

The influence of Gujarati and Tamil L1s on Indian English: a preliminary study

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ABSTRACT: English as spoken as a second language in India has developed distinct sound patterns in terms of both segmental and prosodic characteristics. We investigate the differences between two groups varying in native language (Gujarati, Tamil) to evaluate to what extent Indian English (IE) accents are based on a single target phonological-phonetic system (i.e., General Indian English), and/or vary due to transfer from the native language. Consonants, vowels and intonation patterns from five Gujarati English (GE) and five Tamil English (TE) speakers of IE were transcribed and, in a subset of cases, acoustically analyzed. The results showed transfer effects in GE back vowels, TE rhotics and the proportion of rising versus falling pitch accents in GE intonation. The effect of the General Indian English model was evident in the front vowels of both GE and TE and in the presence of initial voiced stops in TE. Thus, the data reveal both phonetic and phonological influences of IE speakers' native language on their accent in IE, even in proficient speakers; these influences appear to supersede IE norms and can be found in both the segmental and suprasegmental properties of their speech.

INTRODUCTION¹

Indian English (IE) is a new dialect of English with millions of speakers in the Indian subcontinent (India, Pakistan, Bangladesh, Nepal) and worldwide. English was brought to India by the British in the seventeenth century, and after India's independence in 1947, English was recognized as one of the 15 official languages in the constitution, to be used in the government and taught in the school system (Krishnaswamy and Burde, 1998). Indian English is primarily acquired in a classroom setting, beginning in the first grade (around the age of six years) and continuing through higher education. Thus, most IE speakers acquire this language in addition to others, including the language(s) spoken at home and prominent languages at the national level, such as Hindi.

IE varieties are thus products of a complex contact situation. IE has been called a "transplanted variety" because it is not taught as merely a foreign language to be used with (foreign) native speakers, but as a second language, used in daily life in India with other Indians, particularly those with other first languages. A transplanted system differs from an interlanguage system, in which some native system of that language has not been fully acquired. A transplanted system, by contrast, is stable and self-replicating (Kachru, 1983); the learners are exposed to the nativized variety of the second language system, which they master, rather than incompletely acquiring a foreign target language system.

As even fluent IE speakers usually begin to study English after beginning to acquire another L1, the development of segmental and prosodic differences among varieties of

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English in India has usually been attributed to transfer from the native languages spoken by the IE speakers.

Varieties of IE have also likely been influenced by the phonological/phonetic norms of the “model” dialect of English used in instructional settings. In this study, variation within IE is investigated by describing the segmental and intonational differences between IE speakers based on their native language. This factor in IE variation was chosen for study in order to evaluate the roles of native language transfer and the phonological norms serving as the target language in the development of varieties of IE. To distinguish transfer from the influence of target phonological norms, we needed to compare varieties of L2 English produced by speakers of L1s with significantly different phonologies.

We also needed to confirm the particular phonological system that served as a target in acquisition; it might be presumed to be a variety of British English given the colonial history of the Indian subcontinent. For example, the model variety of English taught in the Indian school system had been some form of British English for generations. However, beginning in the 1960s, there was a movement for the use of a General(ized) Indian English (GIE) model (CIEFL, 1972; Bansal, 1976), a variety that can serve as “a socially acceptable pronunciation devoid of regional peculiarities that may impair communication with speakers from within and from outside the country” (Pandey, 1981: 11). We take GIE to be a prestigious variety shared among educated users of the language which is the target to which learners aspire.

The system of GIE has been described by CIEFL (1972) for consonants and vowels. First, the consonant inventory of GIE is shown in Table 1. Frequent phonetic variants (“personal or regional”) are shown in parentheses; the slash between [v] and [w] means that they are in allophonic variation. CIEFL (1972) states that subvarieties of /r/ are not distinguished, although it lists /r/ with the approximants; Bansal (1976) describes it as an approximant or flap, and Singh (2004) as a tap or trill. As for IE’s phonotactic constraints, CIEFL (1972) notes that consonant clusters in GIE are generally the same as in RP English, except due to the absence of certain sounds not in the GIE inventory, such as /v/ or /ʒ/ (1972: 4).

