PROSODIC SIGNALLING OF SENTENCE MODE IN TWO VARIETIES OF IRISH (GAELIC)

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ABSTRACT

This paper examines how sentence mode is encoded in the typically falling (Inis Mór) and rising (Donegal) varieties of Irish (Gaelic). Analyses cover the phonological description of tunes as well as the global and local f_0 metrics in statements and two question types. Results suggest that sentence mode is already marked by tune in Donegal Irish. Inis Mór, however, uses the same array of tunes in both statements and questions, only with varying frequency. Additionally, in both dialects effect of sentence mode is found in specific f_0 metrics even when the same tune type is employed.

Keywords: sentence mode, questions, statements, intonation, Irish Gaelic

1. INTRODUCTION

The distinction between statement and question intonation has been widely studied [6, 9, 10, 11, 12]. In general, a combination of lexical, syntactic, morphological or tonal markers is employed for distinguishing questions from declaratives. A link between sentence type and pitch accent type has been suggested in [8] and [13], where nuclear accents are generally assumed to be falling in statements and rising in questions. Notably, the reverse is the case in a small number of languages, including Chickasaw, where statements are rising and questions falling [4]. Questions are most typically supported by syntactic and/or lexical markers to distinguish them from statements, and therefore a trade-off between lexical/syntactical and intonational markers is expected [9]. Even when differences are not present on the phonological level, phonetic distinctions may exist, such as decrease or absence of global declination in questions [7].

This paper investigates how sentence mode is encoded in f_0 contours of three utterance types in two regional varieties of Irish (Gaelic): Ulster Irish (Donegal, henceforth DI) and Connemara Irish (Inis Mór, henceforth IM) (Figure 1).

We are dealing with two remarkably different dialects of Irish in terms of their default melodic contours: Donegal declaratives are predominantly rising (L*+H L*+H L*+H %), a pattern generally regarded as atypical for statements. The mainly falling contour of Inis Mór (H*+L H*+L H*+L %) corresponds to the assumed standard tonal pattern of declaratives [2, 3].

Figure 1: Map of Ireland showing informant locations.

The utterance types investigated in this study are statements (ST), wh-questions (WHQ) and yes/no questions (YNQ). As sentence mode in Irish is already marked syntactically, it is of particular interest to us whether interrogativity is additionally conveyed by means of f_0. Provided that such dual differentiation of sentence type exists, we are also interested in whether the same intonational devices are used in both dialects, and whether IP-length also affects the realisation of utterance types.

2. METHODS & MATERIALS

2.1. Materials

The material analysed here is part of larger datasets collected for prosodic analysis of Irish dialects. Target utterances were designed in three sentence modes with two different IP-lengths (two and three stress groups respectively). The longer sentences were modeled on those shown in Table 1 by adding another stress group. Target sentences were embedded in a series of randomised mini-dialogues

and read four times (DI) or five times (IM) in pairs. The total number of tokens was 120 for DI and 150 for IM. Utterances not suitable for analysis (due to either random focus or disfluencies) were excluded (17% for DI and 10% for IM).

Table 1: Matched 2-accent ST, WHQ and YNQ.

ST	**Bhuail** mé le **Dó**nall. *met me with Dónall* 'I met Dónall.'
WHQ	Cá**r** **bhuail** tú le **Dó**nall? *when met you with Dónall?* 'When did you meet Dónall?'
YNQ	Ar **bhuail** tú le **Dó**nall? *q-part met you with Dónall?* 'Did you meet Dónall?'

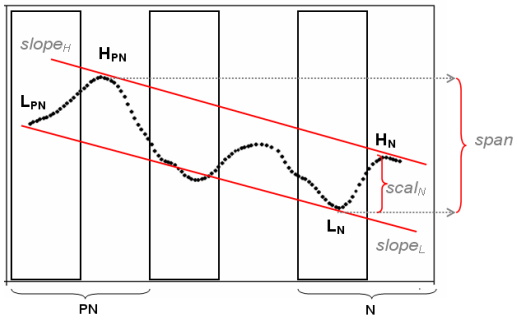
For each variety five informants were chosen for analysis for this study. All informants for IM came from one location, informants for DI came from three different locations. Speakers were recorded locally in the respective Irish speaking areas (Gaeltachtaí), using digital equipment, ZOOM Handy Recorder H4, and Edirol UA/25EX, in a quiet room in private accommodation or in public institutions.

2.2. Methods and measurements

Tonal contours of each utterance type were determined by careful auditory analysis. All data was analysed and annotated using the Praat software [1] and labeled within the autosegmental-metrical framework using the IViE labeling system [5]. All utterances were transcribed orthographically, stressed syllables were marked and tonal contours transcribed.

