Wug-testing phonetic prominence in Munster Irish

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Abstract

8 speakers of Munster Irish were presented with a series of disyllabic nonwords and directed to read them aloud in a carrier phrase. Each nonword corresponded to a different pairing of syllable weights (e.g. light-heavy, heavy-light), said to determine lexical stress placement in the variety. A binomial logistic regression examined phonetic measures of prominence as predictors of syllable location, and mixed-effect multiple linear regressions evaluated weight-pairings as predictors of cross-syllable change in the same measures. Results suggest a great deal of inter- and intraspeaker variation, and no clear role of weight in determining assignment of prominence. This is relevant for work on the complex stress system typically attributed to Munster Irish, and for critical examinations of stress description beyond Irish.

Key words: Phonetics, prominence, weight, Bayesian, Irish

Introduction

Munster Irish (MI) is said to exhibit a complex system of weight-sensitive lexical stress, diverging from the initial stress of other Irish varieties (Ó Sé 1989; Doherty 1991). A ternary weight hierarchy – VV/V: > [ax] > V – is used in a stress domain of the first three syllables of a word. Initial stress obtains when this domain contains only light syllables, and otherwise the rightmost heavy syllable in the domain is stressed. Stress is non-contrastive. There are numerous lexical exceptions, and the system's origins and precise details are disputed.

Formal accounts of MI stress typically use impressionistic, non-L1 descriptions by early-20th-century dialectologists as input (e.g., O'Rahilly 1932). Recent, ongoing phonetic investigation of conservative recordings from 1928 has questioned the accuracy of these complex descriptions (McCabe 2021).

A 'wug' (nonword) task was devised to investigate whether present-day MI speakers productively use syllable weight to assign stress to unknown words.

Methods & Materials

The syllables /bʸa/, /bʸax/, and /bʸɑː/ were combined to create 36 di- and trisyllabic nonwords. The present discussion is restricted to disyllables.

Targets were presented in the carrier phrase *Cad a dúirt an __? Dúirt an __ 'Tá.'* ('What did the __ say? The __ said 'Yes.'"), with the second instance used for measurement. The first instance allowed for brief familiarisation with the target. Participants were told to treat the nonwords as foreign governmental

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titles, akin to the untranslated use of Irish titles like *Taoiseach* ('chieftain'/'prime minister') in English-language media, to facilitate relatively natural reading. Participants were directed to emphasise the answer given (i.e. *Tá* 'Is'/'Yes'), in order to draw phrasal focus, which has the potential to mask or distort the implementation of lexical stress (de Lacy 2014), away from the nonword.

8 L1-MI participants were recruited online. Elicitation sessions took place over Zoom due to public health restrictions, with participants being coached to record themselves locally using Audacity. Materials were presented in PowerPoint via Zoom, with stimuli in pseudorandomised orders over 5 trials, for a total of 360 tokens (8 participants x 9 disyllabic targets x 5 trials).

Segmentally flawed tokens (e.g. /bʸaxa/ or /bʸabʸabʸa/ for target /bʸabʸa/) were discarded. Participant error rates ranged from 0-32.5%, leading to a total of 322 usable tokens.

Table 1. Disyllabic nonwords representing all 9 permutations of the 3 traditionally described weight-categories

Weight	**Light (V)**	**/ax/**	**Heavy (V:)**
Light (V)	*baba* /bʸabʸa/	*babach* /bʸabʸax/	*babá* /bʸabʸɑ:/
/ax/	*bacha* /bʸaxa/	*bachach* /bʸaxax/	*bacha* /bʸaxa/
Heavy (V:)	*bába* /bʸɑ:bʸa/	*bábach* /bʸɑ:bʸax/	*bábá* /bʸɑ:bʸɑ:/

Analysis & Results

Praat was used to label individual words and syllables, and to automatically extract the following syllable-level measures: duration, mean intensity, minimum, maximum, and mean F0, mean F1, and mean F2. Minimum and maximum F0 were used to calculate the range of F0 on a given syllable. Measurements were z-scored at the level of the individual speaker to facilitate interspeaker comparison. Statistical analysis explicitly avoided reference to prescribed location of phonological 'stress', instead focussing on the relationship between phonetic prominence(s) and syllable position.

First, a binomial logistic regression was fitted using Bayesian methods. Speaker-normalised mean intensity, F0 range, mean F1, mean F2, and the interaction between mean intensity and F0 range were used as predictors of the log-likelihood that a given syllable was the final syllable of a disyllabic target. In other words, this asked whether an exaggeration in one or more phonetic exponents of prominence favoured a particular syllable position, and indeed whether different exponents (e.g. pitch and intensity) behaved uniformly. F0 range was selected over a measure of F0 height to focus exclusively on pitch *excursion*, as both rising and falling pitch accents are attested in Irish; high F0 does not necessarily indicate stress. F1 and F2 were included as indicators of vowel reduction in line with previous work on lexical prominence in the variety (Blum 2018). Duration was not used due to its robust contrastive status in the language. Random slopes by speaker, target, and repetition were included for all

predictors. These incorporate the potential for wide variability between speaker strategies, between targets of different weight structure, and for change as the nonwords became more familiar over the course of the task. Weakly informative, normally-distributed priors were used for a model comprising 4 chains of 5000 iterations with a warmup of 1000 iterations.

