Categoricity and Gradience in the Articulation of /l/ Vocalisation

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Introduction: English alveolar laterals are canonically produced with two lingual constrictions: one anterior and one dorsal. However, several dialects exhibit variable coda /l/ vocalisation such that the anterior constriction is reduced until there is no tongue tip contact with the hard palate. A number of studies have explored /l/ vocalisation from articulatory (e.g. Hardcastle & Barry, 1989) and acoustic-impressionistic (e.g. Borowsky, 2001) perspectives. However, it remains an open question whether variation between vocalised and unvocalised /l/ is the result of an alternation between discrete articulatory categories or phonetic implementation across articulatory continua. We present Electromagnetic Articulographic data for instances of /l/, finding evidence of both categorical and gradient implementations of /l/ vocalisation in terms of tongue tip (TT) height.

Methods: 391 tokens of underlying /l/ were drawn from a sample of recordings from 8 speakers of British Englishes in the ESPF DoubleTalk Corpus. Tokens with immediately adjacent coronal segments were excluded. For each token, the timestamp and TT height were measured at a 3D TT tangential velocity minimum corresponding to /l/ according to synchronised spectrographic cues. These measures were also taken at both the onset and offset of each vowel+/l/ sequence. Tokens where TT height was lower at the offset than the onset were labelled as involving overall downward TT movement, so vocalisation is probably intended. For tokens with no preceding vowel, the timepoint of the immediately preceding TT tangential velocity minimum was used in place of the onset of the vowel+/l/ sequence. Tokens were additionally coded for word and the phonological context of /l/. TT height measures were converted to by-speaker z-scores, and duration measures were log-transformed.

Results/Discussion: Previous studies have noted that is challenging to determine whether /l/ vocalisation exists as a variable categorical process or a consequence of variation in phonetic implementation (Scobbie & Wrench, 2003). However, it is possible that both are true. While some instances of /l/ may constitute a discrete vocalised /l/ allophone, still others may only sound vocalised due to undershoot of an anterior gesture. Figure 1 shows the TT height at /l/'s velocity minimum by the duration of the vowel+/l/ sequence. There is no relationship between TT height and duration for onset /l/ [$r = -0.005$, $p = 0.94$], and the same is true for coda /l/ where the overall TT movement across the vowel+/l/ is downwards [$r = -0.003$, $p = 0.97$]. However, when TT movement is upwards, coda /l/ TT height is correlated with duration [$r = 0.36$, $p < 0.01$]. Moreover, TT heights for this group overlap with the other two. If – as classic accounts suggest – TT height determines the perception of vocalisation, these /l/s might be variably perceived as vocalised depending on the degree of undershoot.

We corroborate previous findings that conditioning on /l/ allophony is not deterministic. There are instances of coda /l/ with overall downward and upward TT movement in every environment. Figure 2 shows that coda /l/s differ greatly in observed TT height according to context. Before oral consonants, TT heights for /l/ are highest after high-front vowels and lowest after low-back vowels. However, before pauses and laryngeal consonants TT heights after high-front vowels span a very narrow medium range, but TT heights after low-back vowels span almost the entire possible range of TT heights observed in other contexts.

Conclusions: We address the question of categoricity and gradience in the execution of /l/ vocalisation and find that these options may not be mutually exclusive. Rather, perhaps /l/ can be fully unvocalised, fully vocalised, or realised on a continuum between these two extremes. This tripartite classification is reminiscent of classic allophony between light, dark, and vocalised /l/. Furthermore, the analogous intermediate category of dark /l/ has also been observed to exhibit unique sensitivity to duration (Turton, 2017).

