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Original Paper

Phonology and Phonetics of L2 Telugu English

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Abstract

The paper provides a partial phonological and phonetic description of the segmental structure of L2 Telugu English (TE). Previous research on the subject has been carried out in the context of a more general notion of Indian English (IE), so the properties of TE as distinct from other varieties of IE (e.g., Gujarati English) have largely remained unexplored. We have primarily focused on areas that previous research identified as prominent issues in the study of IE: vowel inventory and production, representation and realization of liquids, word-final obstruent phenomena, and allophones of /w/. To account for these aspects of TE, we have combined a generative approach to the study of an individual's linguistic competence with linguistic fieldwork as a means of collecting first-hand data. On the basis of collected data, we have conducted a spectrographic analysis of TE vowels and a distributional analysis of TE consonants. The paper provides the first description of the acoustic spaces of TE vowels. We found that all vowels except [ɔ] and [i] are more central in TE than in General American English. /r/ was realized as either [r] or [ɻ] without a specific pattern, and occasionally as [ɾ] in the intervocalic position. /l/ was realized as [l̪] in word-final position and as [l] elsewhere. TE displayed word-final obstruent devoicing for all obstruents except for /b/, which was consistently unreleased. /w/ was realized as [ʋ] before front vowels and as [w] elsewhere. While previous research that concentrated on the broad notion of Indian English recognized the issue of /w/-allophony, it has not provided a principle that governs the exact distribution of /w/'s allophones. By combining the generative framework with linguistic fieldwork, we have accounted for this long-standing puzzle with a single rule: /w/ → [ʋ] / __ [–CONS, –BACK].

Keywords

Telugu English, Indian English, phonology, phonetics, generative linguistics

1. Introduction

The regional variety of English that is acquired as either a first (L1) or a second language (L2) in India is often referred to as *Indian English* (IE) (Sailaja, 2009). Most speakers of IE are also native speakers of other languages of India such as Hindi and Telugu (Sirsa & Redford, 2013, p. 393). IE is the most widely spoken non-native language in India, adopted by some 129 million people (according to the *Ethnologue*). A complicating factor in the study of IE is its great variability (Maxwell & Fletcher 2009). When acquiring a second language, there are numerous factors that interact and affect the acquisition process, including the grammatical rules of a speaker's native language(s), the structure of the target language, and the quantity and quality of observable linguistic data (Wiltshire, 2006; Maskara, 2013; Slabakova, 2016). The nature of linguistic data that enter into L2 acquisition and shape the final outcome is to a large extent determined diachronically, as a result of the historical influence from different native languages. The data available to L2 IE learners are highly variable because the influencing native languages of India are numerous and span several different language families. The major families are the Dravidian family to which, for example, Telugu and Tamil belong; the Indo-Aryan family to which Hindi belongs; and the Tibeto-Burman family to which Manipuri and Himalayish belong (Kaur & Saini, 2014, p. 54). The notion of IE is a generalization over more than a hundred million speakers. In other words, 'Indian English' is a label that covers millions of individual linguistic competences. Such a high-level generalization, as we show below, obscures certain linguistic patterns of IE, patterns that only become apparent once a finer-grained approach to the study of IE is adopted.

To obviate this difficulty, we adopt a classic generative perspective that treats "language" as an internalized competence of an *individual*, i.e., an *I-language* (Chomsky, 1986, p. 22; 2000, pp. 48-49). Our main goal is to examine the properties of a single speaker's L2 competence of what is loosely called Indian English (Note 1). While various studies have focused on English of unspecified groups of speakers whose native languages are Hindi, Gujarati and Kannada (see below), there is a scarcity of information about the L2 English of native Telugu speakers. This study therefore focuses on aspects of *Telugu English* (TE), bearing in mind that this is merely a loose (but convenient) label and that the actual object of this study is a particular I-language.

To constrain the study, our focus will be limited to several phonological and phonetic phenomena that have been recognized in the literature as prominent characteristics of IE (Sailaja, 2009, p. §2) (Note 2). Prabhakar Babu's (1976) doctoral thesis—a phonetic and phonological study of Telugu's influence on English—is the most comprehensive work on the topic. However, due to its reliance on the massively variable notion of IE and without revealing the sources of its Telugu English data, the study fails to detect several significant linguistic patterns that become apparent only once an I-language perspective is adopted. Apart from Babu's thesis, only cursory remarks on the phonology and phonetics of L2 TE exists in the literature (discussed below), and a thorough study of the topic within a generative

framework is lacking.

As noted, the main objective of Babu's (1976) study was to explore the effects that L1 Telugu has on the production of L2 English by analyzing if features from the native language were carried over to affect the production of English. In doing so, Babu (1976, p. 42) gave a description of the Telugu English vowel phoneme inventory, claiming that there are 16 distinctive vowels. Those include 12 monophthongs: /i/, /ɪ/, /eː/, /ɛ/, /æ/, /ɜː/, /ə/, /aː/, /uː/, /ʊ/, /oː/, /ɒ/; and 4 diphthongs: /ɪə/, /ɔi/, /ai/ and /aʊ/. In addition to this, he claims that /ə/ occurs in both stressed and unstressed syllables in TE, therefore not making use of /ʌ/ like in RP English (Babu, 1976, p. 43). Pandey's (2015) study of 'General Indian English' (GIE) also acknowledges the use of schwa in both stressed and unstressed syllables, but provides a slightly different account of the monophthongs, as shown in Figure 1 (Note 3).

