, the four varieties show clear 'stress-timing' characteristics: the high nVPVI and rCVPI place them with traditionally classified 'stress-timed' languages, such as English, German or Dutch. This is little surprising since in the literature, Irish has been described as a language with typically 'stress-timed' characteristics, i.e vowel reduction in unstressed syllables, distinction between long and short vowel and avoidance of stress-clash. The relatively high vocalic PVI (nVPVI) suggests variability in duration of adjacent vowel durations and this is indeed the case in Irish, where phonologically long, short and also reduced vowel occur, similar to English. In addition, vowel sequences of up to four vowels in succession occurred in the recorded materials (e.g.: Agus b'éigean don ghaoth adu***aidh é a*** ***a***dmháil [...]), which shows the possibility of vowel clusters across word boundaries.
However, the rather more intermediate values for nSVPI, showing a less variable syllable duration than say, English, does suggest that they veer some distance towards the 'syllable-timed' end of this continuum. The distance in nSPVI values between the four varieties of this study and the KI and CI dialects is even more striking. This measure may be picking up on the layperson's intuitions concerning the northern/southern dialects.

The fact that the nSVPI shows intermediate values, while nVPVI and rCVPI values are clearly in the 'stressed-timed' end of their continua, is in itself interesting. As pointed out in the introduction to this chapter (section 7.1), the latter measures are essentially highly linked to features of the segmental phonology, while the nSVPI is a more directly rhythm-oriented measure. The fact that they yield rather different results suggests that while rhythm is influenced by the segmental phonology, it is not wholly determined by it. So, in the case of the Donegal Irish varieties, while they are phonologically predisposed towards stress timing, there is a rhythmic undertow towards syllable timing, reflected in the nSVPI measure.

Although the results for the nSPVI do offer a measure of support for the initial hypothesis, we would be cautious in claiming this analysis to be a definitive statement. The limitations of the data have already been mentioned. The data from the pilot study for the southern Irish dialects was also very limited, and the clear evidence of considerable inter-speaker differences highlight the need for further analysis of these dialects.

The intention at the outset was to make an initial exploration of this issue. The present results suggest that this is an area that will be interesting to investigate further, and the analysis of considerably more data, particularly from southern Irish dialects is a priority for the future.

✘ Q2: Are there sub-dialect differences?

Although there were some differences between the averaged values for the four varieties, the considerable cross speaker differences observed makes any comment on cross variety differences premature. Large cross speaker differences are also indicated in the cross language data (English, Castillian Spanish, Mexican Spanish and Estonian) reported on in Nolan & Asu, (2009) as shown in Figure 7.17. Establishing whether there are cross variety rhythmic differences in these Donegal varieties would require a large-scale study.
In future work I would hope to extend this work by analysing more extensive samples of the southern dialects. It would also be of interest to compare Donegal English, not only to the present Donegal Irish data, but also to other varieties of Irish English, in the North and in the South.

In the following chapter, the main findings of this thesis are summarised. The main research questions addressed at the beginning of the thesis are reviewed and findings are discussed in relation to the literature. Finally, possible future directions are considered.

8 Summary & Conclusion

8.1 Introduction

This thesis discussed sub-dialect variation in the intonation of a northern (Donegal) variety of Irish Gaelic. The four varieties of Donegal Irish included *Rann na Feirste* (Rannafast), *Baile na Finne* (Fintown), *Gleann Cholm Cille* (Glencolmcille) and *Ros Goill* (Rosguill). The emphasis in this work was placed on the analysis of both coarse-grained prosodic characteristics as well as fine-detailed phonetic features providing shed light on possible regional variation in intonation. The investigation covered the prosodic analysis of tunes and specific phonetic features covering four different aspects: question/statement distinction (sentence mode, Chapter 4), alignment of tonal targets relative to the segmental string (alignment, Chapter 5), effects of focus on f_0 and duration (focus, Chapter 6) and the analysis of rhythmic features (the PVI measures, Chapter 7).

This chapter summarises the main findings in relation to the specific research questions addressed in this study, particularly those of the analytic chapters: Chapters 4 (sentence mode), 5 (alignment), 6 (focus) and 7 (rhythmic features (PVI)). We will subsequently return to the three main research questions posed at the beginning of the thesis and shed light on sub-dialect differences in Donegal Irish, as well as on similarities and differences to the southern Irish varieties. The later sections in this chapter also address the limitations of this study. Finally, we will conclude with implications of this thesis for theories concerning the origin of nuclear rises in UNB (Urban Northern British) varieties of English and point to future work as regards dialect variation in intonational analysis in general and studies on varieties with rising nuclear tonal patterns in particular.

8.2 Summary of main findings

The following sections summarise the main findings for each data chapter presented in the thesis. Results show that sub-dialect differences between the four Donegal Irish varieties exist, both in terms of the default preferred tunes, and in how the tunes are aligned to the segmental/syllable tier.

Overall, despite these salient differences between RG and the other varieties, it is clear, that the four share common features that mark them out as Ulster Irish varieties, quite different as a group from the southern varieties. They have in common, a preponderance of rising tunes, both in nuclear and in pre-nuclear accents. There is a striking sparsity of final falling accents, which is characteristic of the southern dialects for which descriptions are available (Dalton, 2008; Dalton & Ní Chasaide, 2003, 2005a, 2005b, 2007a, 2007b).

8.2.1 Sentence Mode

Chapter 4 looked at the tonal patterns of the four Donegal Irish varieties for different sentence modes (ST vs WHQ, YNQ), looking at whether they have similar inventories of tunes, and addressing whether and how sentence mode may be marked prosodically.

As concerns the tonal patterns of the different varieties, RG stands out from the other varieties by showing an overall preference for nuclear rises with a falling trajectory towards the phrase boundary (L*+H L%) – and this tune preference showed up in the different corpora analysed in this study. This contrasted with the more expected rise plateau L*+H % which was the most common in the other three varieties, and which had been described by Dalton (2008) for the Gaoth Dobhair variety. In this respect, RG can be regarded as being quite a distinct sub-dialect of Donegal Irish, as it differs from the other three varieties in terms of the overall preferred nuclear tune. Note that the more "classic" Donegal rise (L*+H %), however, is also always a second tune choice. In terms of pre-nuclear tunes, there was more variation of accent type, with a dominance of either rising L*+H or high H*. The relative frequency of either pre-nuclear tune varied somewhat with the variety and with the sentence mode.

Results for the three varieties RF, BF and GCC show them to be rather like the previously described variety of Gaoth Dobhair (Dalton, 2008). The main difference was in the relative frequency of H* pre-nuclear accents, particularly in statements. In Gaoth Dobhair the L*+H accent was dominant throughout, and the H* accent was frequent only in WHQ (ca.40%), and very infrequent in statements or YNQ. In the RF, BF and GCC varieties analysed in this study, the H* was much more in evidence, particularly in ST and WHQ.

It was noted in Chapter 2.3 that in Irish questions are syntactically marked, and it was of interest to see whether additional prosodic marking is used, in terms of either tunes or other prosodic marker - pitch slope (f_0 slope), pitch span, nuclear (N) rise excursion and pre-nuclear/nuclear (PN/N) peak height differences (H slope). Results from this study showed that, while the same tunes can be used to express different sentence modes, the relative frequency of particular pre-nuclear accents did vary with sentence mode. The trends were not uniform across dialects. For example, the pre-nuclear H* was much more frequent in WHQ than in ST in RF, but the reverse of this was found in BF. Given the variability in pre-nuclear accents in any case, and the fact that the same tune can be used across sentence modes, it does not seem to be obligatory in signalling sentence mode.

However, the major prosodic markers of interrogativity appear to be in adjustments to the relative pitch (regardless of tune) in the initial or final accent of the utterance. For WHQ there was a boosting of the pre-nuclear accent (e.g., raising of the L and H tones of L*+H accents, or of the H* in the speaker's register), relative to ST or YNQ. For YNQ the principal correlate involves the boosting of the nucleus (i.e. raising of the L*+H accent in the speaker's register) compared to ST. In addition, both WHQ and YNQ have a significantly wider nuclear (N) rise excursion than ST. WHQ is further characterised by the widest pitch span among the three modes. And as regards pitch slope, YNQ is overall characterised by a tendency towards upsweep (= rising f_0 slope) compared to ST. WHQ more typically shows a falling f_0 slope (downdrift).

