

THE ACOUSTIC CORRELATES OF THE UNPARSED : WHY WE NEED MORE THAN A STRONG-WEAK DISTINCTION

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1. INTRODUCTION

This paper reports results from 2 experiments on St'át'imcets (Lillooet Salish) that test the prediction that phonologically distinct domains in the Prosodic Hierarchy are also acoustically distinct. In particular, that when a phonological distinction between non-prominent syllables exists, an acoustic distinction should also be produced by speakers, contra the traditionally assumed strong-weak dichotomy. These acoustic differences should be reflected in traditional prominence cues as well as boundary effects.

The current model of the Prosodic Hierarchy permits a 3-way syllable distinction at Pword level [1]: 1) stressed head of foot, 2) unstressed non-head of foot, and 3) unstressed, unparsed at foot level, or 'extrapod'. Stressed syllables are accepted to be more prominent or stronger (have higher F₀, duration and intensity) than unstressed [2]. However, the acoustic characteristics of this third type of syllable have been ignored. It has generally been assumed that extrapods and unstressed syllables are indistinguishably non-prominent or 'weak' [3][4].

Another underlying principle of the current model is that the prosodic constituents which are the domains of phonological processes are acoustically distinct [5]. These distinctions are generally discussed in terms of prominence, as above, or Prosodic Strengthening [6].

If the model permits a ternary syllable distinction at the Pword level, then given a systematic mapping, there should also be a ternary acoustic distinction. This predicts that if footed, unstressed syllables and extrapods are shown to be phonologically distinct domains, they should also be acoustically distinct. Testing this prediction requires a language that makes such a phonological distinction.

St'át'imcets presents a case in which some word-final suffix vowels are subject to phonological reduction when they are parsed as footed, unstressed syllables but not extrapods [7]. If the hypothesis above is correct, this predicts St'át'imcets word-final unstressed syllables and extrapods should show distinct acoustic characteristics.

Experiment 1 compares the prominence cues of Pword-final unstressed syllables and extrapods. The prediction tested is that extrapods will be more prominent in terms of F₀, duration and intensity than unstressed syllables.

Experiment 2 focuses on boundary effects. It has been shown that a vowel's position on the F₁/F₂ plane is more peripheral at higher boundaries in the Prosodic Hierarchy [6]. The prediction tested here is that, given that Pword-final extrapods lack a foot boundary, they will be less peripheral on the F₁/F₂ plane than Pword-final footed, unstressed syllables.

2. METHOD

2.1 Participants

Participants in both experiments were 4 fluent St'át'imcets speakers. AP: female, 64 yrs, Northern dialect and LT: female, 77 yrs, Southern dialect, took part in both experiments. RW: female, 77 yrs, Northern dialect and CS: 85 yrs, Northern dialect participated in Experiment 1. CA: male, 67 yrs, Northern dialect; and HD: male, 70yrs, Southern dialect, participated in experiment 2.

2.2 Stimuli

Stimuli in both experiments were word-final suffixes containing /a,i,u/. Tokens in which the suffix was parsed as footed, unstressed syllables or extrapods were created and checked with speakers. In experiment 1, 1sg.subj. /-ʔkan/, 3pl.subj. /-wit/ and 3pl.obj. /-tumuʔ/ were selected. In experiment 2, possessive suffixes were selected: 2sg /-ʂu/, 3sg. /-ʂa/ and 3pl. /-i/. In both cases, tokens were placed in contextual target sentences that controlled for intonation. Due to dialect differences, speakers in experiment 2 were presented with 2 vowels each. 22 repetitions of each token were recorded. For experiment 1: 3 vowels x 2 syllable types x 22 repetitions = 132 tokens per speaker. For experiment 2: 2 vowels x 2 syllable types x 22 repetitions = 88 tokens per speaker.

2.3 Experiment procedure

In both experiments, speakers were shown MS PPT slides with pictorial scenarios to elicit the target sentence. In experiment 1, speakers answered a St'át'imcets yes/no question based on what they saw on the slide. In experiment 2, the target sentence was an imperative of the type "Give /his/her/their/your object to me/Henry", with a slide showing the object and the recipient. Speakers could choose to be prompted in English. All speakers were recorded using a Marantz PMD660 solid-state recorder and Audio-technica ATM75 head-mounted cardioid condenser microphone in a private home.

2.4 Acoustical analysis procedure

Measurements for both experiments were done in PRAAT [8]. Vowels were segmented and a script was used to extract duration and F₀ and intensity at midpoint of the vowel. Within subject comparisons were done using independent sample t-tests with conservative p-factors $P=.000$ =*** $p\leq.01$ =**, $p\leq.05$ * [9].

3. RESULTS

All speakers make a prominence distinction between Pword-final unstressed syllables and extrapods. In addition, 3 of 4 speakers show boundary effects as well.