	Front	*Central*	*Back*
Close	ɪ iː		ʊ uː
Close-mid	e/ɛ eː	ə	oː
Open-mid	æ		ɔ (ɔː)
Open		aː	

Figure 1. Monophthong Phonemes of GIE according to Pandey (2015, p. 305)

According to Pandey (2015, p. 305), "[t]he diphthongs that occur on the surface are [five] in number: /aɪ, aʊ, ɔɪ, ɪə, ʊə/" (Note 4), occurring in words like PRICE, MOUTH, CHOICE, NEAR and CURE, respectively. So, Babu's account of the vowel inventory of TE differs from Pandey's account of the vowel inventory of GIE both in terms of monophthongs and diphthongs. Both sources contain cursory remarks regarding the phonetic properties of vowel production, and how these differ from some native variety of English. For example, Babu (1976, p. 44) describes [æ] as "just below half-open, sometimes long, particularly in accented syllables" and in an unspecified way different from the pronunciation of the "standard English [æ]". Pandey (2015, p. 306) claims that "[t]he vocalic allophones of GIE differ to a much greater extent than the consonant allophones from other varieties of English in terms of their phonetic realization. Almost each vowel is different in quality from RP". In neither case are these differences quantified nor is any further detail provided. We thus find not only a discrepancy in vowel inventory accounts but also an absence of a quantitative phonetic description of TE vowels. In their acoustic phonetic analysis of monophthongs produced by L2 speakers of IE whose L1 is either Hindi or Punjabi, Maxwell & Fletcher (2009, p. 68) conclude that the vowel inventory of this variety of English consists of the monophthongs /ɪ, iː, oː, eː, ɛ, æ, ʊ, uː, ɐ, ɐː/. In a follow-up study, Maxwell & Fletcher (2010) find that the same variety of IE has the diphthongs /ɔɪ, aɪ, aʊ, ɪə, eə, ʊə/, noting a high degree of inter-speaker variation. These results differ from Babu's and Pandey's accounts both in terms of

quantity and quality of the vowels.

The descriptive differences in the literature, which no doubt arise from the high variability of IE, persist in the domain of consonants. A long-standing puzzle in the study of IE is the phonological status of [v], [ʋ] and [w] (Chand, 2009; Fuchs, 2019, p. 1382). Wiltshire (2005, p. 282) reports that in IE the surface consonant inventory contains [w] and [ʋ], which "are in allophonic variation". The phoneme from which the two allophones are derived is not stated (due to complications presented below); it can only be assumed that in words such as *wind* or *warm*, the underlying phoneme is /w/. A rule that captures the distribution of these putative allophones is not provided. Speakers of Tibeto-Burman English and Gujarati English use the voiced labiodental fricative [v] and the labial-velar approximant [w] contrastively (Wiltshire, 2005; Wiltshire & Harnsberger, 2006). Wiltshire (2005, p. 284) further explains that these speakers maintain the segment [w] for words that are spelled with <w> (e.g., *water*) and alternate—without a discernible pattern—between [v] and the voiced labiodental approximant [ʋ] for words that are spelled with <v> (e.g., *voice*). Speakers of Tibeto-Burman English produce [v] and [w] more often than Gujarati English speakers, who tend to use [ʋ] much more frequently (Wiltshire, 2005, p. 285). For example, for words spelled with <w> such as *with*, *wise* and *weather*, Tibeto-Burman speakers used [w] almost 100% of the time, while Gujarati speakers used [ʋ] instead of [w] in those cases significantly more often. Furthermore, for words spelled with <v>, such as *valentine*, *volunteer* and *television*, Tibeto-Burman English speakers used [v] more than [ʋ], while Gujarati English speakers used [ʋ] significantly more often than [v]. Therefore, according to Wiltshire (2005, p. 284), when pronouncing words such as *warm* vs. *volume*, Tibeto-Burman English speakers would use [w] in the former case and [v] in the latter, while Gujarati English speakers would use [ʋ] for both. These conclusions were based on the study of the production of English by native speakers of several Tibeto-Burman languages and of Gujarati, i.e., languages which belong to two different language families, and it is unclear if any of the conclusions apply to Telugu English, which belongs to yet another language family.

Moreover, Dinkar (2013, p. 40) presents the following insight about Kannada English (note that Kannada, like Telugu, is a Dravidian language):

> "If the labiodental approximant occurs, it is likely to occur in the /w/ initial onset position, and it is unlikely to occur in bilabial /w/ onset clusters and fricative /v/ onset environments. Results are mixed when looking at whether glide /ʋ/ occurs when bilabial /w/ in the initial onset position precedes rounded vowels".

In regard to the "/w/ initial onset position", e.g., for words such as *with* and *way*, Dinkar (2013, p. 32) suggests that the approximant [ʋ] will be used for the "bilabial /w/" by some speakers of Kannada, while [w] will be used by others. As for /w/ in onset clusters only, in words such as *twelve* and *twenty*, there were no instances in which any of the speakers realized /w/ as [ʋ]. When the fricative /v/ occurred in onset environments, Dinkar (2013, p. 33) reports that it was only realized as [ʋ] 0.013% of the time.

