TENSE-LAX CONTRASTS IN INDIAN ENGLISH VOWELS: TRANSFER EFFECTS FROM L1 TELUGU AT THE PHONETICS-PHONOLOGY INTERFACE

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ABSTRACT

We investigate the effects of L1 Telugu on tense-lax contrasts in Indian English vowels. While English has a tense-lax contrast in high vowels, / iː, ɪ, uː, ʊ/, with duration as an additional cue, Telugu has only a short-long contrast, /i, iː, u, uː/, though these also have the lax *allophones* /ɪ, ɪː, ʊ, ʊː/ as a result of vowel harmony (VH), triggered by a following low vowel. We examine whether L1 transfer effects are limited to the 'base' phonological inventory (e.g. 'borrowing' the Telugu length contrast for English), or whether speakers access the spectrally closer VH allophones from Telugu. The results reveal something more complex, with some speakers showing tense-lax allophones also for Telugu length contrasts. In L1-L2 transfer, these speakers exapt these phonetically laxer short allophones for the English lax vowels. The other speakers, showing less tense-lax variation all round in L1, create entirely new phonetic categories for the English lax vowels.

Keywords: high vowels, Telugu, Indian English, L1-L2 transfer.

1. INTRODUCTION

We investigate the extent and mechanisms by which the L1 Telugu vowel system influences that of the Indian English (IndE) spoken by Telugu speakers. 'IndE' is commonly applied to the variety(/ies) of English used by speakers in India (and also by the Indian diaspora around the world). The vast majority of IndE speakers in India are native speakers of one or more indigenous Indian languages, most of whom are exposed to English from school age (3-4+ years). IndE has been called a 'transplanted' variety [16] since learners acquire and indeed, depending on various sociological and educational factors, master a self-replicating, nativised variety as a second language, rather than more or less incompletely acquiring a foreign language.

IndE is itself the product of a complex contact situation, due to the vast linguistic diversity and complex multilingualism to be found in India. The influence of L1s for some features at least is strong [3,4,28], potentially leading to the identification of different varieties of IndE [11,20,22,24, 25,26,27,30]. However, L1 substrate features may themselves be independently convergent (i.e. identifiable as 'areal features' [17,19]), and secondly, unified target features may emerge in standardisation [27].

In terms of variation in IndE vowels, studies have revealed evidence both for L1-specific influence and for convergence on a more uniform model of IndE. [30] found a tense lax distinction for front vowels in Gujurati IndE and Tamil IndE, but not for back vowels, which they argue may be a more general feature of IndE. [29] reports L1 transfer from Tibeto-Burman languages, with the tense-lax contrast being mostly marked by duration. [21] find that the realization of the tense/lax contrast in Hindi and Punjabi IndE can be based on quality and durational differences in some instances, or on durational differences alone, and report a difference in both front and back, for both varieties. On IndE with L1 Telugu, [27] report small but systematic effects of L1 Telugu for FLEECE, START and GOOSE vowels.

1.2 L1-L2 Transfer effects

It is well-documented how early experience in a first language can influence acquisition of L2 [see 1,8,14]. Phonological contrasts that do not exist in L1 are harder to perceive and produce [7,12,23], suggesting L1 categories interfere with category formation in L2 [15].

The nature and extent of such effects will depend on the nature of the L1 and L2 'systems' that, as [8,9,10] argues, co-exist and interact in the same phonological space for the multilingual speaker. L2 categories are likely to be mapped onto existing similar categories in L1, while those with no near equivalent may be easier to acquire because they are not in competition for that region of the vowel space [14]. The relationship between categories is also important [2]. With a pair of contrasting sounds in L2, where both map onto an existing L1 category, but one is a closer fit, a new category may be formed for the ill-fitting L2 phoneme. If both have a similar fit, learning of the L2 contrast may be more difficult.

Two aspects of L1-L2 transfer, that have not, to our knowledge, been explicitly considered, are i) partial mapping of phonetic features, and ii) mappings that involve differences of category *status*.

With respect to the first: while Telugu has no phonological contrast between tense and lax vowels (cf. English /iː/ vs /ɪ/ and /uː/ vs /ʊ/), it *does* contrast length (/i/ vs /iː/ and /u/ vs /uː/). Thus, the question arises as to whether English lax vowels (which are also short) map onto the short Telugu vowel (i.e. a partial fit), while the tense vowels (which are also long) map onto the long vowel (a closer fit).