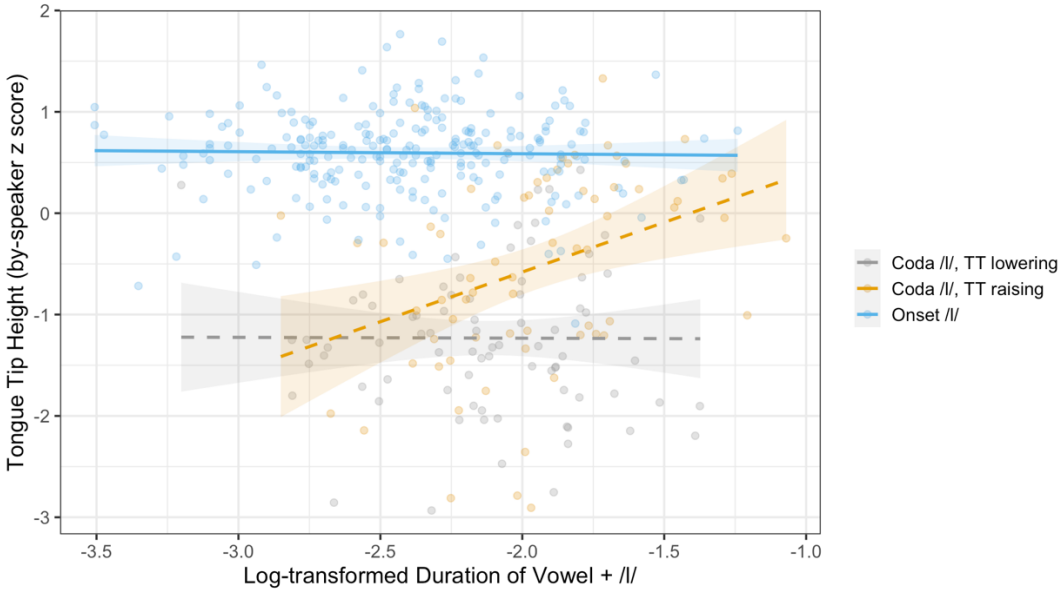

Fig 1: */l/ TT height by duration of vowel+/l/, syllable position, and TT movement direction.*

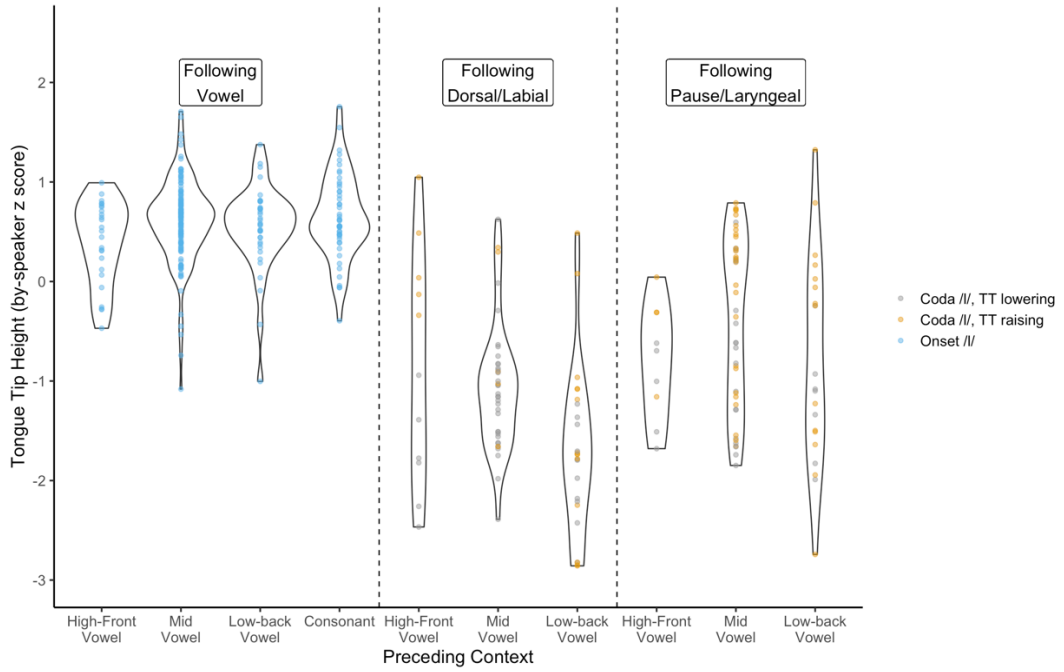

Fig 2: */l/ TT height by preceding and following segmental context.*

Selected References

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