Furthermore, according to Dinkar (2013, p. 11), the distribution of [w] is limited to word-initial positions preceding a rounded vowel for speakers of Kannada English. While [w] will only occur word-initially before a rounded vowel in Kannada English, the labiodental approximant [ʋ] and the labiodental fricative [v] never precede a rounded vowel word-initially, unless it appears in a word that is an English loan in Kannada (Dinkar, 2013, pp. 11-12). For this reason, Dinkar hypothesized, somewhat counterintuitively, that [ʋ] would sometimes be used for /w/ in Kannada English when occurring word-initially before a rounded vowel (e.g., in words like *would*, but not in *weed*), while in other cases [w] would be retained. Note that this claim is separate from that of [w] occurring in onset clusters and solely focuses on its presence word-initially when preceding a rounded vowel. The results of Dinkar's study were highly variable and a definitive conclusion could not be drawn as to whether this phenomenon occurs systematically.

Contrary to Wiltshire (2005), Masoko and Trinidad (2017, p. 12) claim that [v] and [w] are not contrastive and concludes that [ʋ] replaces both segments in all cases when an Indian speaker speaks English, without elaborating on the topic. Fuchs (2019) suggests that "the /v/-/w/ contrast might constitute a near-merger in IndE, a result that would account for the conflicting views present in the literature." Although the idea that [ʋ] and [w] are non-contrastive does seem to be a recurring assumption among scholars (Sailaja, 2009, p. 20; Pandey, 2015, p. 303), further measures should be taken in order to verify such a claim. Evidently, there are open questions in regard to this topic, especially for native Telugu speakers.

Issues in the phonology and phonetics of IE rhotics have also been recognized and briefly addressed in previous research. In his table of consonant phonemes of GIE, Pandey (2015, p. 303) gives /ɾ/ as the only rhotic, claiming that it is "variously termed as approximant or flap" in the literature. On the other hand, Sailaja (2009, pp. 19-20) claims that the trill /r/ is the only rhotic phoneme in IE, appearing in words such as *rock* and *round*. Scholars such as Babu (1976, p. 54) and Fuchs (2016, p. 25) acknowledge that there are several different surface variants of the underlying IE rhotic. While allophones such as trill [r], retroflex approximant [ɻ] and flap [ɾ] are presented in these sources, the environments in which they occur are not specified. On the subject of the "rhotic" vs. "non-rhotic" variety of English, Sailaja (2009, p. 19) says the following:

> "Standard IE pronunciation is non-rhotic, in which feature it matches RP. That is, the letter *r* in words like *card*, *park*, *smart*, *heart*, *bird*, *earth*, *purse*, where it occurs before consonant sounds, is not articulated. Also, it remains silent when it occurs in word-final positions as in *car*, *player*, *singer*, *sir* etc".

Pandey (2015, p. 304) claims that "/ɾ/ optionally does not occur before consonants and word-finally", while Fuchs (2016) concludes that overall there are contradictory claims in the literature on whether IE is a rhotic or a non-rhotic variety of English.

Wiltshire (2006, p. 3) reports that speakers of Tibeto-Burman English tend to devoice obstruents in word-final positions. As an explanation for this phenomenon, she offers the observation that Tibeto-Burman languages generally do not allow codas. However, it is unclear why in light of that fact these speakers devoice word-final coda obstruents rather than deleting them, which would be more in line with the patterns of their native language. Unlike Tibeto-Burman languages, Gujarati and Hindi do allow voiced obstruents in codas (Wiltshire, 2006, p. 3). It is not surprising, then, that speakers of Tibeto-Burman languages such as Angami and Mizo devoice English word-final voiced obstruents much more often than speakers of Hindi and Gujarati (Wiltshire, 2006, p. 3). Overall, this topic is still understudied, particularly in regard to Telugu.

Retroflexion of the lateral approximant /l/ in TE has also been inconsistently described in previous literature. Babu (1976, p. 54) states that the lateral alveolar approximant /l/ can occur either at the beginning, middle or end of a word, in words such as *look*, *fellow* and *signal*. He suggests that an underlying /l/ can sometimes be realized as a retroflex lateral approximant [ɭ] when it occurs in word-final position, e.g., in words such as *girl* and *pull*. On the other hand, Pandey (2015, p. 304) claims that "the alveolar lateral tends to be retroflexed [ɭ] intervocalically". Sailaja (2009, p. 23) does not provide a generalization about the distribution of /l/'s allophones at all and merely states that "the deeper south one goes, the greater the degree of retroflexion of [ɭ]".

In sum, a survey of the relevant literature reveals a set of open research questions, particularly in regard to the vowel inventory, "v-like" sounds, rhotics, word-final voiced obstruents and lateral approximants of non-native Indian English. Thus, we address these research questions for L2 Telugu English, where investigations have been particularly scarce.

2. Method

2.1 Participants

Since the goal of this study was to provide a partial description of the linguistic competence of an *individual* (consistent with the I-language perspective; cf. Chomsky, 1986; Vaux & Cooper, 1999), the study included a single consultant, whose linguistic performance served as a source of evidence.

The consultant was a male in his mid-20s, born in Jaggayyapeta, Andhrapradesh, India. He spent the first 5 years of his life there, moving to Hyderabad, Telangana, India afterwards. His native language is Telugu, and his exposure to English began around the age of 5. While his parents can speak English, Telugu was the only language that was spoken in his household. The consultant's parents, who can be classified as belonging to a forward caste, had attained a post-graduate level of education through Telugu-medium schools. The consultant attended an English-medium private school in India that also incorporated Telugu and Hindi. The textbooks used in the school were written in English, except for the subject *Telugu language*. At the time when the elicitation session took place, the consultant had lived in Montreal, Canada for 5 years. He completed a Bachelor's program and a Master's program in Software

Engineering at Concordia University (Montreal, Canada), with both programs administered exclusively in English.