For the quantitative analysis, we measured four inflection points in the contour: 2 f_0 points corresponding to the H and L targets in the phrase-initial (L_{PN}, H_{PN}) and 2 in the phrase-final (L_N, H_N) accent groups (Figure 2). This was done to ensure uniform treatment of all data, which consists of phrases with differing lengths (2 and 3 accent groups). Note that the LH tonal sequence of DI as shown in Figure 2 corresponds to that of HL in IM. 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 $slope_H$ respectively), and scaling of the nuclear pitch accent ($scal_N$). Declination slope values were obtained by calculating the difference between the corresponding targets in the IP-initial and nuclear accent groups ($slope_L$=L_{PN}-L_N, $slope_N$=H_{PN}-H_N). The global f_0 minimum and maximum were used for calculating span. These typically coincided with the L target of the nuclear accent group, and the H target of the IP-initial group, respectively. The exception was YNQ in DI, where f_0 maximum was found in the IP-final accent group.

Figure 2: Schematic representation of f_0 measurement points and derived metrics.



The quantitative analysis covered all DI data, while in IM only utterances with the major nuclear contour type, H*+L %, which constituted 72% of all data, were chosen. Additionally, we deemed necessary to decide whether all measurements were meaningful for the research questions posited. As L_{PN} and $slope_L$ are only justified in cases where the L target is present, these two metrics were not calculated for IP-initial H* accents. Instances of H* were found across all sentence types in IM, but mainly in WHQ in DI.

3. RESULTS

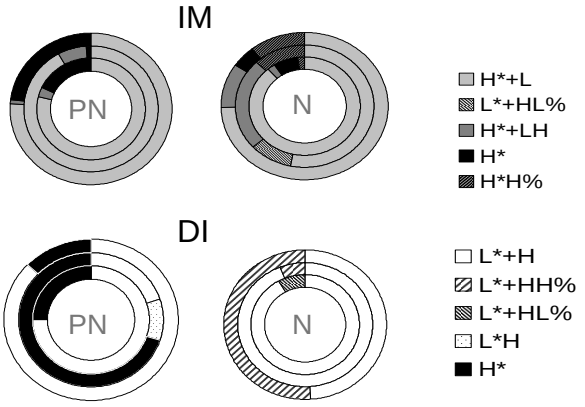
Results cover tune inventory analysis (Section 3.1), followed by assessment of the specific f_0 metrics characterizing each sentence mode (Section 3.2). Finally, the effects of factors sentence mode and IP-length on the direct and derived f_0 measurements are discussed (Section 3.3).

3.1. Tonal inventory

The analysis of the tune inventory for the two dialects shows that they are strikingly different, both in terms of the pre-nuclear and nuclear accent types (Figure 3.1). The predominant nuclear contour choice across all three sentence modes is the low rise (L*+H %) in DI, while in IM it is the fall (H*+L %). Along with the most frequently occurring tune, there seems to be a second choice of preference in both dialects, too: in IM there is a noticeable use of the fall-rise (H*+L H%) in WHQ. Fall-rise is also used, though less often, in YNQ and occasionally in ST. High-level and high rises (H* %, H* H%) are comparatively rare, and can occur in any of the modes. In DI, roughly half

YNQ end with a high final boundary (L*+H H%), while the other half are rise-plateaux (L*+H %). Further analyses will be conducted to determine if we are truly dealing with two distinct categories.

Figure 3.1: Tonal inventory of PN and N accents for IM and DI. Each ring in the doughnut represents one sentence mode: ST (inner ring), WHQ (middle) and YNQ (outer ring). Percentage signs (%) indicate that the tone only occurs in nuclear position.

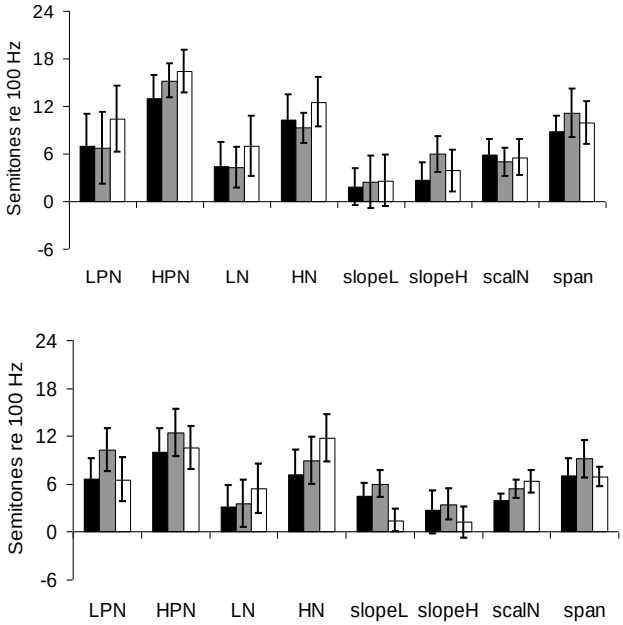


As regards the pre-nuclear accents, we observe that again the rise (L*+H) is the predominant contour type in ST and YNQ for DI, whereas WHQ mainly employs either a high accent (H*) or L*+H with similar frequency. In some cases of WHQ, both targets are located at or near the syllable boundaries, which for now we label as L*H. This pattern will need to be further investigated. Finally, we also observed frequent deaccentuation in phrase medial position in DI (31%), which was not the case in IM (2 cases). This, however, did not affect our results, as IP-medial accent metrics were not included in the present analysis. In IM, the fall (H*+L) is the major accent type in the PN position regardless of sentence mode. High accents (H*) are also found in ST and YNQ, but rarely in WHQ.