We limit our discussion of IE vowels to the monophthongs for the purposes of this study. The description of the contrasting monophthongs of GIE from CIEFL (1972)

Table 1. Consonant inventory of GIE (CIEFL, 1972)

	labial	labio-dental	dental	alveolar	post-alveolar	retroflex	palatal	velar	glottal
Stop	p (p ^h) b		(t) t ^h d̪			t (t ^h) ɖ		k (k ^h) g	
Affricate					tʃ (tʃ ^h) dʒ				
Nasal	m			n				ŋ	
Fricative		f		s z	ʃ				h
Approximant	v/w			r			j		
Lateral approximant				l		(l)			

includes the following: /i:/, ɪ, e: (ɛ:), ɛ, æ, ə, ɜr (ɜ:r), a: (ɑ:), ɒ:(ɔ,ɔ:), ɔ:, ʊ, u:/. Again the symbols in parentheses are meant as alternative pronunciations that are frequently heard. Like some native varieties of English, some pairs of vowels contrast in both length and quality, such as /i:/ vs. /ɪ/ and /u:/ vs. /ʊ/. The description of the GIE model allows for both post-vocalic rhotic and non-rhotic varieties. Based on the symbols provided, the system looks as shown in Table 2.

Differences in the segmental inventories and allophonics are the most frequently discussed and the more systematically studied of the differences among varieties of English, such as Indian, British, and American Englishes. Some of the most prominent and best-documented characteristics of IE are as follows:

- Most varieties of IE are said to use retroflex stops [ʈ, ɖ] or to vary inconsistently between retroflexes and alveolars (Kachru, 1983; Bhatt, 1995; Nair, 1996).
- The distribution of aspirated and unaspirated voiceless stops, which is systematic in some varieties of English, has been described as either unsystematic or all unaspirated (Nair, 1996; Coelho, 1997).
- Dental stops [t̪, t̪ʰ, d̪] generally replace interdental fricatives [θ, ð] (Kachru, 1983; Bhatt, 1995).
- Some sub-varieties lack post-vocalic [ɹ], presumably because they are based on a British English (RP) model; while others are “r-ful”, the “r” that is used is generally a flap or trill (Bansal, 1976; Saghal and Agnihotri, 1988; Coelho, 1997).
- The use of [v] for [w] is widespread (Saghal and Agnihotri 1988).
- The vowel system has monophthongs for the mid-close vowels, i.e., [e:] and [o:] (Bansal, 1983; Nair, 1996). Vowel quality in unstressed position is not reduced in quality, although duration may be (Gumperz, 1982; Kachru, 1983; Coelho, 1997).

As for suprasegmentals, CIEFL (1972) does not offer much detail or systematic description. They note that GIE has stress, although its phonetic correlates may differ from those of British English stressed syllables (cf. Wiltshire and Moon, 2003); they also observe that the location of stress may be different.

Intonation has received less attention; CIEFL (1972) merely describes it as different from British English and from various Indian languages. However, the intonational properties of IE have been cited as a major factor in misunderstandings, particularly causing either misinterpretations of discourse function or misinterpretations of affect (Gumperz 1982; Kachru, 1983; Pickering, 1999). Gumperz (1982), for example, discusses how the different intonation system of IE can cause AE or RP speakers to misinterpret discourse function, such as contrastive stress interpreted as applying to a different word than intended, or to misinterpret affect, as when an offer is interpreted as rude. Intonation

Table 2. GIE vowels (from CIEFL 1972): contrasts of monophthongs

	Front	Central	Back
Close	i: ɪ		u: ʊ
Close-mid	e: (ɛ:)	ɜr (ɜ:r) ə	o:
Open-mid	ɛ		(ɔ,ɔ:)
Open	æ	a: (ɑ:)	ɒ:(ɔ:)

is likely to play a major role in differentiating IE from other English dialects, given the intonational phonology of major substrate languages of IE, such as Hindi (Rajendran and Yegnanarayana, 1996; Bingham, 1998; Harnsberger, 1999), Bengali (Hayes and Lahiri, 1991), and Tamil (Ravishankar, 1994).

PRESENT STUDY

Segmental and prosodic descriptions of IE, such as those described above, have tended to focus on contrasts between this new variety and standard American or British English varieties and, by assumption, treat GIE as a single, cohesive dialect.² While there may be a GIE model, researchers have also documented regional and social differences in IE varieties, along with characteristics which most dialects share (Kachru, 1983; Saghal and Agnihotri, 1988; Agnihotri, 1991; Nair, 1996; Coelho, 1997). There has been more work in India on variation within IE, but these studies usually focus on one aspect, such as stress in Telugu English (Srinivas, 1992) or intonation in Malayalam English (Latha, 1978), so it is difficult to make direct comparisons among different varieties.