2.2 Materials

The study consisted of a 30-minute and a 90-minute elicitation session; the two sessions were spaced two months apart to avoid priming and overloading the consultant. On the first occasion, the consultant was presented with a PowerPoint presentation that consisted of 20 isolated English words, 10 English sentences, 20 isolated Telugu words and 20 Telugu sentences. On the second occasion, he was presented with 52 English words and 30 English sentences. The presentation was set up to include one word per slide, accompanied by a picture, in order to facilitate his understanding. In regard to sentences, there were 2 per slide, also presented to the consultant on a computer screen. Words and sentences were chosen so as to provide a representative variety of phonological forms, thus allowing for an exploration of various segmental phenomena. A *MacBook Pro* was used to present the relevant material to the consultant as well as to record the elicitation session via an external microphone. *Praat* was used for the spectrographic analysis of the vowels, and *R Studio* for the creation of Figure 2.

2.3 Procedure

The consultant was given a concise explanation of how the elicitation sessions would proceed. He was told that he would be provided with English words and sentences in written form, which he would have to pronounce. The session began by eliciting monosyllabic words such as *boat*, disyllabic words such as *island* and finally some trisyllabic words like *sunglasses* or *spectacles*.

After all 20 isolated words were elicited, we moved on to sentences. Here, the consultant was provided with 10 English sentences, which included the 20 words that he was previously asked to produce. He was simply asked to read the English sentences aloud. After going through all 10 sentences, we moved away from eliciting data for a few minutes to speak about the consultant's background, in order to avoid fatigue or boredom potentially brought by repetitive tasks (Vaux & Cooper 1999, p. 19). The consultant was asked about what languages he spoke growing up, when he acquired English and his education level as well that of his parents.

Such a procedure comprised the first 30-minute elicitation session. Two months later, a similar procedure was implemented two more times, with a larger set of English words and sentences. These two sessions were split by a 30-minute break. Ultimately, the entire experimental paradigm yielded three 30-minute sessions of the form just described.

R Studio was used to plot all vowels in terms of their F1-by-F2 values, as well as to create ellipses that capture the 95% confidence intervals around the occurrences of all vowel tokens.

3. Results

3.1 Vowels

Table 1 shows the average values for the first three formants (F1, F2 and F3) for each of the observed

vowels. The formant values were extracted in *Praat* using the 'get all formants' function over the entire temporal window in which the vowel's formants visually appeared to be stable. For each vowel, the formant values were averaged across all occurrences (612 tokens in total). Corresponding Standard Deviations (SD) are included in the brackets below each formant value.

Table 1. Average Formant Frequencies of Telugu English Vowels and Their Corresponding Standard Deviations

	[i]	[ɪ]	[e̞]	[ɛ]	[æ]	[ə]	[u]	[ʊ]	[o]	[ɔ]	[ɑ]
F1	293	388	362	523	765	517	352	427	415	538	731
(SD)	(25)	(32)	(30)	(48)	(60)	(68)	(33)	(63)	(31)	(99)	(72)
F2	2383	1970	2254	1780	1612	1527	1106	1213	986	974	1204
(SD)	(117)	(164)	(139)	(165)	(131)	(114)	(279)	(143)	(147)	(149)	(154)
F3	2843	2550	2701	2457	2359	2500	2648	2513	2623	2486	2391
(SD)	(260)	(134)	(163)	(171)	(195)	(148)	(133)	(114)	(149)	(248)	(239)

Figure 2 is a scatter plot in which every TE vowel token is characterized by its F1 and F2 value. The x-axis tracks F2 from right to left, while the y-axis tracks F1 from top to bottom. The ellipses are 95% confidence intervals for mean formant values; as such, they are taken to represent the acoustic spaces of the 11 observed vowels. Tokens and spaces are color-coded so as to reflect the distinctness of their categorical (phonological) sources.

Figure 3 is a comparison of the consultant's Telugu English vowels in red with the vowels of General American English (GAE; as described by Ladefoged & Johnson, 2010, p. 193) in black. Here, the x-axis also tracks F2 from right to left, while the y-axis tracks F1 from top to bottom.