With respect to the second aspect: while there is no tense/lax *contrast* in Telugu, tense and lax allophones of single vowel categories do exist, as a result of VH. Thus, for the phonological categories /i/ and /u/ in Telugu, there exist both high and low allophones, respectively [i]-[ɪ] and [u]-[ʊ], and these may map onto English tense and lax vowels. If so, that would suggest that, in L1-L2 transfer, phonetic categories take precedence over phonological.

2. METHOD

2.1 Participants

Five (3F; 2M) speakers of IndE, with L1 Telugu, were recorded at the University of Hyderabad, India. All speakers were enrolled in a university degree, had started learning English at 4-5 years, identified as multilingual, and were aged 25 to 30.

2.2 Materials and analysis

The speakers were recorded reading 4 repetitions of word lists in Telugu and English. For English, the words contained all Southern British English (SBE) monophthongs and diphthongs. The vowels investigated here were: /iː ɪ ʊ uː/, and were in the following words: *(beat, bead, people, keep); (bit, bid); (good, could); (food)*. For Telugu, the words contained all long and short vowels, with both high and low allophones of each. The vowels investigated were: /i, iː, u, uː /, and the full set of allophones were [i, iː, ɪ, ɪː, ʊ, ʊː, u, uː]. These were in the first syllable of the following words: [pilːi; pɪlːɐ; giːɾu; gɪːɾɐ; piːkɐ; puʈːu; pʊʈːɐ; kuːɾu; kʊːɾɐ; kuːpi] (n.b. there is no lexical stress in Telugu [5]).

The speakers were recorded in a quiet room using a Zoom H4nSP audio recorder with an external lapel microphone. The recordings were made at a sampling rate of 44.1 kHz. For the English sub-set, audio recordings were automatically segmented using WebMAUS [17] followed by manual correction in Praat [5]. For Telugu, recordings were manually aligned and transcribed phonetically directly in Praat. Formant and duration measures were taken using the emuR package [31], again with minimal hand correction for formant data. Formant values (F1, F2, F3) were extracted at 0.2, 0.5 and 0.8 of the relevant vowels, however for this paper only the 0.5 (i.e. midpoint) data for F1 and F2 have been used.

A series of repeated measures ANOVA tests were performed in R on two data sets (IndE and Telugu) to determine whether tense and lax vowels differed significantly for F1, F2 and duration, and whether there was any interaction between tense-lax and length. Subsequently, a series of ANOVA tests were run for each speaker, followed by post-hoc Tukey comparisons. The F1/F2 ellipse plots of the target position of vowels represent 95% data points for each vowel category.

3. RESULTS

3.1 Cross-speaker overview

In Telugu, across speakers, long vowels are higher than short vowels, regardless of VH (Fig. 1) (length is a main effect for F1, $p<0.001$; but not for F2). Tense allophones are higher ($p<0.001$) and less central ($p<0.01$) than lax. However, for F2 there is a sig. interaction between length and tenseness: tense allophones are only less central when long ($p<0.01$). In other words, spectral differences result both from VH and phonological length.

Figure 1: Telugu high vowels, all speakers.

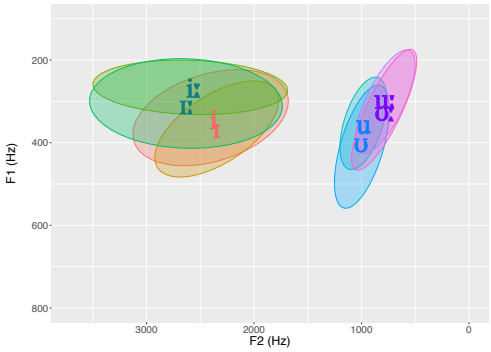
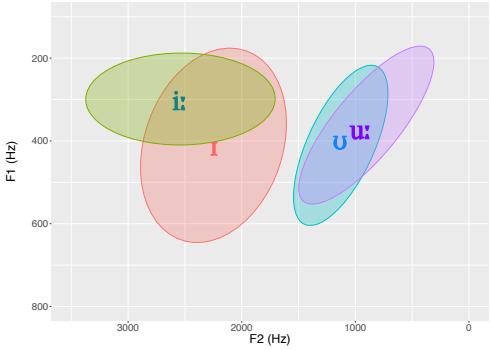


Figure 2: English high vowels, all speakers.



What is striking about the IndE vowels (Fig. 2) is the degree of variability compared with their Telugu equivalents, especially for front vowels. FLEECE occupies the combined spectral space of tense and lax allophones of Telugu long high front vowels,

suggesting the full allophone set of the long vowel, and not just the tense ones, maps onto FLEECE. Phonetically, being the longest and tensest vowels in Telugu, they are the nearest match for FLEECE (though would appear to be somewhat lower and considerably fronter than the latter in modern RP [13], though that study investigated only make speakers).

