Stylistic variation of sub-phonemic syllabic influences on New Zealand English schwa production

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While a number of articulatory [1, 2 ,3] and acoustic studies [4, 5] have investigated the phonetic variability of schwa in English, variationist research has largely neglected its potential as a sociolinguistic variable, regarding it instead as a targetless phoneme entirely predictable from its phonetic environment (but see [6]). This paper presents articulatory findings and corpus data from New Zealand English (NZE) that reveal a bimodal distribution of schwa when it occurs word-initially and medially versus finally (NZE is non-rhotic; a few publications mention the possibility of an opener realization in the commA/lettER environments (cf. [7]): [8, 9]). This varies with speech style (read versus spontaneous speech) and interacts with speaker year of birth. Furthermore, schwa occurring in non-final contexts is statistically different from the centralized KIT vowel, contrary to the literature which frequently makes use of the same IPA symbol for these phonemes [10] (cf. also [8, 11]).

Analysis of midsagittal ultrasound traces for nine speakers of NZE in an earlier study [12] showed that speakers reading a wordlist use significantly different tongue positions when producing KIT (/ə/) and unstressed schwa (/ə/), and similarly distinguish final and non-final schwa, although sections of the respective SSANOVA average curves [13] calculated in polar coordinates [14] sometimes overlapped. Acoustic analysis supports both of these observations.

To test whether these observations hold for a bigger dataset, including spontaneous speech, we exported formant measurements at vowel midpoints from the Canterbury Corpus, part of the Origins of NZE (ONZE) project [15]. We removed monosyllabic functions words by compiling a list of such items from CELEX [16], as well as vowels labeled as KIT occurring in word-final context (cf. [8, 9]). Furthermore, we removed acoustic outliers exceeding 2.5SDs by speaker, vowel and vowel formant. Linear mixed-effects model fittings using R [17, 18], run for F1 and F2, were then performed in a stepwise backwards-iterative fashion (cf. [19]) until the factors reached significance. The results for F1 indicate an interaction (t=-4.210) between 1) articulation of word-final compared to non-word-final schwa, 2) speaker year of birth, and 3) wordlist readings (25,148 tokens including low central STRUT, 395 speakers) versus spontaneous speech (220,383 tokens including STRUT, 393 speakers). Among older speakers reading from the wordlist, word-final schwa has a significantly higher F1 than non-word-final schwa; however, this difference diminishes until it becomes nearly nonexistent for the youngest speakers, and does not show up in the spontaneous speech data at all.

Bimodal distributions for schwa have previously been described for German [20], where it is phonemic, for final schwa in lexical versus function words [21], and as a sociophonetic marker of ethnolect in Australian English [6]. Our results show that lexical schwa is not targetless; rather, its sub-phonemic differences behave similarly to other vowels in terms of speech style [22, 23, 24], and are subject to diachronic change.

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