In this study, variation within IE is investigated by describing the segmental and prosodic differences between IE speakers based on their native language; the choice of this factor in IE variation allows us to evaluate the roles of native language transfer and the model of GIE in the development of varieties of IE. To distinguish transfer from the influence of GIE norms, we compare varieties of L2 English produced by speakers of L1s with significantly different phonologies. For this study, two groups of speakers were examined with L1s from different language families: Gujarati and Tamil. These two language groups were suitable for several reasons: they represent two important language families of the region where IE is spoken (Gujarati belongs to the Indo-Aryan family, while Tamil is a Dravidian language); they are sufficiently different from one another phonologically to study L1 transfer; detailed descriptions of both languages are available, although at the segmental level only. Finally, both languages are widely spoken in India and have a large population of IE speakers. According to the 1991 census, Gujarati speakers in India number about 40.7 million, with 4.3 million speakers of English as a second or third language; Tamil has approximately 53 million speakers, of whom about 7.4 million speak English as a second or third language.

We investigate the differences between the two L1 groups by examining the phonetic and phonological characteristics of the vowels, consonants and broad intonational patterns of these varieties. The description will help us to evaluate to what extent IE accents are based on a single target phonological-phonetic system ("the IE model" being taught) and/or influenced by transfer from L1. The phonetic and phonological variation in the L2 English of L1 Gujarati and Tamil speakers may reveal L1 transfer effects in both segmental and suprasegmental properties, so we turn now to a description of the L1 phonologies.

L1 phonologies: Gujarati and Tamil

Tamil segmental phonology has been described in great detail (e.g., Asher, 1985; Christdas, 1988; Schiffman, 1999), as has Gujarati (Cardona, 1965; Masica, 1991; Mistry, 1997). Their consonant inventories appear in Tables 3 and 4. Both languages distinguish five places of articulation for stops, labial, dental, retroflex, palatal and velar, with fewer distinctions among the nasals and fricatives. The Tamil consonant inventory is

Table 3. Gujarati consonantal inventory (from Mistry, 1997)

Gujarati L1	labial	labio-dental	dental	alveolar	post-alveolar	retroflex	palatal	velar	glottal
Stop	p b p ^h b ^h		t̪ d̪ t̪ ^h d̪ ^h			t̪̠ d̪̠ t̪̠ ^h d̪̠ ^h	c ɟ c ^h ɟ ^h	k g k ^h g ^h	
Affricate									
Nasal	m			n		ɳ	(ɲ)	(ŋ)	
Tap or flap				r					
Fricative				s			ʃ		h
Approximant		v					j		
Lateral				l		ɭ			

Table 4. Tamil consonantal inventory (based on Christdas, 1988, modified for central dialect (Madurai and surroundings))

Tamil L1	labial	labio-dental	dental	alveolar	post-alveolar	retroflex	palatal	velar	glottal
Stop	p		t̪			t̪̠		k	
Affricate					tʃ				
Nasal	m			n		ɳ	ɲ		
Tap or flap				r					
Fricative				s		ʂ*			
Approximant		v				ɻ*	j		
Lateral				l		ɭ			

* ɻ = the symbol for raised under retroflex voiced approximant, signifying a voiced, slightly fricativized, retroflex approximant.

smaller, particularly because Tamil does not distinguish aspiration or even voicing in the stop series; allophonically, stops are voiceless and weakly aspirated in initial position, and voiced after nasals (Balasubramanian, 1975). Gujarati, by contrast, does distinguish both voicing and aspiration (Dave, 1967; Mistry, 1997; Nair, 1979; Rami *et al.*, 1999). Some varieties of Tamil contrast two types of rhotics, a flap and a fricativized retroflex rhotic, while Gujarati phonemically has only the flap. Furthermore, Tamil syllable structure is very simple, preferring no clusters in onsets or codas and using epenthesis to avoid them. Gujarati allows clusters in assimilated loanwords from Sanskrit, Perso-Arabic, and English.

