



Investigating Lexical Stress in Hindi-Urdu Pop Music

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Background

Although Hindi-Urdu is described as having lexical stress, experimental studies have failed to find consistent acoustic correlates and perceptual cues that signal stress:

STUDY	STRESS?	KEY CORRELATES / FINDINGS
Dryud (2001); Pandey (2014)	✓ YES	LH Pitch Contour & Duration
Nair et al. (2001)	✓ YES	Duration (primary cue), Weaker formants; Doubtful centralization (secondary cues)
Mumtaz (2020)	✓ YES	Duration & Lower F0 / Mean ST in stressed syllable
Roy (2014, 2015)	✓ YES	Weighted Duration (Ratio of Pitch/Amp × Duration)
Ain (2023)	✓ YES	Existence of Secondary Stress
Féry (2010)	✗ NO	By-product of phrasal intonation
Ohala (1977, 1983b, 1986)	✗ NO	No significant difference in coda or nucleus duration
Ohala (1991, 1994)	✗ NO	Pragmatic only. No lexical stress; pitch varies by sentence frame

Table 1. Current Consensus on Acoustic Correlates of Stress in Hindi-Urdu

We present evidence consistent with proposals that Hindi-Urdu does not have lexical stress achieved from musical text-setting and confirmed with acoustic analysis.

What we did

- **Music Corpus:** 1,089 syllabic tokens from Hindi-Urdu pop songs
- **Controls:** Tempo restricted to 95–115 BPM
- **Transcription:** UPSID conventions for Hindi
- **Objective:** To operationalize the influence of stress on duration and syllable complexity on text-setting
- **Acoustic corpus:** 40,000 measurements of 262 syllables from VoxAngeles

Claim	Test
Heavy-light words	$\sigma_1 > \sigma_2$
Light-light words	$\sigma_1 > \sigma_2$
Words with Superheavy syllables	$\sigma_S > \sigma_{-S}$
$\neg\{Superheavy Heavy\}$ Light-Light	$L_1 > L_2$
Others involving Superheavy σ_*	—

Table 2. Claims made for stress and how they would manifest in syllable duration

Methods

We used Bayesian mixed effects modeling with weakly informative priors:

1. **Beat Interval Duration:** Modeled with ordinal logistic regression
2. **Beat Strength:** Modeled with logistic regression
3. **F0, F1, F2, H1-H2, H1-A1, H1-A2, H1-A3:** Modeled with GAMMs

Results

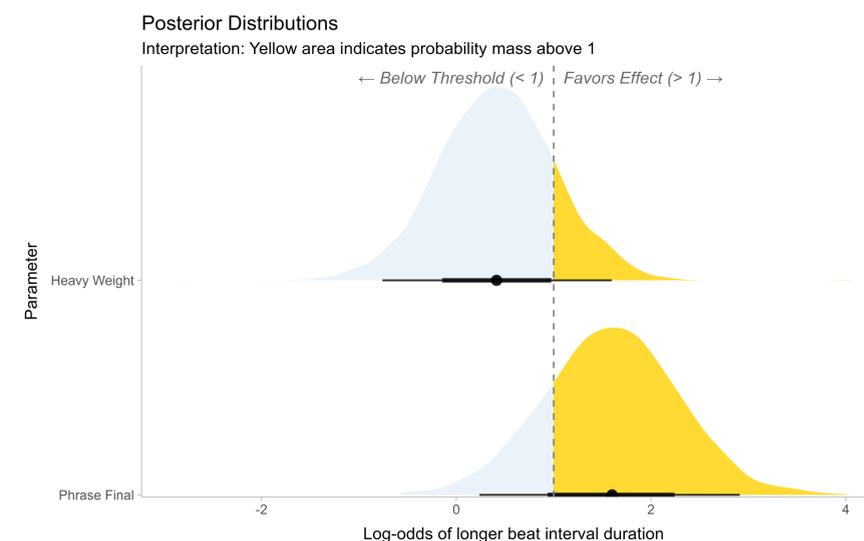


Figure 1. Log-odds of H being set to higher beat durations in a disyllabic HL word