The marking of sentence mode was remarkably uniform across the varieties, regardless of differences the choice of tunes. Similar phonetic markers of sentence mode have been reported for other languages (see discussion in Chapter 2.7.2) and it is clear that raising of the $f0$ level at either the beginning of the phrase (as in Finnish, Iivonen, 1998) or the end of the phrase - e.g., by extending the range of the nuclear peak, as in Dutch (Haan, 2002); Belfast and Glasgow English (Sullivan, 2011), Drogheda English (Kalaldeh, 2011) – or by suspending/reducing declination, as in Danish (Gronnum and Tondering, 2007) are widespread mechanisms for signalling questions, in languages with rather different intonation systems.

8.2.2 Tonal alignment

Chapter 5 covered the analysis of tonal alignment as a function of tail length (N) and anacrusis size (PN). The alignment of the low elbow L and the end of the raise, the trailing peak H of the bi-tonal accent L*+H were calculated in absolute terms from the onset of the accented syllable and as a percentage of the duration of the accented syllable. Sub-dialect differences emerged in this analysis, affecting RG and probably related to the tune difference that characterises that dialect (see below). For the three other dialects results were very similar. Results show that the L elbow is at a rather constant average delay distance from the onset of the accented syllable, being slightly earlier in pre-nuclear than nuclear accents. Note that as the duration of the nuclear accented syllable varies with tail duration across the three conditions (N0>N1>N2), the L elbow therefore occurs at an increasingly later point in the syllable, going from N0 to N1 to N2. Unlike L*, the trailing tone H increasingly drifts rightwards with the increase in following post-nuclear material. It seems that the length of the tail does not affect the absolute timing of the rise onset, but does affect the duration of the rise, so that it is longer, the longer the tail. Effectively this means that the LH interval is quite variable, and this differs from the general observation (mentioned in Grice, 1995) that the interval between the starred and the trailing tones in bi-tonal accents is relatively constant. In the pre-nuclear conditions, results suggest that neither the L elbow nor the H alignment is affected by anacrusis size, and that the LH interval is considerably less variable. However, there were some indications in the data that the right context may exert an influence on the timing of both the L elbow and the H peak.

RG stood out from the other dialects, not only in having predominantly rise-fall accents in both nuclear and pre-nuclear accents in this corpus, but also in terms of timing and alignment of the tonal targets. To complicate matters further, the analysis revealed two distinct alignment patterns, which appeared to reflect the fact that there were two older and two younger informants. (This was a problem with our data, in that for this dialect we had recorded informants of rather different age groups).

In the older group the timing of the L elbow and the H was very early (compared to the three dialects, RF, BF and GCC described above) and the rise occurred within the accented syllable. Furthermore, the LH interval was relatively constant even in the nuclear case, unlike the very variable durations observed in RF, BF and GCC. In the younger group, the timing of the rise onset (L elbow) was later, rather more similar to the other three dialects, but the LH interval was rather constant (the H was not delayed with increasing tail length). For both groups, it is the duration of the fall to the low boundary tone L% that varies with the duration of the tail. Figure 8.1 illustrates an utterance from both groups.

In PN conditions in the RG variety, results suggest a stable alignment in absolute time for both L* and H, but with both elements occurring earlier than in the other dialects. This dialect would deserve further analysis due to the relatively high variability among the speakers.

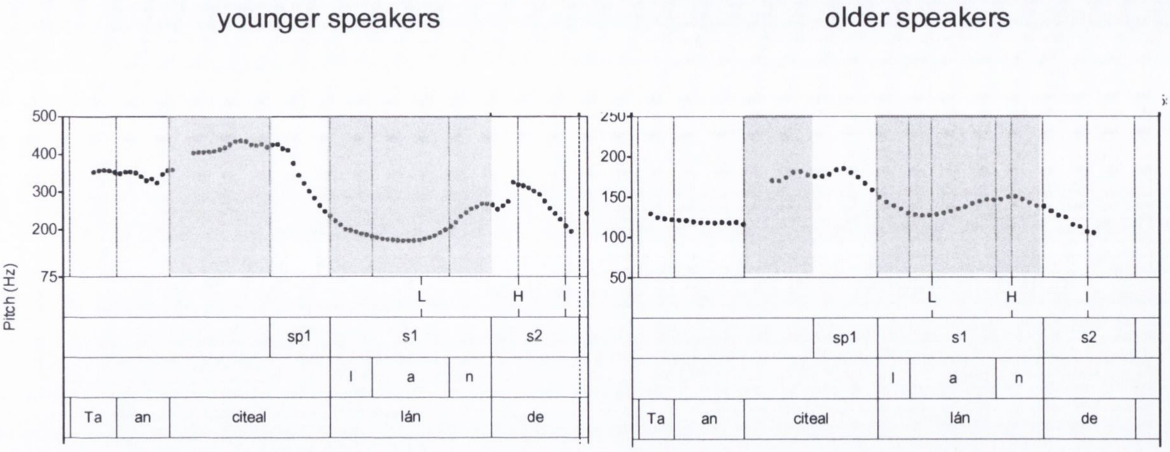


Figure 8.1: Illustration of speaker specific alignment differences of L and H in the N1 condition (*Tá an citeal lán de*) shown by pitch tracks. Younger speaker FP left panel: senior speaker AML right panel. Soundfiles: DI-PN-FP-N1-1 (left panel), DI-AML-N1-2 (right panel).

The fact that informants were poorly matched in age yielded unexpected insights into what appears to be a generational change in prosody. The fact that the alignment of L* is closer to the other varieties could indicate an influence of the other varieties on RG. Note, however, that the younger group nevertheless retain the nuclear (and pre-nuclear) rise-fall which may militate against such an explanation. The relationship of RG to the other three varieties is also intriguing and begs the question as to whether this tune may once have been more widespread. Clearly, the RG sub-dialect and the possible cross-generational differences in this variety are something that would merit further study.

In a past study of alignment in similar pre-nuclear and nuclear conditions, reported by Ní Chasaide and Dalton (2006) for two closely related varieties of Connemara Irish (Cois Fharraige and Inis Oírr) striking differences in alignment were found. The present study suggests that not only may alignment differences such as these differentiate between otherwise similar varieties, but also between age (or other) groupings within a single local variety.

8.2.3 Focus

The effects of focus on f_0 and duration were analysed in Chapter 6 in this thesis. The findings show that, overall, focus is realised in the same way across the varieties. In terms of the pitch contour, it involves a raising of the f_0 peak (in most varieties this is the trailing H of the L*+H accent, see below) of the focal accent, along with de-accentuation of post-focal material. De-accentuation was most commonly manifest with a sharp drop in f_0 from the (typically) preceding trailing H of the focal L*+H accent. There were however quite a few instances where the pitch remained high, in the de-accentuated post-focal portion of the utterance. There were also rather frequent cases where the final syllable of the IP was devoiced as a result of de-accentuation, and this is taken likely evidence of shift in phonation mode (increasingly breathy/whispery phonation) in the de-accentuated portion of the utterance.

Narrow and contrastive focus are realised by the same means: there are no significant differences in tonal patterns between these different focus types and they also show similar trends in terms of accent scaling. The scaling of focal accents, confirmed that focal accents have wider excursion than in the unmarked rendering of the phrase.

As regards the duration effects of focus the results from this study show that both narrow and contrastive focus have similar effects and induce lengthening of focally syllables and the rhythmic foot in which they occur (relative to broad focus). Lengthening effects, however, depend on the position of the focal constituent in the phrase: in phrase-final position both focal syllables and focal feet were on average only marginally longer than in broad focus and this is the case in all varieties. As has been observed in the literature, the reduced effect of focus on the duration in of phrase-final items may be attributed to the already given lengthening of pre-boundary constituents in the utterance final position (P. J. Price et al., 1991; Wightman et al., 1992).