The vowel systems of Gujarati and Tamil are shown in Tables 5 and 6, respectively. Tamil has a five vowel system with contrastive length supplemented by quality differences in the short and long high vowels. Gujarati displays a similar system, which has been treated as a three-way height contrast, but with contrast (in quality rather than length) for the non-high vowels only, leaving Gujarati with only eight oral vowels (Masica, 1991). Gujarati also makes a phonemic distinction between nasalized, oral, and murmured vowels (Pandit, 1955–6; Dave, 1967; Nair, 1979; Masica, 1991), while Tamil has (non-contrastive) nasalized vowels in word-final position only and does not use murmur at all. The allophonic realizations of these vowels are also different. For example, in Tamil, /i, e,

Table 5. Gujarati (Dave, 1967): contrasts of monophthongs

	Front	Central	Back
Close	i ī j̄		u ũ ʋ
Close-mid	e ɛ	ə ẽ	o ɔ
Open-mid	ɛ ẽ		ɔ õ
Open		ɐ ẽ	

Table 6. Tamil vowels (Christdas, 1988)

	Front	Central	Back
Close	i: ɪ		u: ʊ
Close-mid	e: e		o: o
Open-mid		ə	
Open		ɐ: ɐ	

o, u/ have lax counterparts [ɪ, ɛ, ɔ, i] in non-initial syllables (Christdas, 1988), while in Gujarati, /e, ɛ, o, ɔ/ are slightly lowered and /ə, ɐ/ slightly backed in closed syllables (Cardona, 1965).

METHODOLOGY

In this study, data was collected from ten proficient IE speakers during a research trip to the Center for English and Foreign Languages in Hyderabad, India by the first author. Subjects were recruited for English proficiency (as judged by three IE speaking research assistants), five with Gujarati L1 and five Tamil L1 backgrounds. Each speaker was recorded on a Sony TCD-D8 DAT recorder using a head-mounted Shure SM10A microphone reading a list of 95 words containing potential vowel contrasts, 99 isolated sentences, a short passage, and a series of 29 short dialogues.³ After the reading part of the session, a language background interview was conducted by an IE speaking research assistant. Subjects were asked questions about their first language background and use, their education in English and their current use of it, and other languages that they had studied or used.

The speakers were aged 18–24, with four females and one male for each L1; most began studying English in nursery or first grade and continued through college. The Tamil subjects came from central Tamil Nadu; their parents all spoke Tamil as their L1 and Tamil was the language of the home; only two subjects had parents who spoke English as well. They started English at different times: three in English medium schools from LKG (nursery), one from 3rd standard onwards as a second language, and one only from 10th standard; however, this student continued with English throughout a BA degree and into a postgraduate program, resulting in eight years total. The Gujarati subjects were geographically more diverse; one was born and raised in Calcutta, one born in Mumbai but raised in Hyderabad, and the other three born and raised in Hyderabad. All of their parents spoke Gujarati and that was the primary language of the home; their parents' other languages included: Hindi, English, Bengali, Telugu, Marathi, and Marwadi. All

began learning English in nursery (age 3–4) or school (starting at age 5–6); in addition to Gujarati and English, all of them also spoke Hindi, four spoke Telugu, and the fifth Bengali. In Hyderabad, both groups of subjects used English when speaking with their teachers; with their friends, the Tamils said they spoke Tamil and English, and the Gujaratis reported using Hindi and English, with Gujarati less common.

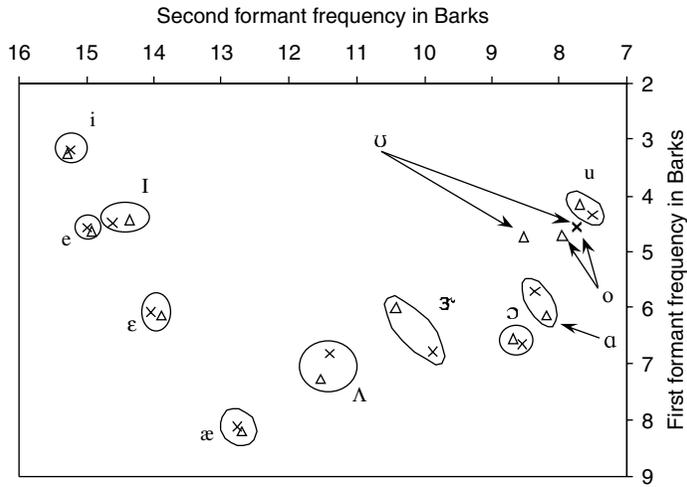
The data were digitized into a CSL MODEL 4400. A trained researcher transcribed consonants, vowels and stress from the paragraph passage, the word list, and selected words from the sentences. A set of keywords containing the complete vowel contrasts was measured for formant values (F1 and F2) for the four female subjects of each L1.⁴ Using SoundScope/16 (GW Instruments) speech analysis software, measures of the first two formants, F1–F2, were taken at temporal midpoint from a combined FFT and LPC (14-coefficient autoregressive analysis) display, with a 25 ms analysis window. Formant frequency decisions were based primarily on LPC peaks. Stop consonants' voice onset time (VOT) was determined by visual inspection of the waveform. Finally, F2 and F3 transitions were measured from vowels preceding the retroflexed consonants. Specifically, formant measures were taken at vowel temporal midpoint and at the final 25 ms of vocalic voicing. As with the vowel measurements, formant transitions were measured using a combined FFT and LPC. Formant frequency decisions were based primarily on LPC peaks. The physical measures were then converted to Bark and the respective differences between F2/F3 at vowel midpoint/offset were calculated.

