Overgeneralization of distributional cues across syntactic contexts in non-native speech segmentation

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Listeners employ various cues to segment speech, but it is unclear how these cues interact. Speech segmentation has been proposed to operate as a function of a hierarchy of cues, with syntactic cues overriding lexical cues, and with lexical cues overriding phonotactic and acoustic-phonetic cues (e.g., Mattys, White, & Melhorn, 2005; Mattys, Melhorn, & White, 2005). This hierarchy stems from the greater reliability and saliency of higher-level cues over lower-level cues. This research aims to:

(i) determine whether syntactic cues override distributional cues (assumed to approximate phonotactic cues) in native speakers' (NSs') speech segmentation; and

(ii) establish whether non-native speakers (NNSs) rely on the same hierarchy of cues as NSs, and whether their relative reliance on these cues is contingent on their proficiency in the target language.

This study focuses on the misalignment of the syllable and word boundaries that resyllabification poses in French. French has a phonological process called liaison, whereby a word-final otherwise silent consonant is realized as the onset of the following vowel-initial word. Liaison is signaled by several cues, including:

(a) syntactic cues: liaison is possible between a singular or plural adjective and noun (AdjN: *le(s) fameu<u>x</u> [z]élu(s)* 'the famous elected-one(s)') and between a plural noun and adjective (NAdj: *les françai<u>s</u> [z]élus* 'the elected Frenchmen'), but <u>not</u> between a singular noun and adjective (*le françai<u>s</u> [*z]élu* 'the elected Frenchman'); liaison is also more frequent in AdjN than in NAdj sequences (e.g., Durand & Lyche, 2008);

(b) distributional cues: /z/ is a frequent liaison consonant but an infrequent word onset, whereas /t/ has the opposite distribution (e.g., Durand & Lyche, 2008; New, Pallier, Ferrand, & Matos, 2001).

Thirty-six native English speakers at various proficiencies in French and 33 native French speakers completed a visual-world-eye-tracking experiment. They heard stimuli containing singular AdjN and NAdj sequences, where the target word was /z/- or /t/-initial (*le fameux <u>zélé</u>* 'the famous zealous-one'; le *français <u>zélé</u>* 'the zealous Frenchman'; *le parfait <u>taré</u>* 'the perfect stupid-guy'; *le client <u>taré</u>* 'the stupid client'). The display contained pictures of the target, a vowel-initial "competitor" (*élu* 'elected-one/elected,' *Arabe/arabe* 'Arab/Arabic'), and two consonant-initial distracters. Acoustic analyses confirmed that the AdjN and NAdj sequences had similar prosodies. If syntactic cues override distributional cues, vowel-initial words should compete only in AdjN sequences, and more so for /z/- than for /t/-initial words.

Linear mixed-effects models on the (log-odd-transformed; Barr, 2008) proportions of competitor fixations (200-800 ms. from target onset), with syntax (AdjN-NAdj), consonant (/z/-/t/), time (six 100-ms. windows), and group (NSs-NNSs) as fixed effects, and with participant and item as random effects, revealed the following significant effects (α=.05): consonant, group, time, syntax × consonant, and syntax × group. Subsequent models on NSs' fixations revealed an effect of syntax only for /z/, with competition only in Adj-N sequences. Subsequent models on NNSs' fixations, with the addition of proficiency (cloze-test scores; Tremblay, 2011), revealed a syntax × consonant × proficiency interaction: with only /z/-initial words, lower-level NNSs show more competition in Adj-N than in N-Adj sequences, whereas higher-level NNSs show the opposite pattern.

This suggests that syntactic cues override distributional cues for NSs, but not for NNSs. The NNSs' increasing competition across proficiencies in the NAdj sequences with /z/ is attributed to their overgeneralization from plural NAdj contexts, where liaison /z/ is possible. A different hierarchy of segmentation cues is proposed for NNSs, where distributional cues override syntactic cues and where the learning of distributional and syntactic cues is potentially served by distinct memory systems (e.g., Paradis, 2004, 2009; Ullman, 2001).