Sub-dialect differences emerged in tonal patterns, in that RG again differed from the other three in terms of its preferred pre-nuclear nuclear tune, H*+L, whereas the rise L*+H is also the default tonal pattern in broad, narrow and contrastive focal accents in the RF, BF and GCC varieties.

The findings for the Irish varieties reflect the kind of pitch and durational modifications that have been observed for focal accentuation in many languages (discussed in Chapter 2.9). The pitch adjustments observed conform broadly to the proposed universal 'tri-zone pitch adjustment' described by Xu and Xu (2005), whereby the pitch accent excursion is substantially increased on the focal element, and the pitch range in the post-focal material is supressed. One difference concerns the pre-focal material. Whereas Xu and Xu (2005) suggest that the pre-focal material remains unaltered (from a broad focus rendering), in these varieties there was some tendency for a reduction in the pitch range of a pre-focal accent.

8.2.4 Rhythmic features – the PVI

The last analytic chapter, Chapter 7, examined the PVI (Pairwise Variability Index) of vocalic and inter-vocalic intervals (nVPVI, rCPVI), and also of syllables and rhythmic feet (nSPVI, nFPVI). These measures target both the segmental phonology features (e.g., vowel quantity contrasts, vowel reduction, complex consonant clusters) that are thought to influence a language's rhythm (nVPVI, rCPVI) and features that are more directly measures of rhythm (syllable and foot variability). To test a hypothesis that these northern Irish varieties would lie at an intermediate point on the 'stress-timed' to 'syllable-timed' continuum, relative to the southern varieties of Irish, results were compared to similar measures (though based on limited data) obtained for southern dialects in an earlier pilot study. Results were also compared to available measures for other languages. It should be noted that Irish has all the phonological attributes that would be expected for a 'stressed timed' language.

Results show that the nVPVI, rCPVI, and nFPVI point to these varieties being essentially 'stressed-timed' grouping with traditionally classified stress-timed languages, such as English, German or Dutch. However, support for the hypothesis emerged in the syllable variability measure (nSPVI), where values for the four Donegal varieties did fall more at a more intermediate place in the continuum, showing less variability in syllable duration relative to the southern dialects (and to English).

The findings are suggestive but results are presented as being tentative, particularly as the comparative data for the southern dialects was very limited. These data are nonetheless interesting in that appear to indicate that even if the language phonology would predispose to a particular rhythm, it does not fully predict it.

8.3 Main research questions revisited

This section returns now to the main research questions addressed at the beginning of this thesis (Chapter 1, section 1.1.1). Having reviewed the main findings from the analytical chapters, it becomes clear that the initially posed questions are best tackled in reverse order, addressing first the issue of sub-dialect differences (Q2) to provide answers about the homogeneity of the Donegal Irish varieties (Q1). Finally, the similarities and differences between the DI varieties and UNB rises (Q3) are discussed.

Q2: Are there sub-dialect differences?

Findings showed that sub-dialect differences between the four varieties exist, with RG standing out as rather different from the other three, RF, BF and GCC. The main difference concern tune variation. Differences in nuclear tunes emerged first in the sentence mode data where RG showed an overall preference for rising nuclear tunes ending in a low boundary tone L*+H L%, but RF, GCC and BF preferred the more 'classic' Donegal rise L*+H %. Differences also emerged in the tunes associated with focal accentuation. RG informants most commonly produced falls H*+L in phrase-initial focal accents, as opposed to the typical rise L*+H, which was the preferred focal accent throughout for RF, BF and GCC.

Differences in the alignment of L and H targets of rises also emerged between RG and the other varieties. Furthermore within RG, there were differences between the younger and older speakers. The two senior informants showed considerably earlier alignment of both the L and H targets (than in the other varieties), and did not exhibit the rightward drift of the trailing H peak with increasing tail length. The two younger speakers showed tendencies to align the L-elbow relatively late, similar to the other three varieties, but did not either exhibit the rightward drift of H with increasing tail length.

Some differences emerged also between the other three varieties, but these were relatively minor. They had a common tune inventory and had very similar preferences for nuclear L*+H 0% tunes. They also have a more varied inventory of pre-nuclear tunes, and there were some differences among them in the relative frequencies with which particular pre-nuclear accents occurred in particular sentence modes. Despite these differences, one is struck by how similar they are. As a group, they closely resemble the Gaoth Dobhair variety described in earlier studies Dalton (2008), Dalton & Ní Chasaide (2003, 2005b, 2007b), Ní Chasaide & Dalton (2006).

Q1: Is Donegal Irish homogenous in terms of intonation (tunes)?

The findings from three of the four aspects of analysis (sentence mode, alignment and focus), showed that although RG differs from the other three Donegal Irish varieties RF, BF and GCC, they nonetheless have a great deal in common. The tendency to have rising nuclear accents is common to all varieties, even if the final L% boundary singles out the RG variety. In terms of alignment of rising accents, although RG differs from the other varieties, they all have in common that they tend to initiate the rise relatively far into the accented syllable, unlike rises described in languages like German, Dutch or Greek.
They also behave similarly in terms of the pitch adjustments they exploit to express sentence mode (YNQ, WHQ as compared to ST). Similarly the strategies used to express prosodic focus are the same in all varieties, despite preferences for different tunes. Finally, they display similar rhythmic characteristics in terms of the variability of syllable duration.

Similarities and differences to southern Irish dialects?

The relative homogeneity of the four varieties becomes apparent when we compare them to the southern dialects. Comparable descriptions are available for Connaught, Mayo and Kerry Irish (Dalton, 2008). Over all the corpora analysed for the different studies of this thesis it is clear that the rising accent tune is the overall default pattern, particularly in nuclear position in Donegal Irish. In the Connaught, Mayo and Kerry dialects of Irish there is an overall preference for falling nuclear patterns and this includes statements as well as wh-questions and yes-no questions.
As regards tonal alignment, peak timing in two falling (H*+L) Connemara varieties (Cois Fharraige and Inis Oírr) was investigated by Dalton & Ní Chasaide (2007a), where Inis Oírr showed peak drift as a function of tail length, but the H* peak in the Cois Fharraige variety remained relatively stable under the same conditions. Although it is the low elbow L* in the Donegal Irish varieties that is associated with the accented syllable and not the H peak, findings from the data analysed here, suggest that the Donegal Irish varieties behave in a way that is similar to the Cois Fharraige variety where the tonal target on the accented syllable remains strikingly stable in absolute terms, and seems to fall at a fairly constant distance from the syllable onset, in a way that is unaffected by the regardless anacrusis size or tail length.

The small study of rhythmic characteristics suggests that there are rhythmic differences also between these northern varieties and the southern dialects, with the Donegal varieties displaying less syllable duration variability.

Q3: Are DI tunes like UNB English tunes? Implications for English varieties

Since it has been hypothesised by British intonation specialists (Cruttenden, 1986; Knowles, 1984) that the UNB rises might be of Irish origin, the question arises if the Donegal Irish varieties are similar, and more particularly, in what way, to UNB English varieties, such as Belfast or Glasgow, which have also been the topic of intonation studies.

In terms of declarative nuclear patterns, Belfast English (BelE) tunes have been described as rises (Grabe, 2004; Grabe & Post, 2002a) or rise-plateau-slumps (Cruttenden, 1997). Glasgow English (GlaE) nuclear tunes are described as rises (Cruttenden, 1997), rise-plateau-slumps (Ladd, 2008) and even rise-falls (Sullivan, 2011). It is clear then, that in the literature there is considerable variation as to the concrete description of Belfast and Glasgow rises. Ladd (2008) and Mayo et al. (1997), however, comment on GlaE nuclear rises beginning earlier than BelE ones, with the low of the rise occurring even before the accented syllable itself. Mayo et al (1997) label these instances as L*H, rather than the more "classic" L*+H, to indicate that neither target is aligned within the accented syllable. This is not the case in DI nuclear tunes and in this respect the Irish varieties are more like BelE than GlaE. The only instances were a similar pattern described for GlaE occurred in the DI varieties, was in the IP-initial pre-nuclear accents in YNQ in the RF variety and in IP-initial pre-nuclear accents in the broad focus data for the RG variety, where neither the low nor the high targets occurred on the accented syllable, but in the vicinity of it. That's why the L*H label was adopted for marking these instances. We believe that we are dealing with differences in timing rather than categorical differences in these instances, which may warrant further analysis at a later stage.

