Prosodic neighborhood effects in spoken word production
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Current models of lexical access posit that retrieving the phonological representation of a target word involves the activation of structurally similar words (its phonological neighborhood) and their subsequent competition for selection (Dell 1986, Goldinger, Luce & Pisoni 1989). In production, phonological neighborhood density has been shown to influence word naming latencies (Vitevitch & Stamer 2006) and the articulatory realization of the contrasting phoneme: words from dense neighborhoods exhibit longer, more dispersed stressed vowels (Wright 2004) and word-initial voiceless stops with longer VOTs (Baese-Berk & Goldrick 2009). However, little is known about how contrastive prosody affects lexical access. The present study reports the results of a production experiment testing whether words differing solely in the placement of lexical stress form a phonological neighborhood. Our aim was to examine whether prosodic contrasts trigger lexical competition, as manifested in the speed of processing and articulatory implementation.

The experiment tested whether words and pseudowords with prosodic neighbors are produced slower and are more hyperarticulated relative to words without neighbors. The experiment consisted in a delayed reading-aloud task investigating trisyllabic prosodic minimal pairs in Italian, such as àncora ‘still’ and ancóra ‘anchor’. Subjects were shown a word on the screen (with lexical stress specified diacritically) and were required to wait until a given signal to produce it. No subject saw both members of any minimal pair. For words with prosodic neighbors, subjects showed longer onset latencies, longer and more dispersed stressed vowels, but shorter word durations (Figure 1). Crucially, since hyperarticulation affects the point of differentiation between lexical competitors, hyperarticulating the stressed vowels indicates that prosodic contrasts are stored. The effect was observed both for words and pseudowords, suggesting it is due to online competition rather than the retrieval of exemplars that are least perceptually confusable with other items (Pierrehumbert 2002).

The experiment reveals early inhibitory and late facilitatory influence of prosodic competition, signaled by longer onset latencies and shorter word durations respectively. We argue that these competition dynamics are driven by prosodic interference and sublexical facilitation, which implies that prosodic frames are accessed independently of sublexical information. Our proposal is grounded in connectionist models of lexical access (Dell 1986, Baese-Berk & Goldrick 2009). In this approach, top-down activation spreads from the target to its sublexical units. Active segmental units in turn trigger bottom-up excitation of all neighboring words containing the same segments, inducing lexical competition (Figure 2). The activation of mutually inhibitory prosodic nodes introduces interference during planning, while boosting the activation of shared sublexical units. The high activation of the target prosodic frame, required to suppress the competitor, cascades into the contrastive stressed vowel, influencing its articulatory implementation. Support from both competing prosodic frames results in faster encoding and articulation of all segments, except for the hyperarticulated stressed vowel.

The time-varying influence of prosodic neighborhood provides support for dynamic accounts of lexical access, where neighborhood effects evolve based on internal competition dynamics (Magnuson et al. 2007). Overall, the study motivates the existence of prosodic neighborhoods and demonstrates that contrastive prosody constrains lexical access.
Figure 1: Results z-scored by subject and vowel and across conditions. “Real” represents real words with prosodic neighbors, “pseudo” represents pseudowords with prosodic neighbors, and “control” represents real words without prosodic neighbors. The error bars show one standard error.

Figure 2: Integrated spreading and cascading activation model of spoken word production (Dell 1986, Baese-Berk & Goldrick 2009). The orange arrows signal cascading activation.

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