3.1 Prominence Effects

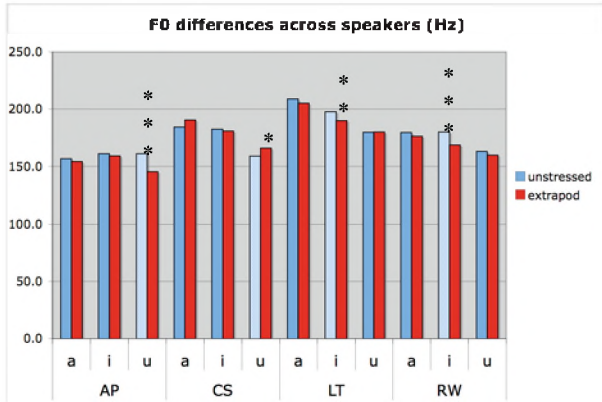


Figure 1 Mean F0 values for vowels across speakers.

Figure 1 shows that all speakers make a distinction in F0 in either /i/ or /u. For 3 of the 4 speakers, unstressed vowels had higher pitch than extrapods.

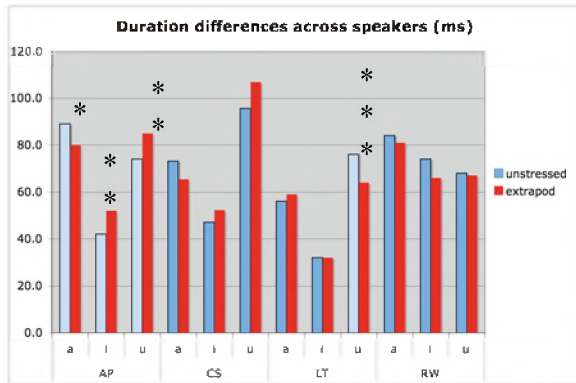


Figure 2 Mean duration values for vowels across speakers

Figure 2 shows only 2 speakers make a duration distinction, in half of which, extrapods were longer than unstressed syllables.

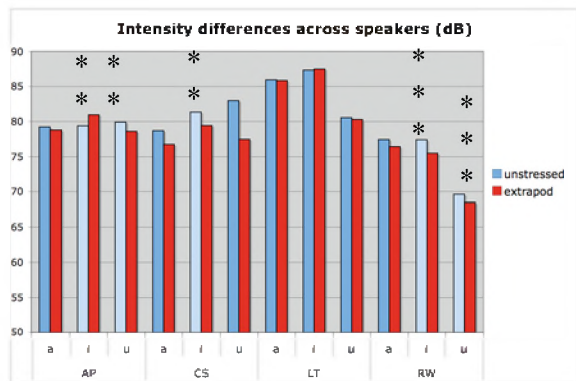


Figure 3 Mean intensity values for vowels across speakers

Figure 3 shows that 3 speakers show significantly greater intensity in unstressed syllables than extrapods.

3.2 Boundary Effects

3 speakers make a distinction at Pword level in F1/F2 values: AP makes no distinction. CA's unstressed /a/ is *

higher than extrapod, and unstressed /u/ is **backer. HD's unstressed /i/ is **fronter than extrapod, and LT's unstressed /i/ is **higher and ***fronter than extrapod.

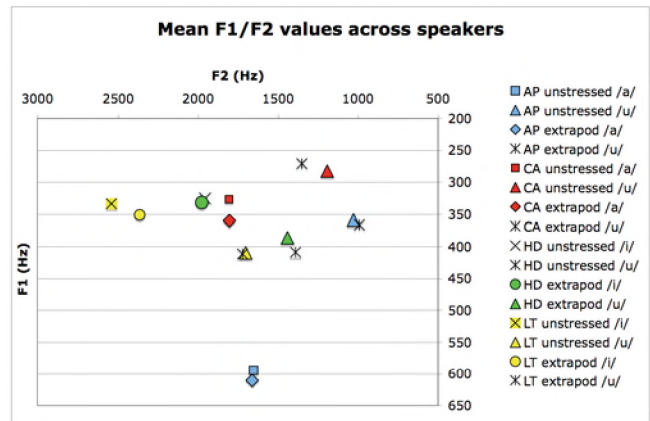


Figure 4 Mean F1/F2 values

4. DISCUSSION

These results support the prediction that a phonological distinction at Pword level is reflected in an acoustic distinction. The direction of the difference was not as predicted for the prominence results—in the majority of cases, unstressed syllables were more prominent than extrapods. The direction of boundary effects were as predicted, with unstressed syllables being more peripheral than extrapods. This supports a version of Prosodic Strengthening that is sensitive to all boundaries, not just the outermost one.

The differences between footed, unstressed vowels and extrapods cannot be accounted for in terms of stress, or positional effects: both are unstressed (weak) and occur word finally. The difference is that one is a constituent of a foot, while the other is not. Parsing, in addition to headedness, or strength, must be taken into account when characterising syllables at the Pword level.

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