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INTONATIONAL SIGNALLING OF SENTENCE TYPE IN NORTHERN WELSH

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ABSTRACT

This paper examines the effect of sentence type on the scaling and alignment of pitch peaks in Anglesey Welsh. The analysis considered a corpus of speech from six Welsh-English bilingual speakers. The sentence types considered for analysis were statements, yes-no questions, wh-questions and declarative questions. It was found that across speakers the pitch peaks were scaled higher in questions than in statements. Furthermore there was gradable scaling in nuclear pitch peaks as a function of the lexical marking of interrogativity available in the sentences. This ties in with Haan's Functional Hypothesis [5] whereby less lexically marked questions are predicted to be more intonationally marked. It was also found that for prenuclear pitch peaks there was a tendency for later alignment as a function of the lexical cues for interrogativity, although this later alignment was not present in nuclear position.

Keywords: intonation, Welsh, scaling, alignment, questions

1. INTRODUCTION

The intonational encoding of interrogativity has been widely studied for a range of languages [2, 3, 4, 5, 6, 7, 8, 10]. Interrogativity can be expressed by means of lexical (e.g wh-words), syntactic (e.g. inversion) or intonational markers. This paper investigates how sentence type is encoded intonationally in the Anglesey variety of northern Welsh by investigating the scaling and alignment of prenuclear and nuclear pitch peaks in rising falling accents in four different sentence types: statements (ST), yes-no questions (YQ), wh-questions (WQ) and declarative questions (DQ).

1.1. Intonational encoding of interrogativity

Question intonation is very often associated with some kind of high pitch [6]. Specifically, it has been found that there may be variation in the scaling of pitch peaks in order to distinguish questions from their statement counterparts. The scaling of F0 values has been found to be affected by the statement/question distinction in a number of languages [5, 8], with peaks in questions realised at a higher pitch than in statements.

Furthermore, it has also been found that peak alignment appears to be affected by the question/ statement distinction. Specifically, there may be later alignment of pitch peaks in order to indicate interrogativity. This later alignment of peaks in interrogatives has been found for Hungarian [3], Mexican Spanish [10], Neapolitan Italian [2] and Russian [8].

1.2. Trade-off

Haan [5] suggested that there might be a functional trade-off between the lexico-syntactic markers of interrogativity and high question pitch in Dutch. She proposed that the less a question is lexico-syntactically marked, the more it will be intonationally marked. Thus, she predicted that high pitch would be maximally present in declarative questions (which are lexico-syntactically identical to their statement counterparts) and minimally present in wh-questions, which are lexico-syntactically marked for interrogativity in Dutch.

Haan confirmed that the most intonationally marked questions were declarative questions, followed by yes-no questions (which in Dutch feature subject-verb inversion). The least intonationally marked question was the wh-question, which is lexico-syntactically marked for interrogativity with both a question word and subject-verb inversion. This trade-off between lexico-syntactic and intonational marking has also been confirmed for several varieties of English [4].

1.3. Welsh

Welsh, like many languages, does not feature subject-verb inversion in questions. Wh-questions do however feature a wh-word as a lexical cue to interrogativity. Yes-no questions are often lexically and syntactically identical to their statement counterparts in spoken Welsh, although in certain grammatical constructions a different form of the auxiliary verb *to be* may be used. Declarative questions in Welsh, as in Dutch and English are lexico-syntactically identical to their statement

counterparts and are thus not marked for interrogativity.

Table 1: Statements and questions in Welsh

Sentence Type	Example
ST	Mae Manon yn licio mafon. be.3S.PRES Manon PRT like.NONFIN raspberries 'Manon likes rasberries.'
YQ	Ydy Manon yn licio mafon? be.3S.PRES Manon PRT like.NONFIN raspberries 'Does Manon like raspberries?'
WQ	Pam mae Manon yn licio mafon? why be.3S.PRES Manon PRT like.NONFIN raspberries 'Why does Manon like rasberries?'
DQ	Mae Manon yn licio mafon? be.3S.PRES Manon PRT like.NONFIN raspberries 'Manon likes raspberries?'

Table 1 above shows the structure of statements vs. questions in an auxiliary, subject, verb, object construction in Welsh. As the wh-questions are identified by an additional question word, it is predicted (following Haan's Functional Hypothesis) that these will be the least intonationally marked questions of the three sentence types as they already are markedly cued for interrogativity. Yes-no questions which can feature a different form of the auxiliary *to be* utterance initially and are predicted to be more intonationally marked than wh-questions but less-so that declarative questions, which are lexico-syntactically identical to the statements.

2. METHOD

2.1. Materials

The material analysed here is part of a larger dataset collected for the analysis of Anglesey Welsh. A set of target sentences was designed to cover the four sentence types (statements, yes-no questions, wh-questions and declarative questions). The target sentences were designed to elicit two pitch movements per utterance, which associated with two accented syllables. Wherever possible, words were composed of sonorant consonants in order to avoid microprosodic effects on the F0 curve. Target sentences were embedded in a series of mini-dialogues.