Further similarities and differences between the UNB and the DI varieties then become only clearer looking at the more fine-grained parameters, such as peak-scaling or nuclear rise excursion. Sullivan (2011, p.138) showed that BelE and GlaE had consistently higher nuclear peak scaling in questions (WHQ and YNQ) than in the corresponding statements. This has also been shown to be the case in the Donegal Irish varieties (see Chapter 4). According to

Sullivan's (2011) analysis, BelE showed wider nuclear accent scaling in YNQ than WHQ, but this difference did not emerge for GlaE. Results from the DI varieties showed that the RF and GCC varieties were in these terms more similar to BelE, but the RF and RG varieties closer to GlaE. Given the rather small number of speakers analysed in both studies, this would warrant a separate investigation with a bigger number of informants to determine a more precise extent of similarity.

All in all, however, it seems that the DI varieties are more similar to BelE rather than GlaE as also suggested by Sullivan (2011).

8.4 Contributions of this study

This study is principally a descriptive analysis of the intonation of four varieties of Donegal Irish. It contributes first and foremost by deepening our knowledge of the prosody of Donegal Irish, presenting on the one hand a broad, wide ranging overview of this northern, Ulster, dialect of Irish, while at the same time presenting fine-grained detail on some of the finer difference among local varieties. It set out to complement the work previously carried out on Gath Dobhair Irish by Dalton (2008) and Dalton & Ní Chasaide (2003, 2005). The picture that emerges is of a single major dialect characterised by rising accents in nuclear position. While most varieties appear very similar, the RG variety stands out as a distinct sub-dialect, marked by the preference for L% boundary tones (where the other accents have 0%), in terms of the timing of the tonal elements relative to the accented syllables, and in terms of preferred pre-nuclear focal accent tune.

The importance of this work must be appreciated in the context of the endangered status of Irish. Although there may be growing numbers learning Irish outside the Gaeltacht, the numbers of native speakers in the Gaeltacht, who use the language as their daily, dominant language, is diminishing. It is one aim of this work to document these varieties of a language which is under considerable threat.

In the broader context of the linguistics of Irish, the present study provides many points of comparison with the southern varieties. As summarised in the earlier sections, on virtually all dimensions analysed, the northern Donegal prosodic structure is radically different from the southern varieties.

In terms of language typology, the varieties of Irish studied here are interesting in having a relatively unusual prosodic structure, characterised particularly by a predominance of rising tunes in nuclear and often in pre-nuclear accents. The different analytic sections contribute a number of insights that are interesting from a typological perspective.

Tunes can be a part of sentence mode signalling, where raising of the f_0 at the beginning (WHQ) or end of the phrase (especially for YNQ but to a lesser extent for WHQ) is the common strategy.

The rise onset in the L*+H accent is considerably later than in other languages (Dutch, German Greek) for which this accent is reported. Essentially the accented syllable is heard mostly as a low tone, and the rise happens in the following unstressed syllable(s), if they are available. The alignment characteristics are relatively unusual, in that the L* tone is relatively constantly timed, but the trailing H peak (at least in nuclear position) drifts as a function of the length of the following unstressed material in the foot. Consequently, the LH interval is not constant, as has been found in other studies. Alignment differences were found to characterise not only different varieties (RG as opposed to the other three varieties), but also different age groups (older and younger informants in the RG sub-dialect).

Despite having rather different tunes, the present study shows that the prosodic signalling of focus is rather similar to what has been described for languages such as English (e.g., Xu & Xu, 2005), broadly supporting the contention that languages with different types of prosodic structures would exploit similar means of expressing prosodic focus. It differed, however, that pre-focal material showed some tendency to reduction in the peak of the pre-focal accent.

The rhythmic study suggests rather interesting differences between varieties that would be regarded as 'stress-timed' i.e., between the northern varieties looked at here, and southern Irish dialects. The rhythmic study further raises questions concerning the linkage between segmental phonology and rhythmic patterning of the language. While segmental phonology has a major influence on whether a language will be heard a 'stress-timed' or 'syllable-timed', the present data strongly suggest that there are rhythmic regularities beyond the segmental phonology.

8.5 Limitations of this work

There are certain limitations to this study which should also be given room for discussion here. First of all, we are dealing with the analysis of a limited set of predefined materials for read speech as opposed to free, unscripted speech. To-date there is a growing trend towards carrying out analyses on large multi-modal corpora including unscripted speech. Although it can be argued that this method provides more natural data and as a consequence a better understanding of prosody, it is certainly also hugely susceptible to variation caused by many, many factors. Given that a main objective was a cross-variety comparison, it is necessary to control for unpredictable variables that would render comparison difficult. Furthermore, the analysis in this thesis did not only provide coarse-grained prosodic characteristics, but also fine-grained phonetic features such as alignment, and we concur with Xu (2010) that scripted speech is essential for this very detailed experimental analysis. To mitigate the effects of read speech, target phrases in the recorded corpus were given a context in the form of mini-dialogues: it was hoped this would yield more natural elicitations, prevent a list reading effect and the placement of narrow focus on random items. Moreover, small samples of free-speech at the beginning and during the recordings were collected as a potential check on how representative participants were of their locality and as a potential check that the patterns found in the read corpora are also typical of the spontaneous speech.

A further limitation, (partly linked to the difficulty of finding native speakers to record, who use Irish in everyday communication and who are deemed representative of their dialect) concerns the composition of the speaker group for each variety, as they were not always optimally matched in terms of gender mix, age etc. Studies have shown that social background, gender as well as age differences can all be factors influencing the prosodic characteristics of speakers (e.g., Lowry, 2002; Sullivan, 2007a,b). The mixed composition showed up clearly in the analysis: the RG group spanned 2 different age groups and their productions were different in terms of alignment characteristics. As it happens, this 'design flaw' bore rich dividends, bringing insights that might have been missed in a homogenous group.

A further limitation concerns the design of the alignment corpus where initial assumptions about syllabification were not necessarily correct and the possibility of re-syllabification could skew results (the 2PN and N2 conditions). Compounding this difficulty was the (unforeseen) additional accent that some speakers placed on (normally unstressed) function words in the 0PN condition. Interestingly, the latter 'flaw' nonetheless drew attention to a likely strong influence of the right context on pre-nuclear accent timing, something that was not directly looked at in the study.

In the rhythmic study, a reduced number of speakers were analysed (2 per variety). The most interesting question concerns how Donegal Irish might differ from southern varieties: as the latter were not analysed in this study, comparative data from a limited data set in a pilot study was used. Interesting differences did emerge, but the conclusions drawn must remain very tentative.

Finally, there are omissions in terms of Donegal Gaeltacht areas covered in this study. A case in point is Tory Island, a strong Gaeltacht area. As explained in Chapter 3, attempts to include it were unsuccessful, but the analysis of this variety remains a priority for future work.

8.6 Future perspectives

This study contributes to the growing body of intonational studies on dialect variation and in particular sub-dialect variation. Findings have shown that despite there being a distinct sub-dialect difference between RG and the other varieties, the four Donegal Irish varieties share common features that identify them as Donegal varieties, and separate them from the southern dialects of Connacht and Munster. The data analysed here, however, also give rise to some questions that would be interesting to investigate in future studies.

Firstly, it would be of interest to extend the analysis of the RG variety, with a larger number of subjects of differing age groups. In addition to further production based analyses, it would be also interesting to explore how some of the differences noted are perceived. How perceptible is the timing difference in the younger and older RG groups? Do non RG speakers identify this feature as a specific RG marker?

The differences noted here between the tunes of RG and the other Donegal varieties, as well as the major differences between all Donegal varieties and the southern dialects raise interesting questions as to why and when these differences came about (assuming they were ever the same). Related to this are questions about the kinds of influences that may have been involved. There may not be a way to answer those questions, but one fruitful way to gain insight would be to analyse samples from old recordings from these and other localities.