RESULTS AND DISCUSSION

Vowels

The oral, monophthongal vowels of Tamil English (TE) and Gujarati English (GE) appear in Figure 1 (no significant nasality or murmur was observed in the GE vowels, so none are reported). Each vowel symbol represents the mean F1 and F2 of a dialect's target vowel at temporal midpoint. The GIE vowel inventory is repeated below Figure 1 for ease of comparison; the corresponding vowel spaces of American English (from Peterson and Barney's 1952 study) and British English (from Deterding, 1997) are also provided in Figure 2 as a point of reference.

Following the GIE model, GE and TE show little formant movement during [e:] or [o:], which are diphthongs in American and British Englishes. The front vowels of the IE dialects and GIE are in general very similar, and include contrasts not found in the L1s of the speakers. In particular, GE speakers have acquired an [ɪ] distinct from [i]; the TE speakers have [ɛ] vs. [e], and both have [æ] in their English, and thus follow the GIE model. However, these IE varieties do appear to differ from GIE greatly in their back vowel systems. Among TE back vowels, the difference between /u/ and /o/ is quite modest, as is the difference between /a/ and /ɔ/. These modest spectral differences among the back vowels appear to be augmented by temporal differences, which are shown for TE and GE vowels in Table 7. Gujarati back vowels show even smaller spectral differences: /u/, /ʊ/ and /o/ are grouped very closely together within the vowel space. However, GE /ʊ/ is shorter in duration than /u/ and /o/, although the /u/-/ʊ/ temporal difference is modest. The overall similarity between /u/ and /ʊ/ in GE (at least as observed in these measures) may be the result of transfer from Gujarati, as the language lacks a short high back vowel similar



	Front	Central	Back
Close	i: I		u: ʊ
Close-Mid	e: (ɛ)	əɾ (ɜ:ɾ) ə	o: ɔ
Open-mid	ɛ		(ɔ, ɔ̃)
Open	æ	ɑ: (ɑ)	ɒ(ɔ)

Figure 1. The monophthongal vowel spaces of Tamil English (shown with triangles) and Gujarati English (shown with “X”s), plotted in Barks. The vowel symbols represent the target vowels as they are normally pronounced in American English. Table 2, the vowel inventory of GIE, is reproduced below the figure for purposes of comparison.

Table 7. The mean duration (in seconds) of ten vowels in Tamil and Gujarati English. The vowel symbols represent the target vowels as they are normally pronounced in AE.

	i	ɪ	e	ɛ	æ	ɜ̃	ʌ	ɑ	ɔ̃	o	ʊ	u
Tamil English	0.210	0.093	0.210	0.086	0.266	0.221	0.150	0.265	0.191	0.220	0.114	0.166
Gujarati English	0.173	0.083	0.193	0.082	0.181	0.183	0.103	0.186	0.170	0.192	0.112	0.152

to /ʊ/, despite the maintenance of the contrast in GIE. However, the apparent similarity between GE /u/ and GE /o/ is not so easily accounted for.

GE and TE vowels proved to be more similar to American English (AE) than British English (as represented by Received Pronunciation, or RP), but their back vowels do differ substantially from AE in being further back. TE and GE diverge even more from British English RP in both the front and back vowel series: GE and TE [ɪ] is fronted relative to RP; RP [e] is considerably lower and backer than its GE and TE equivalents; RP [ɔ̃] is really a mid or high back vowel and differs substantially from both IE dialects in F1 and F2; finally, GE and TE [u] and [ʊ] are backed, while RP fronts these vowels. Thus,

