Communicatively- and prosodically-driven hyper-articulation in English

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Speech variability can arise from a variety of sources, including communicative context as well as prosodic and discourse considerations. In adverse listening situations, talkers will often adopt a speaking style known as ‘clear speech’, typically characterized by hyper-articulation, which includes lengthened durations and greater dynamic pitch range, to increase perceptual intelligibility [4]. Similarly, items in narrow focus are reported to be hyper-articulated in order to enhance their salience within a discourse [1]. Despite sharing similar acoustic correlates, these forms of hyper-articulation stem from different sources, as clear speech can be seen as ‘communicatively driven’ whereas focus is considered ‘prosodically driven’ [2]. Previous research has investigated the influence of speech style and focus on the level of articulation separately [1, 3-5]; however, few have examined how these forces interact with each other [2]. The present study investigated the relationship between communicatively driven (clear speech) and prosodically driven (focus) hyper-articulations in English by examining the acoustic-phonetic outputs of their relative and combined influence.

Six native Canadian English talkers were recorded producing sets of semantically anomalous English sentences (adapted from [4]) in four conditions corresponding to the four possible combinations of clear and conversational speech with neutral and narrow focused items (shown in Table 1). To elicit the appropriate focus, participants heard a prompt question and then read the sentence provided on the computer screen as a response. Acoustic measurements found to be associated with hyper-articulation (e.g. duration, F0 peak and range) on items subject to narrow or neutral focus (i.e. “target keywords”) were dependent variables in linear mixed-effects regression models. Additionally, F0 range and duration data for the utterance portions following the target keywords were also analyzed. Models included focus and style as fixed effects and random intercepts for item and subject.

Consistent with previous findings [1, 4], clear speech and narrow focus yielded significantly longer word durations (Fig. 1), higher F0 peaks and greater F0 ranges on the target keywords than in their respective conversational speech and neutral focus counterparts. Main effects of speech style and focus, without any interactions, were found for the majority of acoustic features, indicating that speech style and focus factors resulted in additive effects on the level of hyper-articulation. Furthermore, the utterance portions following the target keywords in the clear-speech neutral-focus condition were significantly longer than in the clear-speech narrow-focus condition; though, post-keyword duration did not appear to differ in the conversational speech conditions (Fig. 2). Prior research has shown that clear speech typically results in global increases in duration [4]; however, in the present study, duration compression occurred post-focally in a clear speech context. This suggests that talkers in a clear-speech narrow-focus condition aim to maximally convey the intended prosodic structure of their linguistic message by attenuating the degree of hyper-articulation post-focally thus enhancing the prominence of the focused item. Here, phrase-level prosodic considerations appear to supersede local clear speech considerations in situations where their effects may be contradictory.

The current study provides insight into some of the mechanisms that drive variation in speech production in English. Results indicate that communicatively driven and prosodically driven hyper-articulation in large part operate independently at the level of articulation, but that clear speech may be prosodically-mediated in certain contexts to facilitate the heightened salience and intelligibility of information loci.
References

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<th>Neutral Focus</th>
<th>Narrow Focus</th>
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<td><strong>Conversational Speech:</strong>&lt;br&gt;Read the following sentence as if you are speaking to someone who is familiar with your speech and voice patterns</td>
<td><strong>CONDITION 1</strong>&lt;br&gt;Q: What happened?&lt;br&gt;A: Your tedious beacon towed our cab.</td>
<td><strong>CONDITION 3</strong>&lt;br&gt;Q: Your tedious what towed our cab?&lt;br&gt;A: Your tedious beacon towed our cab.</td>
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<td><strong>Clear Speech:</strong>&lt;br&gt;Read the following sentence as if you are speaking to someone with a hearing deficit</td>
<td><strong>CONDITION 2</strong>&lt;br&gt;Q: What happened?&lt;br&gt;A: Your tedious beacon towed our cab.</td>
<td><strong>CONDITION 4</strong>&lt;br&gt;Q: Your tedious what towed our cab?&lt;br&gt;A: Your tedious beacon towed our cab.</td>
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Table 1 Speech style instructions along with sample Question-Answer setups for the four conditions

![Figure 1 Main effects of word duration for focus (focus vs. neutral) and style (clear vs. conversational speech)](image1)

![Figure 2 Style x focus interaction for duration of utterance portions following keywords by condition](image2)