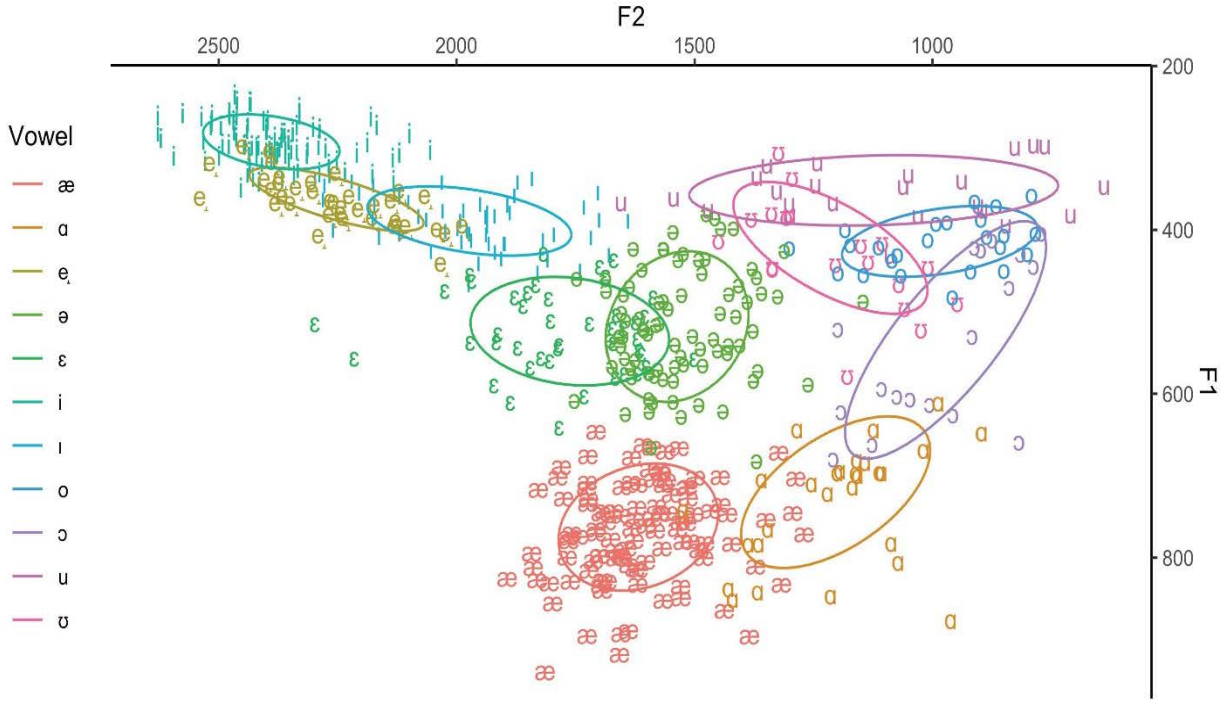

Figure 2. Acoustic Spaces of 11 Telugu English Vowels. Each Vowel Token Is Characterized by Its F1 and F2

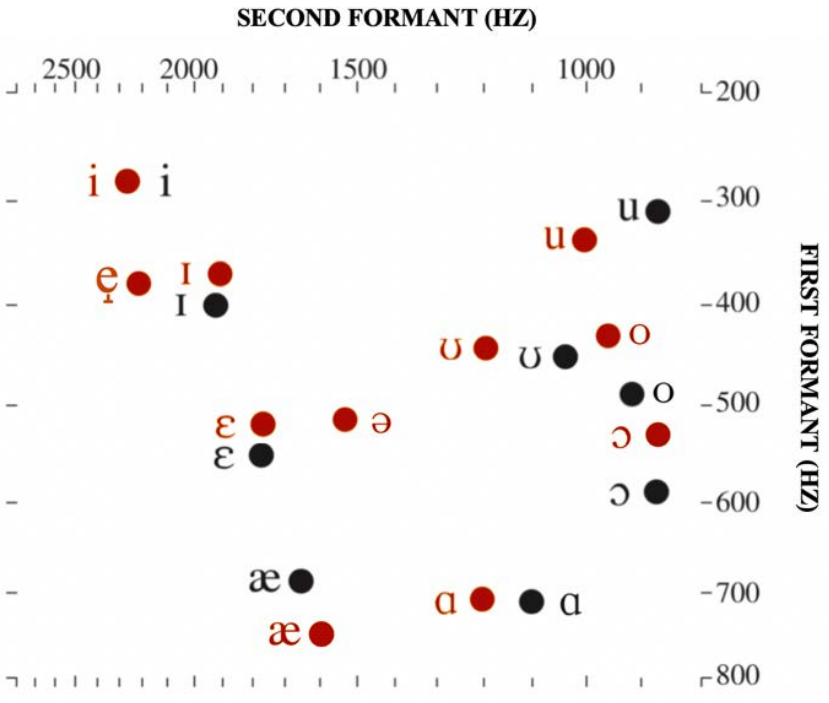

Figure 3. A Comparison between Telugu English Vowels (in red) and General American English Vowels (in black)

The consultant consistently produced the following diphthongs (and only those): [aɪ] in words such as *price* and *kind*, [aʊ] in *mouth* and *pound*, [ɔɪ] in words like *boy* and *poison*.

3.2 [w] and [ʋ]

In both isolated words and in connected speech, the consultant realized the underlying TE /w/ with two allophones—the labial-velar approximant [w] and the labiodental approximant [ʋ]. The two segments are in complementary distribution: [ʋ] occurs when immediately followed by a front vowel and [w] occurs elsewhere. Table 2 shows the instances in which [w] and [ʋ] occurred. Of all 107 tokens that contained either [w] or [ʋ], only 2 were an exception to the general distributional pattern. On a single occasion *water* was pronounced as [ʋɔʈə], even though [ʋ] was not followed by a front vowel. Similarly, on a single occasion *homework* was pronounced with a [ʋ]. While Table 2 shows only a subset of the words and sentences used throughout the elicitation sessions, Table 3 displays *all* of the exceptions that occurred.

Table 2. Telugu English Words and Sentences Displaying [w] and [ʋ]

TE word/sentence	Narrow transcription	TE word/sentence	Narrow transcription
wood	[wʊɽ]	*wetsuit*	[ʋɛɽsuɽ]
shower	[ʃæwə]	*wave*	[ʋẹʊ]
towel	[ɽæwʊl]	*wheel*	[ʋɪl]
water	[wɔɽər]	*window*	[ʋɪndo]
wall	[wɑl]	*waffles*	[ʋæfʊls]
flower	[flæwə]	*highway*	[haɪʋẹ]
award	[əwɑrɽ]	*whale*	[ʋẹl]
There is seaweed on my towel.	[siʋiɽ] [ɽæwʊl]	*My grandmother shares her wisdom while we eat waffles.*	[ʋɪzɖəm] [wɑi] [ʋi] [ʋæfʊls]
Does he take a shower after doing his homework?	[ʃæwə] [homwək]	*The stars twinkle in the sky.*	[ɽʋɪkəl]
The water washed the castle away.	[wɔɽər] [wɑʃɪɽ] [ɛʋẹ]	*I could hear the bird tweeting.*	[ɽʋiɽiŋ]