Materials were also manipulated in order to investigate the effect of phonetic pressure: the proximity of preceding or upcoming tonal events. The number of syllables a) preceding the prenuclear accented syllable b) between the prenuclear and nuclear accented syllables and c) following the nuclear accented syllables were manipulated in order to investigate this.

2.2. Participants and procedure

The materials were read by six speakers of Anglesey Welsh (four male, two female) all of whom were functioning bilinguals in their twenties.

Speakers were recorded in a sound-attenuated booth using a Marantz (PMD570) solid-state recorder with an external microphone. Speakers were instructed to read the dialogues as naturally as possible and were asked to repeat any misread dialogues. 313 target sentences were analysed in total.

2.3. Measurements and calculations

Measurements of fundamental frequency (F0) and duration were made in Praat [1]. For the scaling, the prenuclear and nuclear tonal targets were labelled:

- L1: the lowest F0 value beginning the rise
- H: the highest F0 value at the peak of the rise-fall movement
- L2: the lowest value following the rise-fall movement

To calculate the timing of peaks, three segmental landmarks were marked (following guidelines outlined by Turk et al. [11]):

- C0: consonant onset of the accented syllable
- V: onset of vowel nucleus of the accented syllable
- C1: onset of consonant following the accented vowel

The scaling data were normalised by extracting the maximum and minimum Hz values over the whole data set for each speaker and calculating each individual value as a percentage of these ranges. This resulted in speaker-specific normalised values on a linear scale (following Mennen [9]). The alignment of the peaks was expressed as a percentage of the vowel duration.

We tested whether both sentence type and temporal constraints had an influence on the scaling and alignment of tonal targets. Three-way MANOVAs were conducted to test the hypotheses. As the data set also included information about the upcoming and preceding tonal events (to investigate the realisation of targets in conditions of plenty of space of compared with less space), the prenuclear

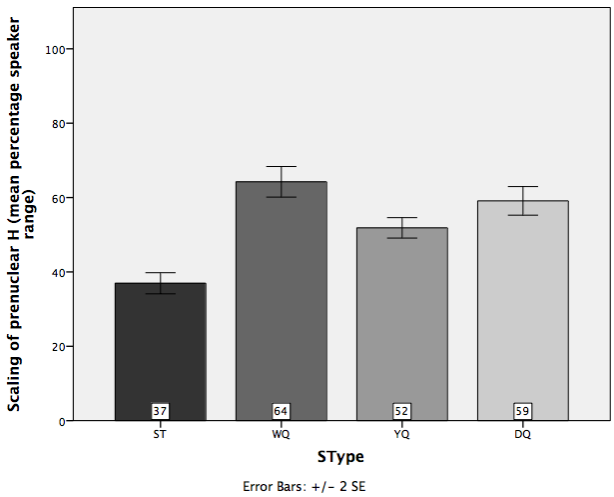
and nuclear targets were subjected to different statistical tests. The prenuclear MANOVA investigated the effect of sentence type, the size of the anacrusis (the number of syllables preceding the prenuclear accented syllable) and the number of syllables between the prenuclear and nuclear accented syllables. The nuclear targets were subjected to a three-way MANOVA with sentence type, number of syllables between and tail length (the number of syllables following the nuclear accented syllable) as independent variables.

3. RESULTS

3.1. Scaling of peaks

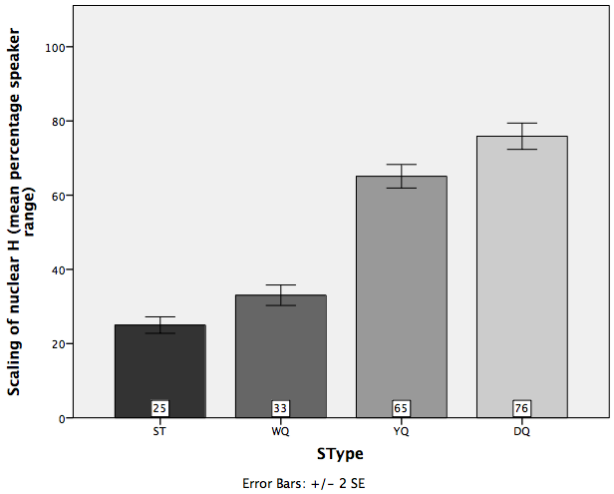
The data show that sentence type is a significant factor in the scaling of the pitch peak in both prenuclear position [$F(3,313) = 25.9$, $p = .001$]. Post hoc comparisons showed that the statements were significantly lower than all three of the questions [p values < .002] and that there were significant differences between YQ and DQ [p < .030] and YQ and WQ [p = .001] but not between DQ and WQ [p = .134]. As can be seen from Figure 1 below, the scaling of the H peak is higher in all three of the questions as compared with the statements. The lowest scaling of prenuclear H is found in the statement (at 37% of speaker range), and the highest is found in the DQ and WQ (between 59 and 64% of the speaker range).

