The domain of phrase-final lengthening in English

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Abstract: Intonational phrase final lengthening is well established for the final syllable rime in English, and there is some evidence that lengthening extends further leftward and rightward from the boundary. We compare boundary-related duration lengthening in prosodically-disambiguated pairs of sentences like Please say (Eleanor and Stefanie) or (Dorothy) will stay vs. Please say (Eleanor) and (Stefanie or Dorothy) will stay, varying the number of syllables and stress pattern of the target words. Although preboundary lengthening affects the final syllable of the phrase most strongly, significant lengthening occurs leftward to the main-stress syllable. In addition, the post-boundary consonant is lengthened more than the rime, particularly if it follows a strong preboundary syllable.

A number of phenomena occur at the edges of the structural constituents of spoken utterances, including duration lengthening (Klatt 1976, Wightman et al. 1992), F0 markers (Pierrehumbert 1980, Beckman and Pierrehumbert 1986), voice quality changes (Henton and Bladon 1988, Pierrehumbert and Talkin 1992, Dilley et al. 1996), within-word location of pitch accents (Beckman and Edwards 1994, Shattuck-Hufnagel et al. 1994), and articulatory strengthening (Fougeron and Keating 1997); see also Byrd 1996. Evidence favors prosodic constituents over morphosyntactic constituents as the elements whose edges are marked, and the magnitude/likelihood of some edge effects varies systematically with the level of the constituent in the prosodic hierarchy (Ferreira 1991, Shattuck-Hufnagel et al. 1994, Shattuck-Hufnagel and Turk 1996, Fougeron and Keating 1997). Less is known about whether edge effects occur on both sides of the boundary, and how far they extend. Studies of Dutch (Cambier-Langeveld 1997), Estonian (Krull 1997), Hebrew (Berkovits 1995) and German (Kohler 1983, Silverman 1990) find some evidence of lengthening to the left of the phrase-final syllable. We examine utterances with contrasting intonational phrase boundaries, also varying target word structure to determine the domain of boundary-related lengthening.

METHODS

In this preliminary study, a single speaker produced pairs of utterances with contrasting intonational phrase boundaries in a string of words like Please say A and B or C will stay. Stimulus sentences: Each pair of utterances used the same triplet of target words A, B and C, with the intonational phrasing linking A and B in a single phrase or B or C. The target words in a triplet shared number of syllables (1 to 4), pattern of full vs. reduced vowels, and location of main lexical stress. Thirteen target word triads were used to construct 26 sentences. Instructions: The speaker read each sentence from a typed script, with the grouping indicated by parentheses; the set was read 4 times. Each utterance was produced with normal phonology and immediately imitated in reiterant speech with the syllable /mti/, a task with which the speaker was very familiar. Results for the reiterant versions are reported here. Informal listening revealed that the speaker had placed the intonational phrase boundaries in the predicted locations.

![Fig 1. Mean syllable durations for 3-syllable target words. Both panels show preboundary lengthening leftward to the main stress syllable, which is syllable 1 in the left panel and syllable 2 in the right panel.](image-url)
RESULTS

We compare the durations of preboundary vs. non-preboundary syllables and of post-boundary vs. non-postboundary onsets and rhymes. Pre-boundary lengthening is greatest in magnitude in the phrase-final syllable, whether it has a full or reduced vowel (see Fig 1), and lengthening extends leftward to the most prominent syllable in the final word. Fig 1 shows that lengthening extends to the first syllable of words like Eleanor, but only to the second syllable of words like Rebecca. Finally, the post-boundary onset consonant is lengthened significantly more than the rime vowel when the preceding syllable is strong, i.e. after target words like Iraq but not China (Fig 2).

![Fig 1. Syllable following an iambic word](image1)

![Fig 2. Syllable following a trochaic word](image2)

Fig.2. Mean segment durations of 2-syllable target words. The left panel shows more duration lengthening for the onset than the rime after W-S words; the right panel shows no such effect after S-W words.

DISCUSSION

Intonational phrase final lengthening in English is not limited to the final syllable; although it affects the final syllable more strongly, it extends leftward to include the most prominent syllable of the word. Postboundary onset lengthening also occurs. These results are particularly interesting in light of proposals made by Lehiste et al. (1976) and Scott (1982), that boundary-related lengthening signals the boundary by interrupting the rhythmic structure of an utterance, suggesting that this can occur anywhere in the boundary-bearing foot. We emphasize that these results are not only preliminary, in the sense that they involve a single speaker and reiterant imitation, but are also ambiguous, in that they do not distinguish between the effects on an onset consonant vs. a cluster, or on lexically main-stressed vs. phrasally pitch accent syllables. Experiments to address these issues are currently underway.

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