The rhythmic properties of Donegal Irish, and the possible differences with southern varieties is an area that I would hope to work on in the near future. A priority here would be the analysis of southern dialects, and the extension of the corpora to include spontaneous speech. In terms of rhythmic features, it would also be of interest to compare Irish patterns with those of Donegal English and other northern varieties of Irish English.

Returning to the question of similarity and/or differences between Donegal Irish and the UNB English varieties, it would be particularly interesting to realise a larger project on the intonation of typically rising varieties including Irish, Donegal and other northern varieties of English, UNB English varieties in England and also the HRT varieties in Australian and New Zealand English. If based on comparable material across these varieties, similar to the IViE project (Grabe et al, 2001), an investigation of both coarse-grained and fine-detailed features could provide even more detailed insights into the differences and similarities between these varieties. In a similar way, a comparative study could also include varieties of Danish or Norwegian where rising tunes have been noted, too.

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Appendix 1: Section A – Sentence Mode

Target sentences

Phrases with 3 potentially accented syllables (underlined):

ST	Bhuail	mé	le	Gráinne	sa	bhialann.
	met	*I*	*with*	*Gráinne*	*in*	*restaurant*
	/ ˈwialʲ	mʲe	lʲə	ˈgɾˠænʲ ə	sˠə	ˈvʲiəlˠənˠ/

'I met Gráinne in the restaurant.'

YNQ	Ar	bhuail	tú	le	Gráinne	sa	bhialann?
	did	*meet*	*you*	*with*	*Gráinne*	*in*	*restaurant*
	/ əɾʲ	ˈwialʲ	tˠu	lʲə	ˈgɾˠænʲə	sˠə	ˈvʲiəlˠənˠ /

'Did you meet Gráinne in the restaurant?'

ST	Thaitin	an	damhsa	le	Nuala.
	Enjoyed-I	*the*	*dance*	*with*	*Nuala*
	/ ˈhatʲənʲ	ənˠ	ˈdˠausˠə	lʲə	ˈnˠualˠə /

'I enjoyed the dance with Nuala.'

WHQ	Cé	bhí	ag	damhsa	le	Nuala?
	who	*was*	*dancing*		*with*	*Nuala*
	/ ˈce	vʲi	ə	ˈdˠausˠə	lʲə	ˈnˠualˠ ə /

'Who was dancing with Nuala?'

Phrases with 2 potentially accented syllables (underlined):

ST	Bhuail	mé	le	Dónall.
	met	*I*	*with*	*Dónall*
	/ ˈwialʲ	mʲe	lʲə	ˈdˠonˠəlˠ /

'I met Dónall.'

WHQ	Cár	bhuail	tú	le	Dónall?
	where	*met*	*you*	*with*	*Dónall*
	/ kaɾˠ	ˈwialʲ	tˠu	lʲə	ˈdˠonˠəlˠ /

'Where did you meet Dónall?'

YNQ	Ar	bhuail	tú	le	Dónall?
	did	*meet*	*you*	*with*	*Dónall*
	/ əɾʲ	ˈwialʲ	tˠu	lʲə	ˈdˠonˠəlˠ /

'Did you meet Dónall?'

Target sentences in context

Set 1a) (3ACC):

ST A:

Caidé	a	rinne	tú	i	ndiaidh	an	Aifrinn?
what		*did*	*you*		*after*	*the*	*mass*
/kə'dʲe	(ə)	'ɾˠinʲ	tˠu	ɪ	'nʲej	ənˠ	'afʲɾʲɪnʲ/

What did you do after the mass?

B:

Bhuail	mé	le	Gráinne	sa	bhialann.
met	*I*	*with*	*Gráinne*	*in the*	*restaurant*
/'wialʲ	mʲe	lʲə	'gɾˠænʲə	sˠə	'vʲiəlˠənˠ/

'I met Gráinne in the restaurant.'

YNQ A:

Bhí	mé	i	nDún	Droma	ar	maidin.
was	*I*	*in*	*Dundrum*		*in the*	*morning*
/'vʲi	mʲe	ɪ	nˠunˠ	'dˠɾˠomˠə	əɾʲ	'mˠadʲinʲ/

'I was in Dundrum in the morning.'

B:

Ar	bhuail	tú	le	Gráinne	sa	bhialann?
Q-part	*met*	*you*	*with*	*Gráinne*	*in the*	*restaurant*
/əɾʲ	wialʲ	tˠu	lʲə	'gɾˠænʲə	sˠə	'vʲiəlˠənˠ/

'Did you meet Gráinne in the restaurant?'

Set 1b) (3ACC):

ST A:

Caidé	mar	bhí	an	bhainis?	Chuala	mé	go raibh		an	ceol	thar cinn.
how		*was*	*the*	*wedding*	*heard*	*me*	*it was*		*the*	*music*	*excellent*
/kədʲe	mˠaɾˠ	vʲi	ənˠ	wanʲɪʃ/	/xualˠə	mʲe	gə	ɾˠo	ənˠ	colˠ	haɾˠ cinʲ/

How was the wedding? I heard the music was excellent.

B:

Thaitin	an	damhsa	le	Nuala.
Enjoyed-I	*the*	*dance*	*with*	*Nuala*
/ 'hatʲənʲ	ənˠ	'dˠausˠə	lʲə	'nˠualˠə /

'I enjoyed the dance with Nuala.'

WHQ A:

Bhí	mé	ag	an	diosco	aréir.	Bhí	a	léir	daoine	ann.
was	*I*	*in*	*the*	*Disco*	*yesterday*	*was*	*a*	*lot*	*people*	*there*
/vʲi	mʲe	eɟ	ənˠ	'dʲiʃco	əɾˠeɾʲ/	/vʲi	ə	'lʲeɾʲ	'dˠinʲi	ənˠ/

'I was in the disco yesterday.' There were a lot of people there

B:	Cé	bhí	ag	damhsa	le	Nuala?
	who	*was*		*dancing*	*with*	*Nuala*
	/ 'ce	vʲi	eɟ	'dˠausˠə	lʲe	'nˠualˠə /

‘Who was dancing with Nuala?’

Set (2ACC):

ST	A:	Caidé	a	rinne	tú	aréir?
		what	*did*		*you*	*last night*
		/kə'dʲe	ə	'ɾˠinʲə	tˠu	ə'ɾˠeɾʲ/

What did you do last night?

B:	Bhuail	mé	le	Dónall.
	met	*I*	*with*	*Dónall*
	/ 'wialʲ	mʲe	lʲə	'dˠonˠəlˠ /

‘I met Dónall.’

YNQ	A:	Cá	raibh	tú	aréir?
		where	*were*	*you*	*last night*
		/ka	'ɾˠo	tˠu	ə'ɾˠeɾʲ/

‘Where were you last night?‘

B:	Thíos	i	dtigh	Mháirtín.
	down	*in*	*house*	*Martin*
	/'hʲisˠ	i	dʲi	'vˠaɾʲtʲinʲ/

Down in Martin’s house.

A:	Ar	bhuail	tú	le	Dónall?
	did	*meet*	*you*	*with*	*Dónall*
	/ əɾʲ	'wialʲ	tˠu	lʲe	'dˠonˠəlˠ /

‘Did you meet Dónall?’

WHQ	A:	Cár	bhuail	tú	le	Dónall?
		where	*met*	*you*	*with*	*Dónall*
		/ kaɾˠ	'wialʲ	tˠu	lʲe	'dˠonˠəlˠ /

‘Where did you meet Dónall?’

B:	Bhuail	mé	le	Dónall	sa	bhialann.
	met	*I*	*with*	*Dónall*	*in the*	*restaurant*
	/'wialʲ	mʲe	lʲə	'dˠonˠəlˠ	sˠə	'vʲiəlˠənˠ/

‘I met Dónall in the restaurant.’

Table A1.1: Summary of statistical test results using a series of mixed models.