Figure 1: Scaling of prenuclear H in the four sentence types expressed as a percentage of speaker pitch range



In nuclear position, the sentence type significantly affected the scaling of the pitch peak [$F(3,308) = 185.6$, $p = .001$]. The post hoc comparisons revealed that there were significant differences between all sentence types [p values < .001]. As can be seen from Figure 2 below, the nuclear peak is scaled highest in questions where there is no lexico-syntactic cue to interrogativity (DQ) at around 76% of the speaker range and lowest in questions where there is the most lexico-syntactic marking for interrogativity (WQ) at 33% of the speaker range, corroborating findings by Haan for Dutch.

Figure 2: Scaling of nuclear H in the four sentence types expressed as a percentage of speaker pitch range



In terms of the reduction of syllabic material in which to realise the contours, for both prenuclear and nuclear tonal targets, the amount of space available for accents to occur (preceding, between and tail) was not found to significantly affect the height of the peaks.

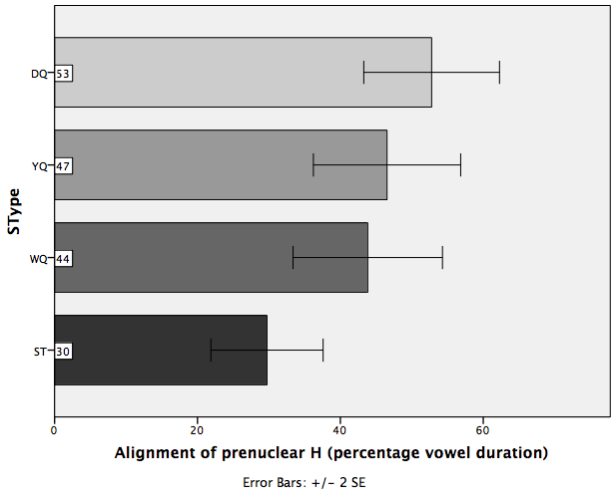
3.2. Alignment of peaks

The alignment ratios showed that the H peak consistently aligned within the accented vowel in both prenuclear and nuclear position. However, the data show that SENTENCE TYPE is a significant factor in the alignment of the pitch peak in prenuclear position [$F(3, 311) = 7.1$, $p = .001$]. The post hoc comparisons show that there was significantly later alignment of the peak in declarative questions than statements [p = .001] and yes-no questions than statements [p = .030]. As can be seen from Figure 3 below, alignment is later in the questions than in the statements overall.

Furthermore, this later alignment appears to vary as a function of the lexico-syntactic cues to interrogativity. The peak is aligned earliest (30% of accented vowel duration) in statements. The earliest aligned question peak occurs in the lexically marked wh-question (44% of accented vowel duration) followed by peaks in yes-no questions (47% of accented vowel duration) and latest in the lexico-

syntactically unmarked declarative question (53% of accented vowel duration), providing support for the Functional Hypothesis [5] in terms of alignment.

Figure 3: Alignment of prenuclear H in the four sentence types expressed as a proportion of the accented vowel



However, there was no significant effect of sentence type on the alignment of the *nuclear* pitch peaks. This suggests that in nuclear position, only the scaling of the pitch peaks is used to cue the interrogatives.

There were also re-adjustments to the alignment of the peaks in both prenuclear and nuclear position as a result of restrictions placed on the number of syllables available in which to realise the contour. The data for nuclear position show that there were significant re-adjustments as a result of the number of syllables available following the nuclear accented syllable (the tail) [$F(1, 284) = 39.4$, $p < .001$]. The nuclear peak was aligned later when there was one syllable following the accented syllable than when there were no syllables following the accented syllable.

4. DISCUSSION

The present study examined the intonational encoding of interrogativity in Anglesey Welsh. The data shown in this paper have provided clear evidence that sentence type affects the scaling of H peaks in both prenuclear and nuclear position: H peaks of interrogatives (WQ, YQ and DQ) are higher than corresponding statements, corroborating findings for other languages [2, 3, 4, 5, 8, 10]. Furthermore, the findings showed that there was an apparent trade off between the lexico-syntactic cues to interrogativity and *nuclear* pitch peak height, following Haan's Functional Hypothesis [5]. The data also confirm that there is a tendency for later alignment in prenuclear accent peaks in questions than in statements, reinforcing findings for a number of languages [2, 3, 7, 8, 10]. Furthermore, this alignment of peaks appears later as a function of the lexical cues to interrogativity, also tying in with the Functional Hypothesis.

Given that these features are consistently found across all six speakers in the corpus, it will be beneficial to investigate how such factors affect the perception of the question/statement contrast in future research.

5. ACKNOWLEDGMENTS

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