KIT occupies an even larger space, going beyond the combined space of short high front vowels in Telugu (and apparently lower and fronter than modern RP [13]).

GOOSE and FOOT map more neatly onto Telugu long and short high back vowels respectively, although GOOSE reaches both further forward and back (but not as far forward as modern RP [13]).

3.2 Speaker-specific strategies

Individual speakers show different strategies with respect to L1 transfer effects. We identify two main types: those who use L1 categories, but in a new way (*category adapters*), and those who create new categories for IndE vowels (*category creators*).

3.2.1 Category adapters

Figure 3: T1's high vowels in Telugu.

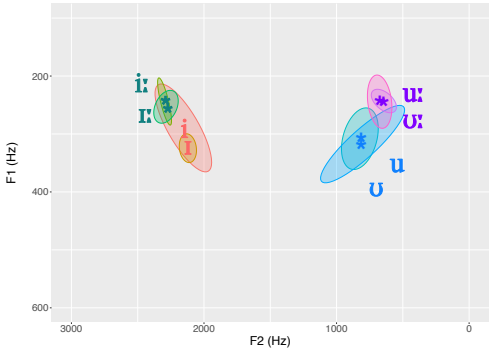


Figure 4: T1's high vowels in English.

Three participants, T1, T4 and T5, map their English tense vowels, FLEECE and GOOSE, onto an intersection of Telugu long vowels, and their English lax vowels, KIT and FOOT, onto an intersection of Telugu short vowels (see Figs 3-6). They make little significant spectral distinction between tense-lax in Telugu, except for T1's front short lax vowel which is lower than his short tense vowel ($p<0.01$).

However, T1's long vowels are higher ($p<0.001$) and less central ($p<0.01$) than his short vowels, for both front and back, while T5's long vowels are higher ($p<0.001$) and less central ($p<0.001$) than her short vowels, for front only. These distinctions are small in absolute terms, just as they are between the English tense vs lax vowels onto which they are mapped. For front vowels, KIT is lower (T1: $p<0.001$; T5: $p<0.05$) and more central (T1: $p<0.01$; T5: $p<0.001$) than FLEECE, whereas FOOT is more central ($p<0.001$) than GOOSE for T1. T5 makes no contrast at all between FOOT and GOOSE. What is a subtle, secondary cue to a length contrast in Telugu, is borrowed as a phonetically subtle distinction in their English tense-lax contrast.

Figure 5: T5's high vowels in Telugu.

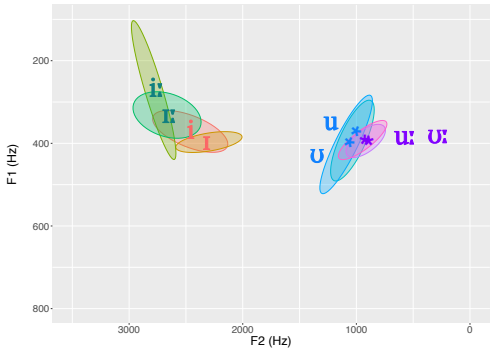
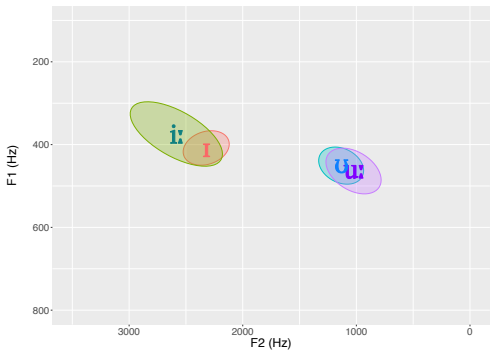


Figure 6: T5's high vowels in English.



3.2.2 Category creators

T2 (Figs 7 and 8) and T3 also map FLEECE and GOOSE onto their long high vowels in Telugu, at least spectrally, but appear to create entirely new spectral categories for KIT and FOOT.

For these speakers, there is little spectral difference between long and short vowels in Telugu (T2's high front vowels are higher when long, $p<0.01$, while T3's high back vowels are backer when long, $p<0.001$). T2 makes no sig. difference between tense or lax vowels, either, while T3's back lax vowels are lower. As a result, there is a high degree of overlap

between the ostensible 4 phonetic categories (short/long, tense/lax), for both front and back, in Telugu. We might interpret this lack of allophonic distinction in L1 as motivation for why, in their L2, T2 and T3 create new categories for English lax vowels. Such innovation results in a large distinction between KIT and FLEECE ($p<0.001$, for both F1 and F2), for both speakers. There is also a distinction between FOOT-GOOSE, though not in all parameters: T2 makes a height distinction ($p<0.001$) and T3 makes a front-back distinction ($p<0.001$).