Table 3. Exceptions in the Distribution of [w] and [ʋ]

TE word/sentence	Narrow transcription
I water the flowers in my wetsuit. *homework*	[ʋɔɽə] [homʋʊk]

3.3 Rhotics

While producing TE words that contain rhotics (like *right* and *trap*), the consultant alternated between the retroflex approximant [ɻ], the alveolar trill [r], and in two isolated cases the retroflex flap [ɽ]. The alveolar central approximant [ɹ], characteristic for GAE and RP, was never used. While [r] and [ɽ] can be seen in both isolated words and in connected speech, the speaker's use of [ɻ] is only apparent in connected speech, the only exception being the word *raspberry*. These results are displayed in Table 4. There were also instances where *different* rhotics were featured in the same environments, which can be seen in Table 5. The dashed lines in both tables indicate that a particular segment was not pronounced in the specified environment. On the basis of the results in Tables 4 and 5, it was not possible to determine a principle that governs the surface distribution of rhotics.

Table 4. Telugu English Words with Rhotics

TE word/sentence	Consultant's use of [ɻ]	Consultant's use of [r]	Consultant's use of [ɽ]
chair	--------	[tʃɻr]	--------
water	--------	[wɔɽər]	--------
shark	--------	[ʃærk]	--------
stars	--------	[sɽærs]	--------
arrow	--------	[æro]	--------
breeze	--------	[bris]	--------
vineyard	--------	[ʋaɪnjærɽ]	--------
kangaroo	--------	--------	[kængæɽu]
I left my sandals under the chair.	--------	[ənɖɛr], [tʃɻr]	--------
There are whitecaps on each crashing wave in the ocean.	[kɻæʃɪŋ]	[ɖɛr ər]	--------

The kangaroo fell right into my trap.	--------	--------	[kængæɽu]
I could hear the bird tweeting.	[hiɻ]	--------	--------
There are so many trees in the vineyard.	[tʃɻis]	[vɑɪnjært̪]	--------

Table 5. Telugu English Words with Rhotics—Free Variation

TE word	Environment	[ɻ] in isolated words	[ɻ] in connected speech	[r] in isolated words	[r] in connected speech
rabbit	#_æ	----------	[ɻæbɪt̪]	----------	----------
raspberry	#_æ	[ræzbɛɻi]	----------	[ræzbɛɻi]	----------
grass	g_æ	----------	----------	----------	[græs]
grandmother	g_æ	----------	[gɻænməɖə]	----------	----------
gravity	g_æ	----------	[gɻævɪt̪i]	----------	----------
cracked	k_æ	----------	[kɻækt̪]	----------	----------
crashing	k_æ	----------	[kɻæʃɪŋ]	----------	----------
crab	k_æ	----------	----------	----------	[kræb̄]

3.4 Word-final obstruents

Different voiced obstruents behaved differently at the end of words. While the voiced obstruents /ɖ, z, g, d͡ʒ, ʒ/ underwent devoicing in word-final position, the voiced bilabial plosive /b/ was unreleased (i.e., realized as [b˺]) word-finally. An acoustic inspection verified that word-final bilabial stops maintained their voicing throughout their closure phase, despite lacking an audible sound burst. Obstruents did not undergo devoicing word-initially or word-medially. Results of both of these alternations, which occurred both in isolated words and in connected speech, can be seen in Table 6 and Table 7.

Table 6. Telugu English Words that Display Word-final Obstruent Devoicing

TE word/sentence	Consultant's devoicing of word-final obstruents					
	/z/	/d̪/	/g/	/ð/	/ʒ/	/d͡ʒ/
sunglasses	[sənglæsʊs]	--------	--------	--------	--------	--------
waffles	[ʋæfʊls]	--------	--------	--------	--------	--------
sand	--------	[sænt̪]	--------	--------	--------	--------
seaweed	--------	[siʋit̪]	--------	--------	--------	--------
smooth	--------	--------	--------	[smut̪]	--------	--------
breathe	--------	--------	--------	[brit̪]	--------	--------
hug	--------	--------	[hək]	--------	--------	--------
flag	--------	--------	[flæk]	--------	--------	--------
judge	--------	--------	--------	--------	--------	[d͡ʒət͡ʃ]
badge	--------	--------	--------	--------	--------	[bæt͡ʃ]
garage	--------	--------	--------	--------	[gærɑʃ]	--------
massage	--------	--------	--------	--------	[mæsæʃ]	--------
The wind brings a cool breeze.	[briŋs] [bris]	[ʋɪnt̪] --------	-------- --------	--------	--------	--------
The frog liked to bathe in the pond.	-------- -------- --------	-------- -------- [pɑnt̪]	[frɑk] -------- --------	-------- [bẹt̪] --------	-------- -------- --------	-------- -------- --------

Table 7. Word-final /b/ Unreleased in Telugu English Words

TE word	Consultant's pronunciation (isolated words)	Consultant's pronunciation (connected speech)
bathtub	[bæt̚əb̚]	[bæt̚əb̚]
cobweb	[kɔbʊɛb̚]	[kɔbʊɛb̚]
crib	[krɪb̚]	[kɻɪb̚]
crab	[kræb̚]	[kræb̚]

3.5 Laterals

In addition to the variation in the production of rhotics (see §3.3), the consultant's pronunciation of TE also featured a variation in the production of the lateral approximant. As shown in Table 8, the consultant used the *retroflex* lateral approximant [ɭ] in word-final position and the *alveolar* lateral approximant [l] elsewhere. This was consistent both in isolated words and in connected speech.