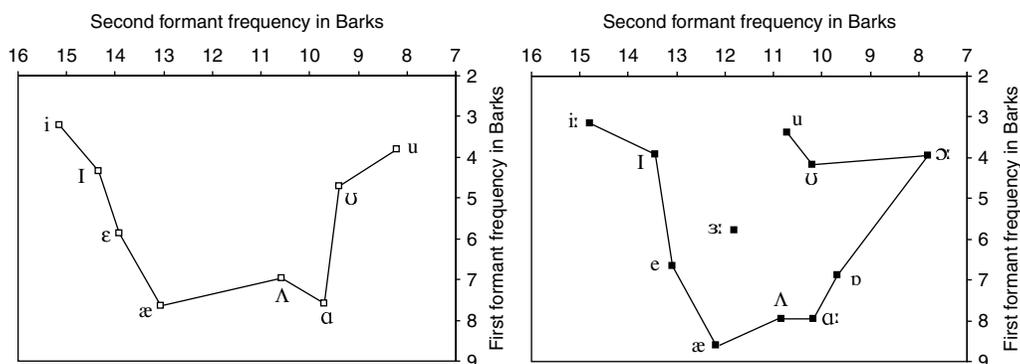


Figure 2. The monophthongal vowel spaces of female speakers of American English (left) and female speakers of British English (right) from Peterson and Barney (1952) and Deterding (1997), respectively, plotted in Barks. The vowel symbols correspond to traditional phonemic labels used in descriptions of these dialects, rather than accurate phonetic labels.

the GE and TE vowels most closely resemble the GIE model, rather than the AE or RP; however, transfer from L1 has perhaps limited the GE and TE speakers from acquiring the full back vowel inventory of GIE.

Consonants

Consonantal differences between the dialects were determined through transcription and acoustic analysis, and several effects of apparent L1 transfer were found. Shared phonetic features were realized differently, exemplified by the rhotic system and the variation in aspiration.

Retroflexion: Both TE and GE use retroflex stops, following the GIE model. Retroflexion was perceived as stronger for TE speakers than for GE speakers; however, this was not reflected in an acoustic analysis of F2 and F3 transition, which showed no significant difference between the two speaker groups. This characteristic should be studied with larger groups of speakers, as we might expect different degrees of retroflexion in different varieties due to transfer of distinct L1 retroflexion norms, which have been observed for Hindi, Telugu, and Tamil (Ladefoged and Bhaskararao, 1983). The Gujarati speakers, many of whom had been born in Hyderabad and were fluent in Telugu, may have been influenced by Dravidian norms; further study should examine the retroflexes of Gujarati speakers who have not had such exposure.

Rhotics: Both varieties of IE tended not to have post-vocalic (coda) rhotics. Prevocally, there was variation in the rhotics used, even by individuals (Table 8). The tendency was for Gujarati speakers to use either taps or trills, and in intervocalic position almost exclusively taps, which do occur in the Gujarati L1. For the Tamil speakers, taps were also common, but approximants were most frequent. The Tamil-style fricativized approximant did appear in the English of all Tamil speakers, indicating transfer as this is not part of the GIE system. The overall average of post-vocalic /r/ use, 16%, approximates that found for speakers of the more prestigious varieties by Saghal and Agnihotri (1988), who found 12% in the most prestigious, English-medium educated students, vs. 62% for students educated in the vernacular.

Table 8. Frequency of occurrence of rhotic variants in Gujarati English and Tamil English

		Gujarati English	Tamil English
Prevocalic	Total:	96% (n = 161)	100% (n = 169)
	Modal rhotic:	r (67%)	ɹ (43%)
	Other rhotics:	ɹ (26%)	r (36%)
		r (7%)	r (1%) ɹ (2%) ɹ̥ (7%) ɹ̥ (12%)
Post-vocalic	Total:	17% (n = 214)	15% (n = 206)
	Modal rhotic:	r (39%)	ɹ (63%)
	Other rhotics:	ɹ (14%)	r (17%)
		r (8%)	ɹ (63%)
		ɹ̥ (33%)	ɹ̥ (20%)
ɹ̥ (6%)			

Glides: Both TE and GE also substituted the labiodental glide [v] for, orthographically, “v” and “w,” confirming previous descriptions of the GIE norms. Most speakers had free variation between [v] and [w], with [v] being the most frequent (~70% of tokens analyzed). One Tamil speaker consistently used [w] and [v]/[v] for words spelled with “w” and “v,” respectively. Saghal and Agnihotri (1988) report very limited use of [w] (20–33% of the time) for all their speakers; they also reported that this did not change greatly as informants provided more formal speech, indicating that this feature is perhaps not associated with prestige or lack of it in IE.

