

Prominence clash induces localized delays in production, not rhythmic readjustments

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In the phonological literature prominence clash is assumed to induce rhythmic readjustments in the first word of a clashing pair **Fig.1**. These effects are attributed to stress shift, aka the Rhythm Rule (e.g. Liberman & Prince 1977, Nespor & Vogel 1977, 1989), or to pitch accent deletion with early pitch accent insertion (e.g. Gussenhoven 1991). Phonetic studies of clash, however, have failed to observe the expected correlates of stress shift (e.g. Vogel *et al.* 1995, Grabe & Warren 1995) and are not fully compatible with pitch accent-based accounts (e.g. Horne 1990 vs Tilsen 2012). Italian, for example, is often assumed to display clash-driven rhythmic effects (e.g. Krämer 2009), but there is just a single phonetic study, limited to two speakers, that supports this view (Farnetani & Kori 1983). We conducted two acoustic studies with Italian speakers and found no evidence of prominence shift or deletion in measures of duration, F0, or intensity. To the contrary, we observed an increase of duration in the final vowel/syllable of word 1 in clashing word pairs. We also did not observe any effects on word 2 in clashing pairs. Accordingly, we argue that the main correlate of clash is a localized slowing of speech rate, not prominence shift or deletion.

Methods.

In Experiment 1, 16 speakers of Italian produced 10 x 36 unique trials elicited from visual stimuli (i.e. pictures) representing a three-word noun phrase consisting of a numeral (w0), a target noun with final stress (w1, *caffè* ‘coffee’, *città* ‘city’, and *colibrì* ‘hummingbird’), and a color term with different stress used to manipulate clash (w2).

In Experiment 2, 8 speakers of Italian produced an identical number of similar sequences, with stress varied in w1 (e.g. *colibrì* ‘hummingbird’ vs. *colùbro* a type of snake vs. *càlibro* ‘caliber’). The effects of clash were analyzed with Linear Mixed Effects regressions, with word and speaker as random factors.

Results. In Experiment 1 we found no significant effects of clash on duration, RMS intensity, or F0 of the initial vowel/syllable of w1. For example [ka] in *caffè* is not different before *néri* /*vérdi* vs *bordó* /*marróni*. Surprisingly, durations of the final vowel/syllable of w1 were *longer* in clash environments, contra the predictions of rhythmic readjustment analyses. For a subset of participants, vowel formants were also more extreme in clash, suggesting hyper-articulation. Experiment 2 replicated the findings of Exp. 1 (**Fig. 2**) and in addition it was found that clash had no effect on the duration, F0, intensity, or formants of the initial vowel of w2. For example, *néri* after *colibrì* is not different from *néri* after *colùbri*. This shows that clash effects are not manifested on the second word of the clashing pair.

Conclusions. Rhythmic analyses of prominence clash were not supported by our data: phonetic evidence for prominence shift or prominence deletion was not observed. Instead, the effects of clash on duration and vowel quality in the final syllable of w1 indicate slowing of speech rate and hyper-articulation. The observation that clash has effects on w1 but not w2 has consequences for analyses based on prosodic boundaries, which can be adapted to generate a variety of predictions. We discuss how the observed effects of prominence clash can be modeled in the framework of Articulatory Phonology (e.g. Gafos 2006, Tilsen 2019).

Experiment 1

Numeral (w0)	Target (w1)	Clash Manipulation (w2)
'no.ve	ca.'ffe	bor.'do
'du.e	ci.'tta	ma.'rro.ni
'mi.lle	co.li.'bri	'ne.ri
		'ver.di

Experiment 2

Numeral (w0)	Clash Manipulation (w1)	Target (w2)
'no.ve	'ca.li.bri	bor.'do
'du.e	co.'lu.bri	ma.'rro.ni
'mi.lle	co.li.'bri	'ne.ri

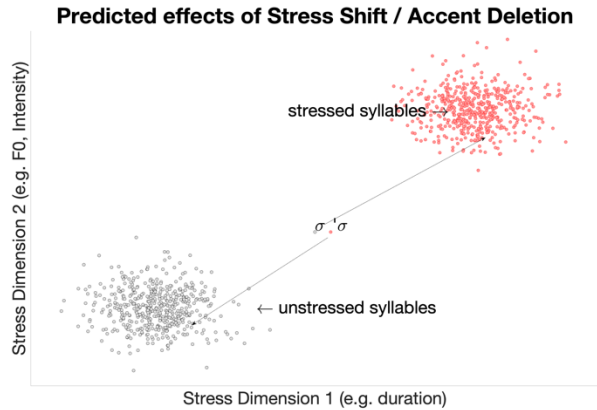


Fig. 1 Phonological prediction of ‘weakening’ of final lexical stress/pitch accent in clash and ‘strengthening’ of preceding unstressed syllable via stress shift or early pitch accent insertion.

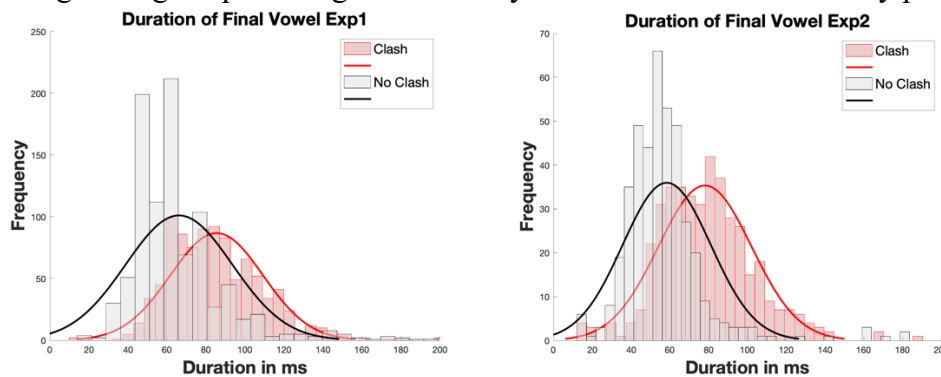


Fig. 2 Increased duration of final vowel of w1 in clash vs no clash.

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