Table 8. Telugu English Words with Lateral Approximants

TE word	Consultant's use of [ɭ]	Consultant's use of [l]
island	--------	[ɑɪlɛnt̚]
glass	--------	[glæs]
seashell	[siʃɛɭ]	--------
coral	[kɔrʊɭ]	--------
oatmeal	[ot̚miɭ]	--------
legal	[ligəɭ]	[ligəl]
royal	[rʊiɭ]	--------
shield	--------	[ʃiɭt̚]

waffles	--------	[ʋæfʊls]
The seagull ate a seashell.	[sigəl̩] [siʃɛl̩]	-------- --------
The beach ball landed on the boat.	[bitʃbɔl̩]	[lændɻɪt̚]
The royal army tends to use cannonballs.	[rʊil̩]	[kænɔnbɑls]
I wrote a novel about my time at the festival.	[nævɛl̩] [fɛstɻɪvʊl̩]	-------- --------

4. Discussion

The results indicate that the vowel inventory of the consultant's Telugu English (TE) contains 11 monophthongs (/i, ɪ, e, ɛ, æ, ə, u, ʊ, o, ɔ, ɑ/) and 3 diphthongs (/aɪ, aʊ, ɔɪ/). Our findings differ from Babu's (1976) account of TE vowels to the extent that our data did not confirm the existence of vowels /ɜ/ and /ɪə/. They also differ from Maxwell & Fletcher's (2010) account of Hindi English and Punjabi English in that we did not find the diphthongs /ɪə, eə, ʊə/ in words like NEAR, SQUARE, and CURE respectively, but rather monophthongs /i, e, u/. The results are well aligned with Pandey's (2015) description of General Indian English (GIE) in terms of the monophthongs, but less aligned in terms of the diphthongs. Pandey's (2015) monophthong inventory, reproduced in Figure 1, also contains 11 vowels; the only difference is that in our results the vowel in words like FATHER is almost equal in backness to [ʊ] (see Figure 3), so we have decided to treat it as the low back [ɑ], unlike Pandey who classified it as the low central [a]. However, in words where Pandey finds diphthongs [ɪə] and [ʊə] (like NEAR and CURE), we have found monophthongs [i] and [u] respectively. Furthermore, our results confirm Babu's (1976) and Pandey's (2015) claims that [ə] occurs in both stressed and unstressed syllables without /ʌ/ ever appearing in any of those environments.

Figure 2 provides the first description of the acoustic spaces of TE vowels (Note 5), following the methodology that Peterson and Barney (1952) and Hillenbrand et al. (1995) used in their seminal studies of GAE vowels. A notable pattern visible in Figure 2 and also reflected in the SD values in Table 1, is that front vowels exhibit less variability than back vowels.

In Figure 3, we have plotted TE vowels (red) and GAE vowels (black) onto a standard vowel chart where the vertical axis indicates F1 and articulatory height while the horizontal axis indicates F2 and articulatory backness. The TE vowels were plotted on the basis of the average F1 and F2 values given in Table 1. The GAE vowels have been plotted on the basis of the data from Ladefoged and Johnson

(2010, p. 193), who give "the average of a number of authorities' values of the frequencies of the first three formants in eight American English vowels". Distinctive characteristics of the TE vowel inventory include a very high [e], a very low [æ], and relatively front [u], [ʊ] and [ɑ]. Comparing the TE and GAE vowels, we have found that all TE vowels except for [ɔ] and [i] are more central in TE (Note 6).

Another prominent issue in the study of Indian English is the occurrence and distribution of /w/'s allophones. While previous sources have acknowledged that underlying /w/ (in words such as *water*, *why*, *towel*) may be realized as either of the three segments, none of the sources have successfully determined the exact distribution of these allophones. For example, while Wiltshire (2005, p. 282) says that /w/ is realized by allophones [w] and [ʋ], she does not specify in which contexts each of these allophones is to be found. Also, Pandey (2015, p. 303) says that in GIE "[t]he labio-dental approximant /ʋ/ is substituted for two native English phonemes, the labial approximant /w/ [...] and the labio-dental fricative /v/, both of which are distinguished in restricted environments allophonically"; again, the exact distribution of /w/'s allophones is left unstated. We think that the reason why its distribution has remained a mystery is the following: conflating the production of many millions of speakers spread across many dialects belonging to several different language families, as is standard practice in the study of this issue (Maxwell & Fletcher, 2009, p. 53), obscures the patterns that would be detectable had a more fine-grained perspective been adopted. In other words, 'Indian English', as conceived in the literature, is such a massively variable notion, an amalgam of so many different things, that it precludes the statement of many important regularities. Specifically, it is not possible to find a rule that governs the distribution of /w/'s allophones unless IE is decomposed into less variable components. In order to achieve that, we have adopted a standard generative perspective which views language as a property of an individual's mind (following Chomsky 1986 and subsequent work), and have combined it with linguistic fieldwork in order to obtain first-hand data (following Vaux & Cooper 1999).