Nulcear (N) excursion			
	mean	**t**	**pMCMC**
ST	4.5		
YNQ	6.2	t=0	pMCMC=0.0001
ST	4.5		
WHQ	5.7	t=0	pMCMC=0.0001
WHQ	5.7		
YNQ	6.2	t=0.0452	pMCMC=0.0445
***f_0* slope**			
	mean	**t**	**pMCMC**
ST	-2.1		
YNQ	1.1	t=0	pMCMC=0.0001
ST	-2.1		
WHQ	-3.7	t=0	pMCMC=0.0001
WHQ	-3.7		
YNQ	1.1	t=0	pMCMC=0.0001
H slope			
	mean	**t**	**pMCMC**
ST	-2.9		
YNQ	-0.2	t=0	pMCMC=0.0001
ST	-2.9		
WHQ	-3.9	t=0.0136	pMCMC=0.0117
WHQ	-3.9		
YNQ	-0.1	t=0	pMCMC=0.0001
register span			
	mean	**t**	**pMCMC**
ST	7.9		
YNQ	7.7	t=0.3736	pMCMC=0.3891
ST	7.9		
WHQ	10.2	t=0	pMCMC=0.0001
WHQ	10.2		
YNQ	7.7	t=0	pMCMC=0.0001

Table A1.2: R codes of the statistical tests using a series of linear mixed models.

Nulcear (N) excursion

```
lmer<-lmer(N_ex~mode+(1|speaker)+(1|repetition)+(1|dialect),d)
> pvals.fnc(lmer)$fixed
         Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)  5.7128   5.7011     4.9178     6.5138 0.0001   0.0000
modeST      -1.1863  -1.2016    -1.6968    -0.7138 0.0001   0.0000
modeYNQ      0.5173   0.5141     0.0065     1.0118 0.0452   0.0445

pvals.fnc(lmer)$fixed
         Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)  4.527    4.498     3.7443      5.280 0.0002        0
modeWHQ      1.186    1.199     0.7157      1.694 0.0001        0
modeYNQ      1.704    1.712     1.2339      2.164 0.0001        0
```

f_0 slope

```
lmer<-lmer(f0_slope~mode+(1|speaker)+(1|repetition)+(1|dialect),d)
> pvals.fnc(lmer)$fixed
         Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)  -3.682   -3.665    -6.0248     -1.328 0.0070   0.0077
modeST        1.553    1.540     0.8045      2.333 0.0001   0.0001
modeYNQ       4.826    4.849     4.0825      5.681 0.0001   0.0000

pvals.fnc(lmer)$fixed
         Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)  -2.128   -2.159     -4.466     0.1589 0.0652   0.1195
modeWHQ      -1.553   -1.548     -2.276    -0.7718 0.0001   0.0001
modeYNQ       3.272    3.308      2.567     4.0191 0.0001   0.0000
```

H slope

```
lmer<-lmer(H_slope~mode+(1|speaker)+(1|repetition)+(1|dialect),d)
> pvals.fnc(lmer)$fixed
         Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)  -3.995   -3.978    -5.6470     -2.083 0.0042   0.0000
modeST        1.031    1.022     0.2365      1.833 0.0102   0.0117
modeYNQ       3.896    3.893     3.0630      4.742 0.0001   0.0000

pvals.fnc(lmer)$fixed
         Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)  -2.965   -2.967     -4.728     -1.103 0.0134   0.0000
modeWHQ      -1.031   -1.015     -1.801     -0.177 0.0136   0.0117
modeYNQ       2.865    2.869      2.109      3.632 0.0001   0.0000
```

register span

```
pvals.fnc(lmer)$fixed
         Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)  10.232   10.216      8.717     11.679 0.0001        0
modeST       -2.303   -2.314     -2.897     -1.715 0.0001        0
modeYNQ      -2.544   -2.565     -3.203     -1.964 0.0001        0

pvals.fnc(lmer)$fixed
         Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)  7.9291   7.9091     6.5557     9.2620 0.0001   0.0000
modeWHQ      2.3026   2.3142     1.7122     2.8802 0.0001   0.0000
modeYNQ     -0.2418  -0.2483    -0.7995     0.3063 0.3736   0.3891
```

Appendix 2: Section B – Alignment

Target sentences

	prenuclear (PN) context		nuclear (N) context
0PN	**Lán** go dtí'n doras. *full to the door* / 'lˠænˠ gˠə dʲinʲ 'dˠʌɾˠəsˠ/ 'Full to the door.'	**N0**	Tá mo mhála **lán.** *is my bag full* / tˠæ mˠə 'walˠə 'lˠænˠ/ 'My bag is full.'
1PN	A **lán** de na seandaoine. *a lot of the old people* / ə 'lˠænˠ dˠe nˠə 'ʃanˠdˠənʲi/ 'A lot of the old people.'	**N1**	Tá an citeal **lán** do/de. *is the kettle full of it* / tˠæ ənˠ 'citʲəlˠ 'lˠænˠ dˠə / 'The kettle is full of it.'
2PN	Bhí a **lán** acu ag ól. *was a lot of them drinking* / vʲi ə 'lˠænˠ aku eɟ 'olˠ/ 'There were a lot of them drinking.'	**N2**	Tá an citeal **lán** aici. *is the kettle full she has* / tˠa ənˠ 'citʲəlˠ 'lˠænˠ ɛci/ 'She has the kettle full of it.'

Target sentences in context

Q: D'tíg leat an leabhar seo a thógáil?
Could you the book this to take
/ 'dʲiɟ lʲatˠ ənˠ 'lʲoərˠ ʃo ə 'hogalʲ /
Could you take this book?

N0: Tá brón orm. Tá mo mhála **lán**.
is sorrow on me *is my bag full*
/ tˠa 'bˠɾˠonˠ orˠəmˠ/ /tˠa mˠə 'walˠə 'lˠænˠ/
I'm sorry. 'My bag is full.'

Q: A' bhfuil uisce ar bith fágtha sa bhaile?
is there water any left in the home
/awˠəlʲ ' iʃcə ərˠ bʲi 'fˠak ə sˠə 'walʲə/
Is there any water left at home?

N1: Tá. Tá an citeal **lán** de/do.
is is the kettle full of it
/ 'tˠa / / 'tˠa ənˠ 'citʲəlˠ 'lˠænˠ dˠə/
'Yes.' 'The kettle is full of it.'

Q:	An	bhfuil	aon	uisce	sa	bhaile?
	is there		*any*	*water*	*in the*	*home*
	/ənˠ	'vˠilʲ	enˠ	'iʃcə	sˠə	'wˠalʲə /

Is there any water at home?

N2:	Tá.	Tá	an	citeal	**lán**	aici.
	is	*is*	*the*	*kettle*	*full*	*she has*
	/ 'tˠæ /	/ 'tˠæ	ənˠ	'citʲəlˠ	'lˠænˠ	eci/
	'Yes.'	'She has the kettle full of it.'				

Q:	Caidé	mar	a	bhí	an	dioscó?
	How	*was*			*the*	*disco*
	/ciə'dʲe	mˠarˠ	ə	'vʲi	ənˠ	'dʲisˠko/

How was the disco?

0PN:	**Lán**	go	dtí 'n	doras.
	full	*to*	*the*	*door*
	/'lˠænˠ	gə	dʲinʲ	'dˠʌrˠəsˠ/

'Full to the door.'

Q:	Cé	nár	thaitin	an	cóisir	leo?
	Who	*didn't*	*enjoy*	*the*	*party*	*with them*
	/'ce	nˠarˠ	'hatʲənʲ	ənˠ	'koʃərʲ	lʲɔ /

Who didn't enjoy the party?

1PN:	A	**lán**	de	na	seandaoine.
	a	*lot*	*of*	*the*	*old people*
	/ə	'lˠænˠ	dˠe	nˠə	'ʃanˠdˠinʲi /

'A lot of the old people.'

Q:	An	raibh	trioblóid	leis	na	mic	léinn	aréir?
	was there		*trouble*	*with*	*the*		*students*	*last night*
	/ ənˠ	rˠo	'tʲrʲibˠlˠodʲ	lʲiʃ	nˠə	mʲic	'lʲenʲ	ə'rˠerʲ/

Was there trouble with the students last night?

2PN:	Bhí	a	**lán**	acu	ag	ól.
	was	*a*	*lot*	*of them*		*drinking*
	/'vʲi	ə	'lˠænˠ	aku	eɟ	'olˠ/

'There were a lot of them drinking.'