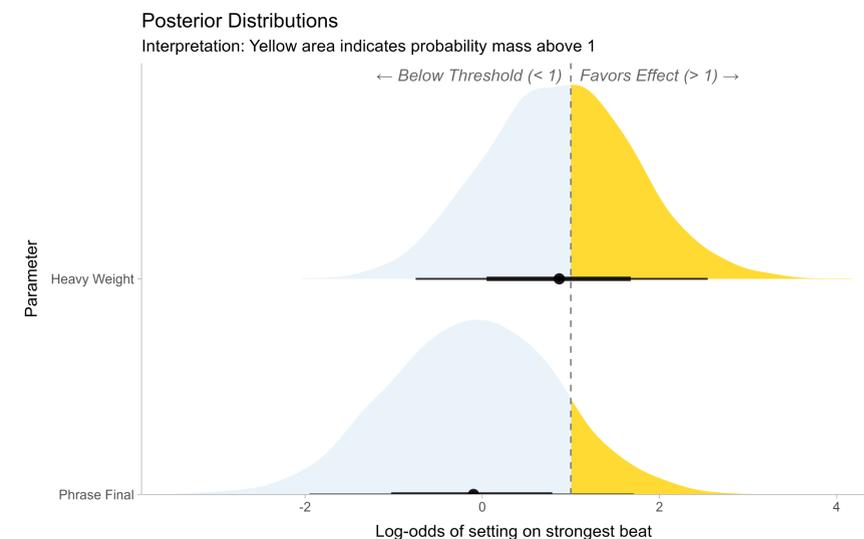


Figure 2. Log-odds of H being set on the strongest beat in a disyllabic HL word

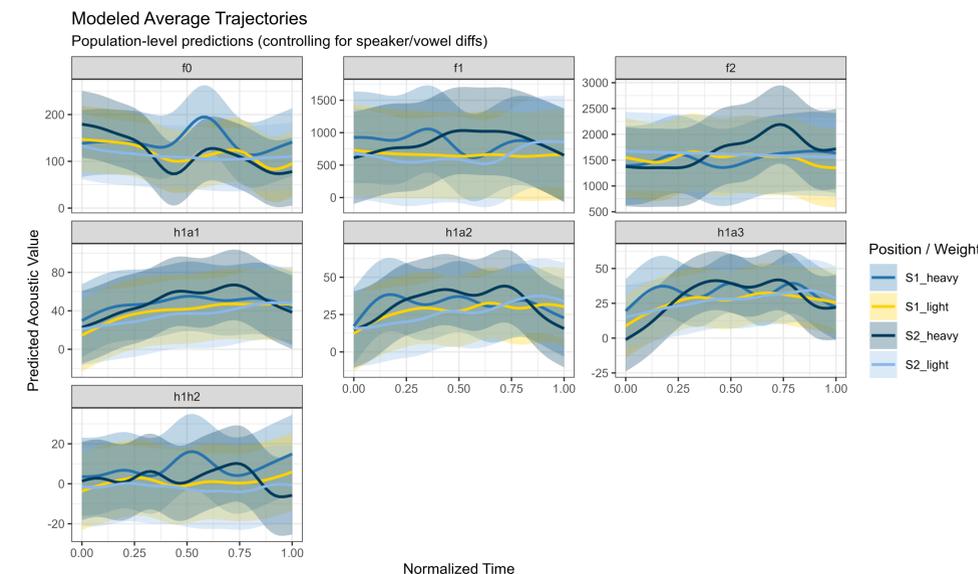


Figure 3. GAMM modeling of acoustic variables w/ best-fitting splines reveals no sig. dif. among acoustic trajectories of putatively (un)stressed syllables; only mid central vowels visualized.

Discussion

- **No evidence for lexical stress:** Hindi-Urdu pop music reveals no consistent patterns indicating a stress system.
- **Statistical results:** Posterior distributions overwhelmingly favored null or near-null effects.
- **Syllable alignment:** (Super)Heavy syllables alleged to be stressed are not set to longer beats; (super)heavy syllables show no preference for strong beats.
- **Acoustic indiscernibility:** Trajectories for F0, formants, and spectral tilt (H1-A1, H1-A2, H1-A3) show substantial overlap across putatively (un)stressed syllables.
- **Support for Ohala & Féry:** Findings confirm prominence is **phrasal or pragmatic**, not lexical. Text-setting acts as a "natural experiment" where rhythmic constraints failed to elicit stress.
- **Conclusion:** Preliminary combined text-setting and acoustic modeling confirms Hindi-Urdu **lacks phonologically encoded lexical stress**.

References

References available at tinyurl.com/hindi-stress

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