3.2. Effect of sentence mode on f_0 metrics

Initially, we tested whether both factors, sentence mode and IP-length, had an influence on the f_0 parameters, and if so, whether there was an interaction between these factors. A two-way repeated measures ANOVA was conducted separately for each dialect to test these hypotheses. The factors were sentence mode (3 levels) and IP-length (2 levels). All results reported in sections 3.2 and 3.3 are referred to in Figure 3.2, and are expressed in semitones (re: 100 Hz).

Figure 3.2: Means and standard deviations of the f_0 metrics in ST (black), WHQ (grey) and YNQ (white) for IM (upper panel) and DI (lower panel).



The tests showed that the interaction between mode and IP-length was not significant for any of the metrics. Consequently, Tukey multiple comparisons tests with factor mode were run on each parameter. For IM, mode was significant for all f_0 metrics with the exception of $slope_L$ and $scal_N$, while in DI it was significant for all f_0 metrics. The few occasions where significance of IP-length emerged, will be briefly discussed in section 3.3. On the whole, the effects on f_0 metrics were mainly due to sentence mode.

Similar trends between the two dialects were found in the following instances: H_N, L_N and span. In both dialects, H_N and L_N are higher in terms of frequency for YNQ, whereas span is widest in WHQ.

Additionally, the effect of mode on both question types was found in H_{PN} in IM and $scal_N$ in DI, where both had increased values.

As regards H_{PN} in IM, it is the only parameter which affects both question types ($F_{(2,92)}$=15.38, p<0.0001). Here the IP-initial peak is on average 2 or 3 semitones higher than in statements. In DI, however, it is $scal_N$ which affects both question types ($F_{(2,106)}$=36.10, p<0.0001): the nuclear rise is increased on average by at least 1.5 semitones compared to statements.

The remaining parameters clearly show sentence mode differentiation in each of the dialects. It is usually one specific parameter, which

contrasts a particular question type with the statement.

In case of IM, the characteristic parameters for YNQ, in addition to those already mentioned, are L_{PN}, H_N and L_N (Figure 3.2). The scaling of both L_{PN} and L_N in YNQ is around 3 semitones higher than in the statements. H_N in YNQ is also increased by around 2 semitones. The parameters which most typically determine WHQ are $slope_H$ and span, which are both increased by 3 semitones compared to ST.

For DI, the defining parameters for YNQ are L_N, H_N, $slope_H$ and $slope_L$ (Figure 3.2). Nuclear L and H values are higher than in ST and WHQ. $Slope_L$ and $slope_H$ are notably reduced, where the reduction of the latter is brought about by the frequent H%. For WHQ the parameters are L_{PN}, H_{PN} and span. In WHQ the prenuclear L and H targets were also higher and span increased by 2 semitones compared to the corresponding ST and YNQ.

3.3. Effect of IP-length on f_0 metrics

As previously pointed out in Section 3.2, results for both varieties showed no significant interaction between sentence mode and IP-length. The latter was found to be significant only for IM. While both factors had an effect on L_{PN} (IP-length: $F_{(1,75)}=14.27$, $p<0.0001$, mode: $F_{(2,75)}=7.74$, $p<0.001$), $slope_L$ was solely affected by IP-length ($F_{(1,72)}=9.52$, $p<0.003$). Contrary to our expectations, longer IPs showed a steeper declination slope regardless of sentence mode.

4. DISCUSSION

The auditory analysis confirmed that we are dealing with two varieties of Irish which have strikingly different tonal patterns. Each variety employs one dominant tune type in all sentence modes, the fall in IM and the rise in DI. The occurrence of a variety of tones in both PN and N accents in both dialects indicates that one particular tune is preferred, but is not exclusive.

In DI, distinction between statements and questions is already discernable from the tonal patterns, which is also mirrored in the measured f_0 metrics. In IM, however, only the more fine-grained analyses showed that even when the same H*+L % category is used YNQ are defined by higher H and L targets in PN and N accents, while WHQ have a higher PN peak and, consequently, wider register span. The most striking between-dialect difference is in the nuclear pitch accent scaling, which increases along the ST-WHQ-YNQ continuum for DI, while this device is not employed at all in IM. Further, utterance length has only a marginal effect: only two f_0 metrics in IM data were affected. Finally, $slope_{L,}$ or declination of the baseline, in DI is largely reduced in YNQ compared to the other two utterance types.

5. CONCLUSION

In this study we investigated the signaling of sentence mode in two phonologically different varieties of Irish. Our findings showed that in both varieties, sentence mode is marked intonationally along with the already present syntactic marking. Both Donegal Irish and Inis Mór Irish are fundamentally different in their intonation patterns, but largely employ the same mechanisms to distinguish statements from questions, and also between the two question types.

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