Appendix 3: Section C – Focus

Target sentence

Bhí	Méabh	'na	luí	ar	a'	leabaí.
was	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
/ vʲi	'mʲewʲ	nˠə	'lˠi	ərˠ	ə	'ʎabˠi /

Méabh was lying on the bed.

Target sentences in context

- **Broad focus**

Q:	Ar	tharla	gach	ar	bith	inné?
	did	*happen*	*anything*			*yesterday*
	/ ərʲ	'harˠlˠə	gah	ərˠ	bʲi	ə'nʲe/
	Did anything happen yesterday?					

bf:	Níor	tharla	mórán.	Bhí	Méabh	'na	luí	ar	a'	leabaí.
	not	*happen*	*much*	*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/nʲirˠ	'harˠlˠə	'mˠorˠanˠ/	/vʲi	'mʲewˠ	nˠə	'lˠi	ərˠ	ə	'ʎabˠi/
	Nothing much happened.			'Méabh was lying on the bed.'						

- **Narrow focus conditions**

Q:	Cé	a	bhí	ina	luí	ar	a'	leabaí?
	who		*was*	*in her*	*lying*	*on*	*the*	*bed*
	/ce	ə	vʲi	nˠə	lˠi	ərʲ	ə	'ʎabˠi/
	'Who was lying on the bed?'							

nf:	Bhí	Méabh	'na	luí	ar	a'	leabaí.
	was	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ vʲi	'mʲew	nˠə	'lˠi	ərˠ	ə	'ʎabˠi /
	'Méabh was lying on the bed.'						

Q:	Cá	raibh	Méabh	ina	luí?
	what	*was*	*Méabh*	*in her*	*lying*
	/ka	ɾˠo	mʲew	nˠə	lˠi/
	'What was Méabh lying on?'				

nf:	Bhí	Méabh	'na	luí	ar	a'	leabaí.
	was	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ vʲi	'mʲew	nˠə	'lˠi	əɾˠ	ə	'ʎabˠi /
	'Méabh was lying on the bed.'						

- **Narrow contrastive focus conditions**

Q:	An	raibh	Bríd	ina	luí	ar	a	leabaí?
	Q-part	*was*	*Bríd*	*in her*	*lying*	*on*	*the*	*bed*
	/ənˠ	ɾˠo	bʲɾʲidʲ	inˠə	'lˠi	əɾˠ	ə	'ʎabˠi/
	'Was Bríd lying on the bed?'							

cf:	Cha raibh/	Ní raibh.	Bhí	Méabh	'na	luí	ar	a'	leabai.
	not was		*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ xa ɾˠo/	/nʲi ɾˠo/	/vʲi	'mʲew	inˠə	'lˠi	əɾˠ	ə	'ʎabˠi/
	'No.'		'Méabh was lying on the bed.'						

Q:	An	raibh	Méabh	ina	seasamh	ar	a'	leabaí?
	Q-part	*was*	*Méabh*	*in her*	*standing*	*on*	*the*	*bed*
	/ənˠ	ɾˠo	'mʲew	nˠə	ʃasˠu	əɾˠ	ə	'ʎabˠi/
	'Was Méabh standing on the bed?'							

cf:	Cha raibh.	/Ní raibh.	Bhí	Méabh	'na	luí	ar	a'	leabaí.
	not was		*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ xa ɾˠo/	/nʲi ɾˠo/	/vʲi	'mʲew	nˠə	'lˠi	əɾˠ	ə	'ʎabˠi/
	'No.'		'Méabh was lying on the bed.'						

Q:	An	raibh	Méabh	ina	luí	ar	an	urlár?
	Q-part	*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*floor*
	/ənˠ	ɾˠo	'mʲew	nˠə	'lˠi	əɾˠ	ənˠ	'uɾˠlˠaɾˠ/
	'Was Méabh lying on the floor?'							

cf:	Cha raibh	/Ní raibh.	Bhí	Méabh	'na	luí	ar	a'	leabaí.
	there wasn't		*was*	*Méabh*	*in her*	*lying*	*on*	*the*	*bed*
	/ xa ɾˠo/	/nʲi ɾˠo/	/vʲi	'mʲew	nˠə	'lˠi	əɾˠ	ə	'ʎabˠi/
	'No.'		'Méabh was lying on the bed.'						

Table C3.1: Summary of the statistical test results of the linear mixed models.

Duration of focal syllables			
(A1)	**mean**	**t**	**pMCMC**
bf	280		
cf	318	t=0	pMCMC=0.0001
bf	280		
nf	318	t=0	pMCMC=0.0001
nf	318		
cf	318	t=0.93	pMCMC=0.93
(A2)	**mean**	**t**	**pMCMC**
bf	199		
cf	237	t=0	pMCMC=0.0001
(A3)	**mean**	**t**	**pMCMC**
bf	266		
cf	276	t=0.0359	pMCMC=0.0528
bf	266		
nf	276	t=0.0435	pMCMC=0.0862
nf	276		
cf	276	t=0.9523	pMCMC=0.9500
Duration of focal feet			
(A1)	**mean**	**t**	**pMCMC**
bf	423		
cf	456	t=0	pMCMC=0.0001
bf	423		
nf	449	t=0	pMCMC=0.0010
nf	449		
cf	456	t=0.38	pMCMC=0.4354
(A2)	**mean**	**t**	**pMCMC**
bf	326		
cf	370	t=0	pMCMC=0.0001
(A3)	**mean**	**t**	**pMCMC**
bf	422		
cf	432	t=0.359	pMCMC=0.0528
bf	422		
nf	446	t=0.0435	pMCMC=0.0862
nf	446		
cf	432	t=0.0616	pMCMC=0.1236

F0 excursion of focal accents				
(A1)		mean	t	pMCMC
	bf	2.6		
	cf	3.9	t=0	pMCMC=0.0001
	bf	2.6		
	nf	3.2	t=0	pMCMC=0.0001
	nf	3.2		
	cf	3.9	t=0.1475	pMCMC=0.0920
(A2)		mean	t	pMCMC
	bf	-0.42		
	cf	5.1	t=0	pMCMC=0.0001
(A3)		mean	t	pMCMC
	bf	5.02		
	cf	5.84	t=0.0426	pMCMC=0.0622
	bf	5.02		
	nf	5.9	t=0.0557	pMCMC=0.0520
	nf	5.9		
	cf	5.84	t=0.9779	pMCMC=0.8916

Table C3.2: R code and statistical results of the linear mixed models.

Duration of focal syllables

(A1)

```
lme< -lmer(dursyll~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a1)
> pvals.fnc(lme)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)   280.75   280.37     253.13     308.78 0.0001        0
conditioncf    37.31    38.04      26.68      49.32 0.0001        0
conditionnf    37.79    38.25      25.87      49.29 0.0001        0


lmer< -lmer(dursyll~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a1)
> pvals.fnc(lmer)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept) 318.0589 318.5066     289.45     345.29 0.0001     0.00
conditionbf -37.3094 -38.0666     -49.14     -26.58 0.0001     0.00
conditionnf   0.4841   0.0282     -11.50      11.64 0.9950     0.93
```

(A2)

```
lme< -lmer(dursyll~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a2)
> pvals.fnc(lme)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)    199.2   198.95      179.7     219.15 0.0001        0
conditioncf     37.8    37.56       26.0      49.38 0.0001        0
```

(A3)

```
lme< -lmer(dursyll~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a3)
> pvals.fnc(lme)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)   265.54   264.34   240.4231     288.76 0.0001   0.0000
conditioncf    10.19    10.07    -0.1462      20.13 0.0528   0.0359
conditionnf    10.50     9.63    -1.2401      20.70 0.0862   0.0435


lmer<-lmer(dursyll~condition+(1|speaker)+(1|rep)+(1|Dialect),a3)
> pvals.fnc(lmer)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept) 275.7345 274.6896     250.05   299.0417 0.0001   0.0000
conditionbf -10.1917 -10.0126     -20.52     0.0163 0.0570   0.0359
conditionnf   0.3117  -0.3892     -11.47    10.8086 0.9500   0.9523
```