Voicing/Aspiration: Allophonic variation also differed by L1 in the voiceless stop series. Although the L1s differ in the contrasts in voicing/aspiration for stops (with Tamil having no phonemic contrast and Gujarati having a four-way contrast), speakers of both varieties of English made a consistent distinction between voiced and voiceless stops. However, the contrast is maintained differently than in RP/AE, which group aspirated and unaspirated voiceless stops to contrast with partially voiced stops. Voiceless stops in initial position are often aspirated by TE speakers, while they are rarely aspirated by GE speakers, for whom aspiration is contrastive in Gujarati. Table 9 lists voice onset times measured from voiceless stops in initial position in isolated English words. Voiceless stops in Gujarati

Table 9. Mean VOT for Gujarati and Tamil speakers producing [p t k] in initial position in isolated English words

	p	t	k
Gujarati English	20 ms	16 ms	36 ms
Tamil English	49 ms	38 ms	74 ms

English had a mean +24 ms VOT across all places (comparable to values observed by Rami *et al.*, 1999, for voiceless unaspirated stops in Gujarati). In contrast, VOTs in Tamil English stops were significantly longer ($p < .05$) at all three places of articulation.

The GIE model is said to tend towards unaspirated stops. One hypothesis about why IE speakers, such as the GE speakers here, tend not to produce aspiration on voiceless stops is related to the orthography. Gujarati, like other languages that have a phonemic distinction between aspirated and unaspirated voiceless stops, represents this contrast in its writing system. When these languages are transliterated, the distinction is represented as, e.g., *p* vs. *ph*. When speakers of languages with this phonemic distinction, such as Gujarati, see a *p* in English spelling, they may assume that it is meant to be unaspirated (Rao, 1961). The important difference between Tamil and Gujarati, that aspiration is not phonemic in Tamil, may be responsible for the difference in the use of aspiration in their varieties of English. Whether voiceless stops are allophonically aspirated in Tamil in initial position remains controversial (Balasubramanian, 1975), but the lack of a phonemic difference between aspirated and unaspirated voiceless means that the orthography of English will not predispose Tamil English speakers to producing unaspirated stops only.

In both varieties of IE, the voiced stops are fully voiced throughout; in initial position they are so pre-voiced as to be sometimes pre-nasalized. This observation was verified in an acoustic analysis of initial voiced bilabial stops /b/; mean VOT values for Gujarati and Tamil English were -86 ms and -97, respectively. Thus, a clear fully-voiced vs. unaspirated voiceless contrast replaces the partially-voiced vs. aspirated contrast used in British and American English. It is unlikely that a voiceless-voiced distinction can be accounted for by L1 transfer for Tamil speakers, given that Tamil lacks a voiced-voiceless contrast;⁵ thus, Tamil speakers have probably acquired this contrast from the GIE model. In the case of Gujarati, while the language maintains a voiced-voiceless distinction, voiced stops in Gujarati may not be produced with the same degree of prevoicing as seen in GE. There is limited data about the production of voiced stops in Gujarati. Rami *et al.* (1999) report that the velar stop /g/ is prevoiced by 37.3 ms, which is less than the prevoicing measured in our stimuli. As these data are based on limited numbers of subjects, the L1s should be further evaluated phonetically to determine whether this is the result of transfer or whether the GIE model provides for such extensive prevoicing.

Intonation

For this study, a preliminary intonation analysis, based on a transcription (closely following the ToBI system for AE; Silverman *et al.*, 1992) of a set of read sentences (e.g., declarative, yes/no questions, wh-questions, focus) revealed systematic differences between TE and GE. In general, IE utterances appeared to have several contours assigned to words prior to the boundary of the intonation phrase, corresponding possibly to pitch accents. In TE and GE, most or all content words prior to the edge of the intonation phrase are assigned a pitch accent. The proportion of different pitch accents used by GE and TE speakers are given in Table 10. GE speakers typically use a rising pitch accent transcribed here as LH, while TE speakers use either a falling pitch accent (HL), a high pitch accent (H), or a rising pitch accent (LH). TE speakers used HL significantly more frequently than GE speakers ($p < .01$), while GE speakers used LH with significantly greater frequency ($p < .01$). The use of multiple pitch accents in single utterances appears

Table 10. Proportion of phrase-internal pitch events (“pitch accents”) produced by different L1 speakers of IE

L1	“Pitch Accents”				n
	LH	HL	L	H	
Gujarati	0.56	0.12	0.05	0.26	354
Tamil	0.37	0.27	0.06	0.31	383

to be an important feature of IE intonational phonology, with TE and GE favoring distinct pitch accents (cf. Ravishankar, 1994).

