Sonority-driven stress does not exist

Shu-hao Shih
Rutgers University

1. Introduction: This talk presents a new claim about sonority-driven stress: namely that there is no such phenomenon. This proposal contrasts with Kenstowicz (1997) and de Lacy (2002 et seq.)'s proposals that metrical structure can be sensitive to sonority. I will first show that Gujarati is central to the evidentiary claims that sonority-driven stress exists. I will then argue that Gujarati does not have sonority-driven stress – the head syllable is consistently the penult. Finally, I will present a theoretical proposal that explains why vowel reduction in unstressed syllables and sonority increase in stressed syllables is possible, but sonority-driven stress is not.

2. Conflicting Accounts: Two types of stress patterns have been reported for Gujarati: penultimate stress (Turner 1921, Master 1925, Patel & Mody 1960) and sonority-driven stress (Cardona 1965, Adenwala 1968, de Lacy 2002, Doctor 2004, among others). The sonority-driven stress descriptions generally agree that a syllable that contains the most sonorous vowel [a] always attracts stress, whereas the least sonorous vowel [ə] repels stress. However, the descriptions are impressionistic – no acoustic or phonological evidence is provided. This study is the first to examine the acoustic realization of sonority-driven stress in Gujarati. I report the results of two experiments that aimed to determine whether stress is attracted by [a] and retracts from a penult [ə] onto a non-[ə] initial syllable.

3. Methodology & Predictions: Four male and two female native Gujarati speakers participated in the experiment (ages between 19 and 25 years old). For the experiment on [a], disyllabic words with the shape [Ca_1Ca_2], [Ca_3CV], and [CVCa_4] (where V ranges over [o, u, i, ə]) were used to allow multiple comparison of [a] in both putatively stressed and unstressed states. Crucially, the penultimate hypothesis predicts [a_4] to be unstressed, but the sonority-driven hypothesis predicts it to be stressed. For the experiment on [ə], trisyllabic words with the shape [Cu.C$ə_1$C.CV] and [C$ə_2$.C$ə_3$C.CV] were examined. The penultimate hypothesis predicts [$ə_1$] and [$ə_3$] to be stressed, whereas the sonority-driven hypothesis says only [$ə_3$] is stressed because the antepenult is [$ə_2$]. Each word was placed in two frame sentences to control for phrasal-final lengthening. Acoustic correlates of stressed/unstressed vowels were measured, including intensity, duration, F0, F1 and F2. The results of each measure were analyzed using linear mixed effect models.

4. Results: According to all descriptions, the penult is the default location for stress. In [Ca_1Ca_2] words, [a_1] in [Ca_1Ca_2] was found to have significantly longer duration, higher intensity, and higher F1 than [a_2] (Duration: [a_1]=95.3 ms, [a_2]=78.7 ms, $p<0.01$; Intensity: [a_1]=73.3 dB, [a_2]=70 dB, $p<0.01$; F1: [a_1]=867.4 Hz, [a_2]=666.6 Hz, $p<0.01$). As expected, [a_3] in [Ca_3CV] was found to be the same as the 'stressed' [a_1] (Duration=98.2 ms, p=0.986; Intensity=75 dB, p=0.435; F1=844.5 Hz, p=0.0624). Previous descriptions have reported that [a_4] in [CVCa_4] is stressed – this is essential to the claim that Gujarati has sonority-driven stress. However, [a_4] had the same quality and intensity as the 'unstressed' [a_2] in [Ca_1Ca_2] (F1=690.7 Hz, p=0.336; Intensity=72 dB, p=0.382). Therefore, the results show that stress is not attracted by [a] but always falls on the penultimate syllable.

If [ə] repels stress, [$ə_1$] in [Cu.C$ə_1$C.CV] words is expected to be realized the same as the 'unstressed' [$ə_2$] in [C$ə_2$.C$ə_3$C.CV]. However, [$ə_1$] was found to be more peripheral than [$ə_2$] (F2: [$ə_1$]=1309.3 Hz, [$ə_2$]=1594.1 Hz, p<0.01), but the same as [$ə_3$] (F2=1305.6, p=0.9713). The results from schwa also support the penultimate hypothesis since both [$ə_1$] and [$ə_3$] are in the penultimate syllable. There was no evidence of a duration, F0, or intensity difference between the schwas. In sum, vowel quality is the most robust cue for stress in Gujarati: stressed vowels are more peripheral while unstressed vowels are more central, as shown in Fig. 1 and 2.

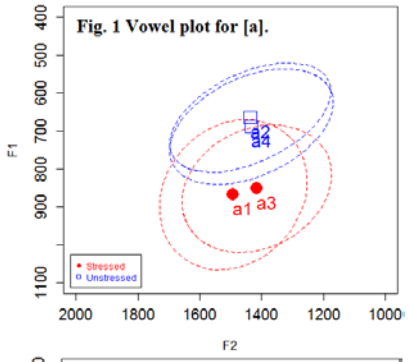

Fig. 1 Vowel plot for [a].

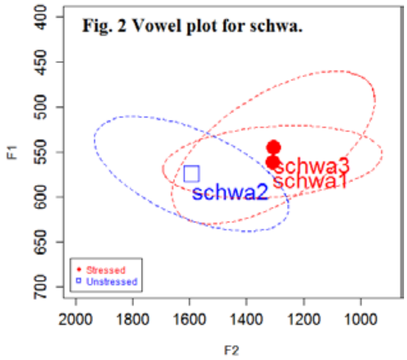

Fig. 2 Vowel plot for schwa.

5. Implications: Gujarati stress has been the subject of more descriptions than any other sonority-driven stress case, and is one of the very few cases where stress is sensitive to multiple sonority levels, and does not simply avoid schwa. Consequently, the disturbing implication is that if Gujarati does not have sonority-driven stress, perhaps none of the other cases do, either. This consequence then presents interesting challenges to OT's property of symmetric effects. For example, de Lacy (2002) argues that *HdFt≤{e,o} plays a crucial role in Gujarati stress (de Lacy 2002) since it is the foot head which requires high sonorous vowels. However, *HdFt/*v* cannot exist if there is no sonority-driven stress. Similarly, *non-HdFt/a cannot exist because it can be used to generate the Gujarati system. However, these constraints are necessary to account for stress-driven neutralization, deletion, and vowel reduction (de Lacy 2006:ch.7). I further show that stringent constraint formulation cannot avoid this problem. Instead, I argue that there is necessarily fixed constraint ranking, with those that locate prosodic structure (e.g. ALIGN-Ft-L) universally outranking constraints that refer to a prosodic node and sonority level (e.g. *Hd_{Ft}≥ə).

Selected References

Cardona, George (1965). *A Gujarati reference grammar*. Philadelphia: The University of Pennsylvania Press.

de Lacy, Paul (2002). *The formal expression of markedness*. Doctoral dissertation, University of Massachusetts, Amherst. Amherst, MA: GLSA Publications. ROA 542.

Doctor, Raimond (2004). *A grammar of Gujarati*. Muenchen: LINCOM GmbH.

Kenstowicz, Michael (1997). Quality-sensitive stress. *Rivista di Linguistica* 9.1. 157-188.

Turner, Ralph L (1921). Gujarati phonology. *Journal of the Royal Asiatic Society of Great Britain and Ireland* 3. 329–365.