

Temporal Sequencing of Cues to Tone and Phonation is Phonological, Not Phonetic

Introduction: This paper presents original data from San Pablo Macuiltianguis Zapotec (MacZ), a Northern Sierra Juárez Zapotec language (ISO 639-3, zaa), providing evidence that the cues to contrastive tone and phonation in this language must be timed according to the phonological contrast they encode and not merely their phonetic implementation.

Background: When vowels carry both contrastive phonation and contrastive tone, the cues to these two phonological contrasts can be temporally configured in one of two ways: with cues to phonation either preceding or following cues to tone (Silverman, 1997). The sequencing of these cues prevents non-modal phonation from obscuring the percept of pitch that cues tonal contrasts (Silverman, 1997). In MacZ, F0 not only provides the cue to lexical tone but is also a subphonemic cue to phonation, at least in on words in citation form (Authors, forthcoming). MacZ is therefore useful in illuminating the nature of cue sequencing: If F0 cues to phonation occur earlier in the vowel where we also see F0 cues to tone, it can be argued that the temporal organization is based on the phonetic nature of the cue, with F0-based cues grouping together temporally regardless of their phonological association. If F0 cues to phonation occur later in the vowel along with the other cues to phonation, this would provide evidence that temporal organization is based on the level of phonological contrast, regardless of the specific cue to the contrast. That is, cues to phonological tone associate with the earlier portion of the vowel and cues to phonological phonation associate with the final portion.

Data: This study examines phonologically modal (V) and checked (V[?]) word-final vowels in MacZ. Bilingual native speakers heard each word in Spanish and were asked to repeat it in MacZ; they saw the Spanish and MacZ orthographic representations of the words throughout the task. The data reveal that 82.9% of the modal vowels were produced with a fluctuation or drop-off in F0 in the final portion of the vowel. Only 14% of checked vowels showed a similar pattern. We therefore analyze this F0 perturbation as a secondary cue to modal phonation, further distinguishing it from checked vowels, 97.7% of which surfaced with a glottal closure at the end of the vowel. Crucially, the F0 perturbation surfaces at the end of the duration of the modal vowels, just as glottalization occurs at the end of the duration of the checked vowels.

Implications: The timing of the F0 cue to phonation at the end of the vowel reveals that the sequencing of cues to tone and phonation is a matter of phonological, not phonetic, sequencing. Rather than occurring early in the vowel, when other F0 cues are realized, this F0 cue to phonation surfaces at the end, at the point in the vowel when other cues to phonation surface. Though future work is needed to determine whether the F0 cue to phonation is active in perception, this result provides strong evidence that grammatical knowledge about the temporal organization of subphonemic cues in production can exist in phonological module of the grammar.

References

- Silverman, D. (1997). Laryngeal complexity in Otomanguean vowels. *Phonology*, 14, 235–261.
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