Speaker normalised mean intensity and mean F2 emerged as the best predictors of a final-syllable classification, both with negative slopes. Increased intensity and decreased vowel backness appear to disfavour second syllables, albeit with very wide 95% credible intervals. All other credible intervals substantially overlap with 0, meaning that a null effect should not be ruled out.

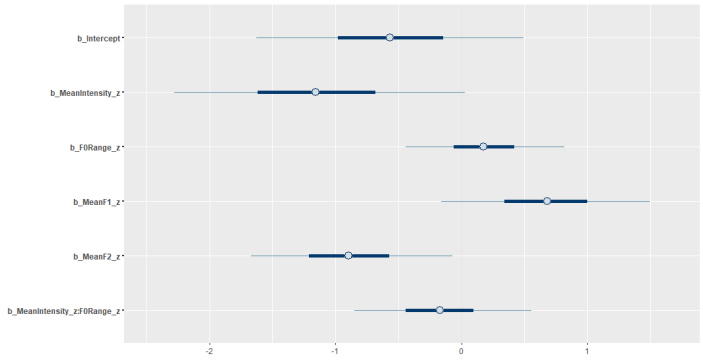

Figure 1. Joint posterior distribution of population-level effects for the binomial logistic regression, showing 95% credible intervals for change in log-likelihood of a final-syllable classification per increase of one standard deviation in the parameter(s) in question.

Additionally, 4 Bayesian mixed-effect multiple linear regressions were fitted using target identity as a predictor of cross-syllable change in speaker-normalised mean intensity, F0 range, mean F1, and mean F2, again with weakly informative, normally distributed priors and random slopes fitted by speaker and repetition. This looked for evidence of consistent directionality of change in phonetic prominence(s) in different weight pairings. For example, light-heavy *babá* might be expected to predict positive cross-syllable change in intensity and/or pitch range if speakers consistently stress the heavier final syllable, and vice versa for heavy-light *bába*.

None of said mixed-effect linear regressions returned evidence of predictive value for any of the parameters used. 95% credible intervals for the effect of all target identities on slope of cross-syllable change all heavily overlap with 0. Individual distributions are not included due to space constraints. These results fail to provide any obvious support for a productive role of syllable weight in the implementation of straightforward phonetic correlates of lexical stress.

Discussion & Conclusion

Native speakers of MI were asked to produce disyllabic nonwords corresponding to pairings of the three different weight categories traditionally said to determine the location of lexical stress in the variety. Results of a binomial logistic regression broadly suggest that, even with different weight-pairings taken into account, increased mean intensity and decreased vowel backness both weakly favour initial syllables, with no measured parameter appearing to favour final syllables. This may suggest a weak preference for initial stress in unfamiliar words, regardless of weight structure. Results of a series of mixed-effect multiple linear regressions do not indicate predictive utility for different weight-pairings with regard to cross-syllable change in measures of intensity, pitch range, and vowel quality.

These results are preliminary, and subject to ongoing refinement as part of the author's PhD. The sample size presented is small, although Bayesian methods allow for greater inferential flexibility in this regard than frequentist statistics. However, the near total lack of evidence for speakers' use of weight-based criteria for assigning prominence to unfamiliar nonwords is of interest.

It is impossible to collect new, controlled data from the era in which impressions of MI's purportedly weight-based stress system were initially recorded. The present data are able to divorce questions of stress and prominence from complex etymological concerns, and focus directly on speakers' default strategies for assigning prominence to unfamiliar words. A weight-based account of stress in historical or present-day MI cannot yet be ruled out. Nevertheless, the above results suggest, at the very least, that the existence and productivity of such a system should not be taken for granted.

References

Blum, E. 2018. Allophony-driven stress in Munster Irish. Manuscript, Rutgers University.

Bürkner, P. 2018. Advanced Bayesian Multivel Modeling with the R packing brms. *The R Journal* 10(1), 395-411.

Doherty, C. 1991. Munster Irish stress. In Proceedings of the 10th West Coast Conference on Formal Linguistics, 115-126.

de Lacy, P. 2014. Evaluating evidence for stress systems. In H. van der Hulst (ed.) Word Stress: Theoretical and Typological Issues. Cambridge: CUP, 149-193.

McCabe, C. 2021. Revisiting assumptions stress and 'stress-shift' in Munster Irish. Poster. Phonetics & Phonology in Europe IV, 21-23 June 2021.

O'Rahilly, T.F. 1932. Irish Dialects Past & Present. Dublin: Brown & Nolan.

Ó Sé, D. 1989. Contributions to the study of word stress in Irish. *Ériu* 40, 147-178.