IE utterances appeared to have many more pitch accents assigned to words prior to the boundary of the intonation phrase than one would expect for AE or RP readings of the same sentences. These systematic differences between IE and the typical patterns for AE may lead to intelligibility problems in communication between IE speakers and those of other English dialects. For example, in the following dialog, a typical tonal sequence in AE read speech for the second sentence would include two high pitch accents (H^*), one each assigned to “been” and “life,” assuming that the speaker is not adding emphasis to another word(s) in the utterance:

“You’re from Mumbai, aren’t you?”

“I’ve never been there in my life.”

The intonation of the same utterance for speakers of IE is shown in Figure 3; the pitch-track to the left of the vertical line is from a speaker of TE, while that to the right is from a speaker of GE. In TE and GE, most or all content words (or sets of function words) prior to the edge of the intonation phrase are assigned what AE listeners might perceive as a pitch accent; GE speakers typically use a rising pitch accent that might be best transcribed as L^*+H or $L+H^*$, while TE speakers use either a falling pitch accent ($H+L^*$ or H^*+L), a high pitch accent (H^*), or a rising pitch accent (L^*+H or $L+H^*$). The assignment of a rising contour to target words in IE (particularly GE) is very similar to the pattern observed in Hindi speakers by Rajendran and Yegnanarayana (1996),

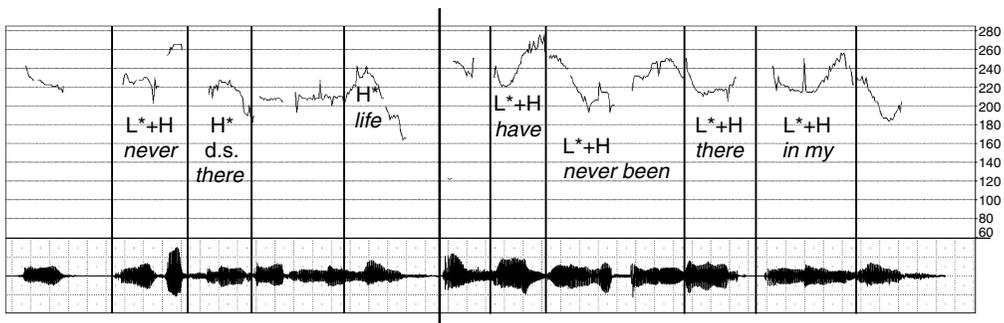


Figure 3. A plot of fundamental frequency vs. time; words that have been made prominent by pitch accents are written directly on the plot along with their perceived pitch accent. “d.s.” refers to a downstepped pitch accent (downstep = a drop in pitch range).

Bingham (1998), Harnsberger (1999), and Dyrud (2001). The use of multiple pitch accents in single utterances appears to be an important feature of IE intonational phonology, and may be the product of transfer from Gujarati, Tamil, or an important substratum language such as Hindi. In any event, it is likely to be a highly salient feature of an IE accent to AE listeners, and may impair intelligibility in cross-dialectal conversations.

CONCLUSIONS

The results showed transfer effects in GE back vowels, TE rhotics and the proportion of rising versus falling pitch accents in GE intonation. The effect of the GIE model was evident in the front vowels of both GE and TE and in the presence of initial voiced stops in TE. Thus, the data reveal both phonetic and phonological influences of IE speakers' native language on their accent in IE, even in proficient speakers; these influences appear to supersede GIE norms and can be found in both the segmental and suprasegmental properties of their speech.

NOTES

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2. For example, Wells (1982), the three-volume *Accents of English*, devotes about eight and a half pages to IE, with the half page on variation within IE.
3. The dialogues were from Jowitt 2000; the short passage was used by permission from the George Mason University Accent Archive website.
4. Because vowel spaces for males and females differ significantly, we limited the analysis to the gender with the most subjects.
5. Voiced stops may occur in certain dialects of Tamil. Lisker and Abramson (1964) measured the VOT of voiced stops for one Brahmin speaker of Tamil from Chennai with averages 62 ms prevoicing for /g/, to 78 ms for /d/, and 74 ms for /b/. It should be noted, however, that Brahmin speakers represent a small sample of the total Tamil-speaking population.

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