Figure 7: T2's high vowels in Telugu.

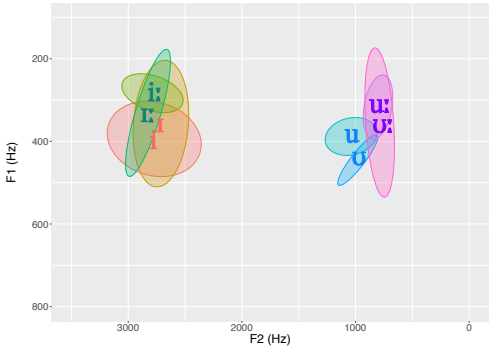
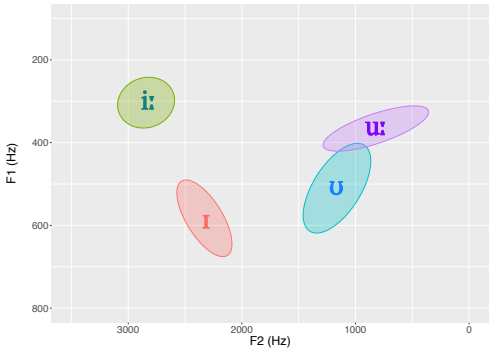
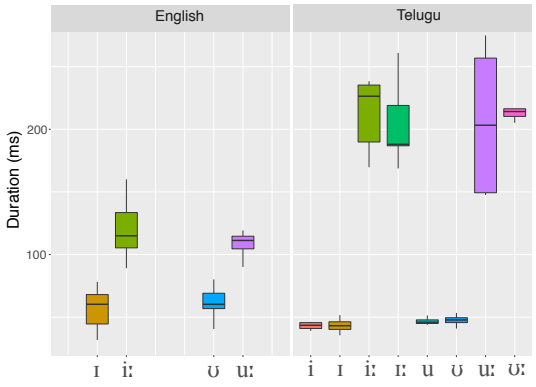


Figure 8: T2's high vowels in English.



3.3 Duration

Figure 9: T1's vowel durations (Eng-Tel).



All speakers used duration to some degree in distinguishing tense and lax vowels in English, with T1 and T2 contrasting both front and back sets (T1: $p<0.001$; T2: $p<0.01$), and the others contrasting only front ($p<0.001$). Fig. 9 shows the very clear durational distinction between Telugu long and short vowels, for T1, and the much greater duration variability in his long vowels.

T2's English lax vowels are of a similar duration to her Telugu short vowels. Her English tense vowels are longer ($p<0.001$) but considerably shorter than her Telugu long vowels ($p<0.001$).

4. DISCUSSION

Our analysis shows that all speakers map their Telugu long vowels onto FLEECE and GOOSE. For T2 and T3, this phonological mapping of [+long] > [+tense] may be partly phonetically motivated, since English tense vowels are also longer. However, there are no obvious category candidates in their Telugu for KIT and FOOT, and so they create new ones, thereby making a robust tense-lax contrast in English, which is further enhanced by duration, especially in T2.

For T1, T4 and T5, the mapping onto FLEECE and GOOSE is a closer phonetic fit, since their Telugu long vowels are also tenser. The availability of tense-lax allophones of [±long] in their Telugu means these speakers also have an available L1 category to adapt for KIT and FOOT. However, just as the tense-lax differences in their L1 allophones are subtle, their L2 tense-lax contrast is not large, and indeed, for T4 and T5, is not significant for back vowels. Use of duration enhances the contrast for front vowels but, for T4 and T5 at least, is absent from back vowels.

5. CONCLUSION

In addition to providing evidence of a fairly granular influence of L1 on IndE vowels, our results echo more general claims about L1-L2 transfer, with those speakers who have to create new categories forming more robust contrasts in L2 than those who draw on existing variants that are not strongly distinctive. Our study has also shown that category status in L1 is relatively unimportant: allophonic variants can map onto L2 phonological categories (even if this undermines distinctiveness).

The effect of phonological length on tense-laxness in Telugu has not, to our knowledge, been reported in the literature, and deserves further investigation, including its potential influence on IndE – as detected here - and also in terms of its perceptual significance. It would appear that spectral tense-laxness is a secondary cue to phonological length in at least some varieties of Telugu. It is of note that this is a mirror image of the situation in (SB) English, whereby phonetic duration is a secondary cue to phonological tense-laxness in high vowels.

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