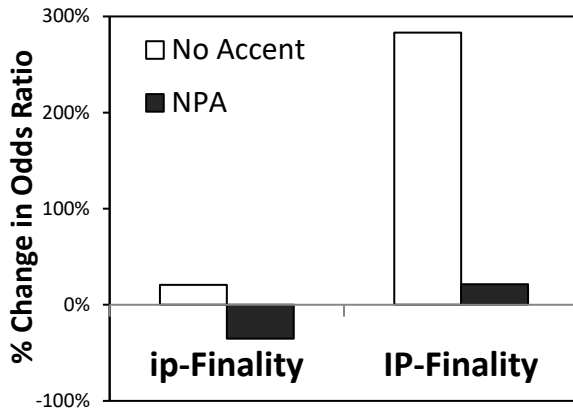# On the perceived prominence of non-prominent words

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Using tasks such as Rapid Prosody Transcription (**RPT**; Cole et al., 2010) and other rating methodology (e.g., Eriksson et al., 2002; Jagdfeld & Baumann, 2011; Bishop, 2012) considerable attention has been devoted to identifying the correlates of perceived prominence—correlates that are both bottom-up and top-down in nature (e.g., Kochanski et al., 2005; Cole et al., 2010; Bishop, 2012). A basic finding in this work, at least for head-marking languages like English and German, is that the factors that predict intonational pitch accent—i.e., phonological prominence—also predict perceived prominence in behavioral tasks (Eriksson et al., 2002; Cole et al., 2010). Consistent with this, when pitch accents themselves are the predictors, the presence of a pitch-accent strongly predicts perceived prominence by human listeners (Baumann & Röhr, 2015; Cole, Mahrt, & Roy, 2017; Bishop & Kuo, in prep). What we explore in the present study is prominence perception that occurs in the *absence* of pitch accent—i.e., the perceived prominence of phonologically *non*-prominent words. The motivation for asking this question comes from a finding in Bishop & Kuo (in prep), in which English-speaking listeners in a RPT task identified as prominent approximately 10% of the words labeled as unaccented by two ToBI labelers. The goal of the present analysis was therefore to determine what factors best predict listeners' perceived prominence for this unaccented subset of the corpus, since presumably these words lack phonological marking.

We approached this question by asking whether (and to what extent) the same factors that predict the perceived prominence of pitch accented words also predict the perceived prominence of unaccented words. Our analysis relied upon mixed-effects logistic regression to model prominence judgments in the unaccented portion of Bishop and Kuo's (in prep) dataset, which amounted to approximately 29,000 listener judgments, comparing it with the portions that included judgments of prenuclear-accented (15,000) and nuclear-accented (13,000) words. In approaching the modeling, we distinguished factors that were bottom-up (e.g., acoustic properties) versus top-down (e.g., linguistic structure/lexical statistics). One hypothesis we were interested in testing was that top-down factors would have a larger effect on prominence perception for unaccented words than for accented words.

In brief, preliminary analyses found that prominence judgments for unaccented words were largely predicted by the same factors that predicted prominence judgments for accented words—and highly significantly so in all cases. We therefore focus here on the effect sizes, which did differ. First, we found a tendency for two acoustic predictors, duration and f0, to have smaller effects on prominence judgments for unaccented words compared with unaccented words (not shown). Second, we found one top-down factor, phrase position, to have a far larger effect on the perceived prominence of unaccented words than accented words; being phrase-final in an Intonational Phrase increased the odds ratio of being perceived as prominent dramatically (Fig.1). Finally, we found factors such as repeated mentions in the materials and lexical frequency to have more complex and asymmetric effects (Fig. 2), which we discuss in terms of predictability (see Calhoun 2006).

Fig.1 Magnitude of the effect of intermediate and Intonational phrase position on the perceived prominence of unaccented versus (nuclear) pitch accented words. (Note that prenuclear pitch accented words cannot occur phrase-finally)
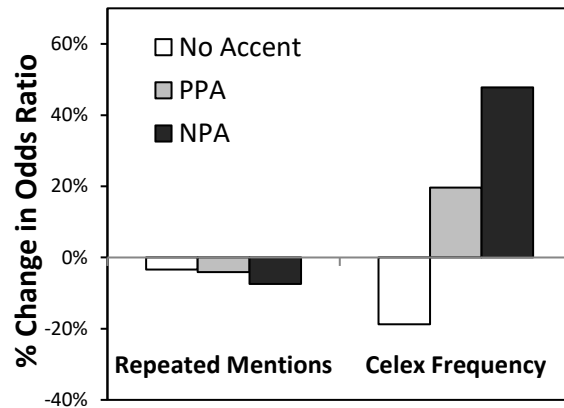
Fig.2 Magnitude of the effects of (a) repeated mentions and (b) lexical frequency on the perceived prominence of unaccented, prenuclear accented, and nuclear accented words.

References

Baumann, S., & Röhr, C. (2015). The perceptual prominence of pitch accent types in German. In *Proceedings of the 18th International Congress of the Phonetic Sciences*.

Bishop, J. (2012). Information structural expectations in the perception of prosodic prominence. In G. Elordieta & P. Prieto (Eds.): *Prosody and Meaning* (Trends in Linguistics). (pp. 239–270). Berlin: Mouton de Gruyter.

Bishop, J. & Kuo, G. (in prep). Prominence and boundary perception as predicted by intonational phonology and individual differences in pragmatic skill. *Journal of Phonetics*.

Calhoun, S. (2006). Information structure and the prosodic structure of English: A probabilistic relationship. Ph.D. dissertation, University of Edinburgh.

Cole, J., Mahrt, T., & Roy, J. (2017). Crowd-sourcing prosodic annotation. *Computer Speech & Language*, *45*, 300–325.

Cole, J., Mo, Y., & Hasegawa-Johnson, M. (2010). Signal-based and expectation-based factors in the perception of prosodic prominence. *Laboratory Phonology*, *1*(2), 425–452.

Eriksson, A., Grabe E., & Traunmüller, H. (2002). Perception of syllable prominence by listeners with and without competence in the tested language. *Proceedings Speech Prosody 2002*, Aix-en-Provence, 275-278.

Jagdfeld, N., & Baumann, S. (2011). Order effects on the perception of relative prominence. *Proceedings 17th ICPhS, Hongkong, China*, 958–961.

Kochanski, G., Grabe, E., Coleman, J., & Rosner, B. (2005). Loudness predicts prominence: Fundamental frequency lends little. *The Journal of the Acoustical Society of America*, *118*(2), 1038–1054.