Duration of focal feet

(A1)

```
lme< -lmer(durfoot~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a1)
> pvals.fnc(lme)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)   424.69   423.98    383.916     462.25 0.0001   0.0000
conditioncf    31.52    32.51     16.949      48.00 0.0001   0.0000
conditionnf    25.49    26.20      9.779      42.02 0.0010   0.0004

> lmer< -lmer(durfoot~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a1)
> pvals.fnc(lmer)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
```

```
(Intercept) 456.211 456.596   416.07   497.736 0.0001  0.0000
conditionbf -31.520 -32.521   -48.05   -16.782 0.0001  0.0000
conditionnf  -6.035  -6.333   -22.30     9.601 0.4354  0.3844
```

(A2)

```
lme< -lmer(durfoot~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a2)
> pvals.fnc(lme)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(> |t| )
(Intercept)   325.81   325.75     294.32     354.30 0.0001        0
conditioncf    44.36    44.94      27.25      62.39 0.0001        0
```

(A3)

```
lme< -lmer(durfoot~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a3)
> pvals.fnc(lme)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(> |t| )
(Intercept)   422.40  421.320    395.690     449.49 0.0001  0.0000
conditioncf    10.17    9.578     -4.993      25.30 0.2070  0.1502
conditionnf    24.49   22.354      6.644      38.61 0.0054  0.0014
```

```
lmer<-lmer(durfoot~condition+(1|speaker)+(1|rep)+(1|Dialect),a3)
> pvals.fnc(lmer)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)   432.56  431.038    403.425    459.916 0.0001  0.0000
conditionbf   -10.17   -9.601    -24.960      4.859 0.2048  0.1502
conditionnf    14.33   12.859     -4.054     29.029 0.1236  0.0616
```

F0 excursion of focal accents

(A1)

```
lme< -lmer(scaling~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a1)
> pvals.fnc(lme)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(> |t| )
(Intercept)   2.5837   2.6037     0.6764      4.438 0.0098  0.1320
conditioncf   1.3437   1.4711     0.6989      2.286 0.0001  0.0004
conditionnf   0.5567   0.7118    -0.0917      1.554 0.0920  0.1475
```

```
lmer<-lmer(scaling~condition+(1|speaker)+(1|rep)+(1|Dialect),a1)
> pvals.fnc(lmer)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)    3.927   4.0613      2.090     5.9074 0.0004  0.0235
conditionbf   -1.344  -1.4691     -2.285    -0.6933 0.0001  0.0004
conditionnf   -0.787  -0.7576     -1.519     0.0479 0.0536  0.0349
```

(A2)

```
lme< -lmer(scaling~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a2)
> pvals.fnc(lme)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(> |t| )
(Intercept)  -0.4183   -0.422     -1.476      0.611 0.3174  0.2972
conditioncf   5.6072    5.656      4.962      6.391 0.0001  0.0000
```

(A3)

```
lme< -lmer(scaling~ condition+ (1| speaker)+ (1| rep)+ (1| Dialect),a3)
> pvals.fnc(lme)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)   5.0151   5.0488      3.857      6.189 0.0001   0.0000
conditioncf   0.8193   0.8160     -0.062      1.643 0.0622   0.0426
conditionnf   0.8323   0.9039     -0.019      1.806 0.0520   0.0557


lmer<-lmer(scaling~condition+(1|speaker)+(1|rep)+(1|Dialect),a3)
> pvals.fnc(lmer)$fixed
            Estimate MCMCmean HPD95lower HPD95upper  pMCMC Pr(>|t|)
(Intercept)   5.8344   5.8694     4.5753     7.1478 0.0004   0.0000
conditionbf  -0.8193  -0.8259    -1.6519     0.0381 0.0574   0.0426
conditionnf   0.0130   0.0669    -0.9039     1.0642 0.8916   0.9779
```

Appendix 4: Section D – Rhythmic features

Read story: The North Wind and the Sun

An Ghaoth Aduaidh agus an Ghrian

Bhí an ghaoth aduaidh 's an ghrian ag aragáil le chéile le fáil amach cé acu den bheirt a ba threise nuair a tháinig taistealaí an bealach agus clóca te á chaitheamh aige. D'aontaigh siad gurb an duine 'ba threise an duine 'ba luaithe a thabhairfeadh ar an taistealaí a chlóca a bhaint dó. Ansin shéid an ghaoth aduaidh comh tréan is a thiocfadh léithe, ach dá mhéid a shéid sé'sea ba dhlúithe a theann an thaistealaí a chlóca thart fá dtaobh dó, agus sa deireadh d'éirigh an ghaoth aduaidh as an iarracht. Ansin lonnraigh an ghrian go te agus bhain an taistealaí dó a chlóca láithreach bonn. Agus ar a'dóigh sin b'éigean don ghaoth aduaidh é a admháil gurbh í'n ghrian a ba láidre den bheirt.

Appendix 5: Research participant questionnaire (Irish)

Eolas faoi na Rannpháirtithe atá ag glacadh páirt sa Taighde seo

1. Ainm:

---

2. Aois:

☐ 20 – 30 ☐ 30 – 40 ☐ 40 – 50 ☐ 50 – 60 ☐ 60 – 70

---

3. Áit Bhreithe:

---

4. Gairm Bheatha:

---

5. Rphost/uimhir ghutháin (roghnach):

---

6. Cén teanga dhúchais atá agat?

---

7. Cén teanga eile a labhraíonn sibh sa bhaile?

---

9. An labhraíonn tú Gaeilge: **go laethúil** **go minic** **anois is arís** **go hannamh**

ní labhraím Gaeilge riamh

---

11. Cad iad na háiteanna eile ina raibh tú i do chónaí, seachas an áit ina bhfuil tú anois?
Cén fhad a chaith tú sna háiteanna sin?

---

12. Bunscoil (town and county):

---

13. Meánscoil (town and county):

---

14. Cad as do thuismitheoirí ó dhúchas (contae agus baile)?

Athair:

Máthair:

Research participant questionnaire (English)

Research Participant Information Form

1. Name:

---

2. Age:

☐ 20 – 30 ☐ 30 – 40 ☐ 40 – 50 ☐ 50 – 60 ☐ 60 – 70

---

3. Place of Birth:

---

4. Profession:

---

5. Email/contact number (optional):

---

6. What is your native language?

---

7. What other languages are used at your home if any?

---

9. Do you converse in Irish: daily often occasionally rarely not at all

---

11. What place/s have you lived in other than where you live now and for how long?

---

12. Primary School (town and county):

---

13. Secondary School (town and county):

---

14. Where are your parents from (county and town)?

Father:

Mother:

Appendix 6: Informant profiles

Dialect	Initials	Gender	Age	Place of birth	Native language	Languages used at home	Frequency of Irish spoken	Place of primary schooling	Place of secondary schooling	Parents' home towns	
										Mother	Father
RF	MNG	F	50-60	Rann na Feirste	Irish	Irish	daily	Rann na Feirste	Gaoth Dobhair	Rann na Feirste	Rann na Feirste
RF	RMD	F	40-50	Rann na Feirste	Irish	Irish	daily	Rann na Feirste	Gaoth Dobhair	Rann na Feirste	Rann na Feirste
GCC	SNC	F	40-50	Teileann	Irish	Irish and English	daily	Na Carraige	Bun Dorain	Malainn Bheag	Teileann
GCC	SMC	M	40-50	Gleann Cholm Cille	Irish	Irish and English	daily	Gleann Cholm Cille	Gleann Cholm Cille	Gleann Cholm Cille	Gleann Cholm Cille
BF	ANM	F	50-60	Na Gleanntaí	Irish	Irish	daily	Baile na Finne	n/A	An Glasaigh	Loch Airig
BF	MNC	F	50-60	Na Gleanntaí	Irish	Irish	daily	Baile na Finne	Na Gleanntaí	An Clochán	Baile na Finne
RG	FP	F	30-40	Na Dúnaibh	Irish	Irish, English and Albanian	daily	Na Dúnaibh	Baile na nGallóglach	Na Dúnaibh	Fanáid
RG	MM	F	40-50	Dun na nGall	Irish	Irish, English	daily	Na Dúnaibh	Baile na nGallóglach	Na Dúnaibh	Na Dúnaibh