Gestural adaptation when 'broadening' an L2 accent: An exploratory EPG study

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Understanding phonetic changes during the processes of bilingual code-switching and L2 acquisition is important as it can provide important insights into interactions between distinct bases of articulation and language-specific phonemic representations [1,2,3]. While considerable work has been done on the phonetics of bilingual speech, most research has focused on a handful of acoustic variables (e.g. VOT in stops [4,5]), with relatively few works exploring changes at the level of articulation [6,7,8,9]. This paper presents results of an exploratory study examining whether and how the production of coronal sounds is adapted when the speaker intentionally modifies their L1-influenced English accent – from their 'normal' pronunciation to an exaggerated, 'broad' accent. This is done using electropalatography (EPG, [10]) – the method that employs a custom-made artificial palate with built-in electrodes to track the contact between the tongue and the roof of the mouth.

EPG data were collected from a female Punjabi-Canadian English bilingual, who has been using English extensively since the age of 11. Her speech can be characterized as having a rather subtle non-native English accent. A 'broad' version of this accent is expected to manifest a fuller set of phonetic/phonological characteristics of the speaker's L1. Note that Punjabi employs a contrast between dentals and retroflexes, and the use of [t̪, d̪] instead of [t, d] is typical for Punjabi-influenced English [11] (and Indian English in general [12]). Punjabi also differs from English in the quality of the corresponding lateral and rhotic sounds (a clear /l/ and an alveolar trill/tap /r/), while lacking English-like dental fricatives /θ, ð/ (as shown in (1)). It was therefore expected that articulatory changes, if occurred, would primarily involve these most salient L1/L2 differences.

The materials for the study consisted of a set of English words with 12 coronal consonants in word-initial position (shown in 2a), produced in a carrier sentence (2b). The same list was recorded using the speaker's 'normal' English accent and using a 'broad', intentionally exaggerated Punjabi-accented English. Articulatory measurements were extracted at the point of maximum contact for each consonant constriction from 9 repetitions of the utterances (216 tokens in total). The dependent variables were (a) the *quotient of activation* over the entire palate (*Q*, the number of 'on' electrodes divided by the total number, 62) and the *centre of gravity* of contact along the front/back dimension (*CoG*) [10]. These were expected to distinguish between small-scale differences in constriction degree and location of consonants. T-tests were performed to compare the two conditions separately for each consonant.

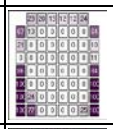
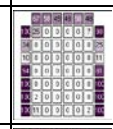
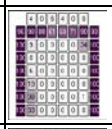
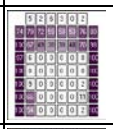
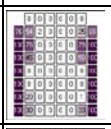
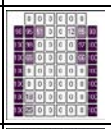
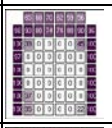
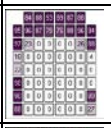
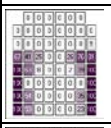
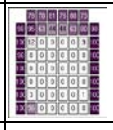
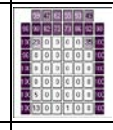
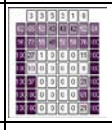
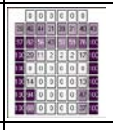
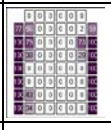
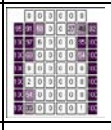
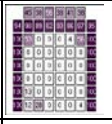
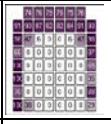
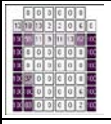
The results revealed that some consonants were significantly affected by the conditions, while others remained essentially the same. This can be seen in linguopalatal contact profiles in (3). Specifically, the tongue constrictions for /θ, ð/ were shifted backwards in the broad accent (BA) compared to the normal accent condition (NA), reflective of a change in place (dental to denti-alveolar). A similar place shift from alveolar to post-alveolar (retroflex) was observed for /t/; while not showing the retraction, /d/ exhibited a higher posterior side contact in BA, indicative of a retroflex-like raising. The lateral had more anterior side contact in BA, reflecting the raising/fronting of the tongue body (a clear /l/). The rhotic showed a more anterior constriction, indicative of a shift from the retroflex to the alveolar place. The other consonants (/s, z, n/ as well as /ʧ, ʤ, ʃ/ not shown in (3)) did not exhibit significant differences, and thus seem to have employed the same gestures. We are currently comparing the BA contact patterns to those exhibited by the same speaker in her L1 (Punjabi) productions.

While limited to a single-speaker case, the results provide an interesting insight into gestural adjustments made during the process of L2 accent manipulation. These findings can be used for further articulatory work investigating bilingual/L2 speech and phonetic imitation.

(1) English coronals: /θ, ð, t, d, ʧ, ʤ, s, z, ʃ, ʒ, n, l, ɹ/
Punjabi coronals: /ʈ, ʈʰ, ɖ, ʈ, ʈʰ, ɖ, ʧ, ʧʰ, ʤ s, ʂ, n, ɳ, l, ɭ, r, ɽ/

(2) a. *thigh, thy, tie, die, chai, jive, sigh, 'zye', shy, nigh. lie, rye*
b. *He saw* ___ (repeated 3 times).

(3) Linguopalatal contact profiles for English coronal consonants produced by the speaker under the *normal accent (NA)* and *broad accent (BA)* conditions, with t-test results for Q and CoG measures indicated below (****p<0.001, **p<0.01, *p<0.05, n.s.*='not significant').

	/θ/	/ð/	/t/	/d/	/s/	/z/	/n/	/l/	/ɹ/	
NA										*front* *back*
BA										*front* *back*
Q	***	***	***	n.s.	n.s.	n.s.	n.s.	***	**	
CoG	***	*	*	*	n.s.	n.s.	n.s.	*	***	

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