While Dinkar (2013) reports that both the voiced labiodental fricative /v/ and the approximant /ʋ/ exist at the underlying level in IE, our results show that the consultant's TE does not include /v/. Instead, in all cases where we would expect to find [v] (for example, in words such as *vineyard* and *gravity*) we have consistently found only [ʋ]. The simplest and most plausible analysis is that in those words the speaker has internalized /ʋ/ as the phoneme from which only [ʋ] is derived. Furthermore, Wiltshire (2005, p. 284) says that speakers of Gujarati English and Tibeto-Burman English use [v] and [w] contrastively; we have not found that to be the case for TE.

Our findings concur with Wiltshire's (2005, p. 282) claim that [w] and [ʋ] are in allophonic distribution. However, while Wiltshire and other sources do not state the environments that condition these allophones, the linguistic performance of our consultant demonstrated a clear pattern in their distribution. As shown in Table 2, /w/ was realized as [ʋ] before front vowels and as [w] elsewhere. We can thus attribute the following phonological rule to the speaker's TE competence:

(a) /w/ → [ʊ] / __ $V_{[-BACK]}$

Dinkar puts forth three claims about this allophonic pattern in Kannada English:

(1) /w/ is sometimes realized as [ʊ] before rounded vowels (2013, p. 40);

(2) /w/ is sometimes realized as [ʊ] in an "initial onset position" (2013, p. 32);

(3) /w/ is not realized as [ʊ] in onset clusters (2013, p. 33).

The results in Table 2 show that the roundedness of the following vowel has no impact on the realization of /w/: it is realized as [w] when followed by rounded vowels in words such as *wood*, *towel* and *wall*; also, it is realized as [ʊ] before unrounded vowels in words such as *seaweed*, *wave* and *window*. This shows that, contrary to (1), the distribution of allophones [w] and [ʊ] is not determined by the feature [ROUND] of the following vowel, but rather by the specification of its [BACK] feature. We have also not found any evidence supporting claims (2) and (3): the position of /w/ within a syllable did not play any role in determining the distribution of its allophones. We therefore conclude that although Dinkar's (2013) claims may be valid for Kannada English, they do not apply to the consultant's Telugu English, despite the fact that Kannada and Telugu belong to the Dravidian family.

Before proceeding to discuss the results on rhotics, we should clarify what the literature says about their underlying and surface distribution in both General American English (GAE) and Telugu. General American English contains the alveolar approximant /ɹ/, whose most common allophone is [ɹ], while [ɻ] and [ɹ̠] occur marginally; it also features the flap [ɾ] as an allophone of /t/ and /d/ (Burleigh & Skandera, 2005, pp. 109-110). Telugu—the consultant's native language—has the alveolar trill /r/ which has two allophones: the flap [ɾ] intervocalically and [r] elsewhere (Bhaskararao & Ray, 2017, p. 235). As can be seen in Tables 4 and 5, the consultant predominantly produced [r] in place of the typical GAE [ɹ], and less frequently [ɻ] and [ɽ]; there were no instances of [ɹ]. While Telugu has several retroflex consonants, its phoneme inventory does not contain /ɻ/ or /ɽ/ (Pandey 2015, p. 303; Bakst 2012), so it may be plausible that a general tendency towards retroflection in his native language is what led the consultant to produce [ɻ] and [ɽ] in some TE words. This assumption is corroborated by the fact that where a typical GAE speaker would produce the alveolar flap [ɾ] (in words like *water*), the consultant produced the retroflex stop [ʈ]. The tendency to produce [ɻ] was more prominent in connected speech than in isolated words; in the latter, only two instances of [ɻ] were found. On the other hand, while [ɽ] was used less frequently than [r], the difference between connected speech and isolated words did not seem to have a significant impact on its selection. On the basis of the surface distribution of rhotic consonants in TE, we can conclude that, phonologically, it would be plausible (e.g., more parsimonious and less abstract) to assume that the consultant's TE contains the trill /r/ and not the approximant /ɹ/. However, in accordance with other sources (Babu, 1976; Fuchs, 2016; Bhaskararao & Ray, 2017), it was not possible to determine any general principles that govern the distribution of allophones [r], [ɻ] and [ɽ] of the phoneme /r/. The environments in which each of these allophones occur appear to be random. Thus, we are led to the conclusion that the realization of /r/ in TE is a matter of free surface variation.

As can be seen from Tables 6 and 7, different voiced obstruents behaved differently in word-final position. The consultant consistently devoiced word-final /d̪/, /z/, /g/, /d͡ʒ/ and /ʒ/. Note that the consultant always produced retroflex [ʈ] and [ɖ] in place of GAE phonemes /t/ and /d/ (see examples in Table 6)—a well-known phenomenon in IE (Sirsa & Redford, 2013, p. 404)—so we are assuming that he internalized /ʈ/ and /ɖ/, and not /t/ and /d/, as part of his underlying inventory. Furthermore, word-final /b/ (but no other word-final stop) was consistently unreleased. We can postulate two phonological rules to account for these patterns:

(b) [+CONS, –SON] → [–VOICED] / __#

(c) /b/ → [b̚] / __ #

Similarly to the Tibeto-Burman languages which generally do not allow codas (Wiltshire, 2006, p. 3), Telugu does not allow consonants in word-final position except for /m/, /j/ and /w/ (Sailaja, 1999, p. 744). Babu (1976, p. 30) specifically states that stops never occur in word-final position in Telugu. It is possible that these restrictions on word-final obstruents in the consultant's native Telugu are reflected in his production of L2 TE. For the Tibeto-Burman English (e.g., non-native English of native speakers of Angami and Ao), Broselow (2018, p. 5) reports that both of these word-final effects can frequently be observed in all obstruents, and attributes those effects to the influence of the native language. However, if that is the case, then several aspects of the influence of native Telugu on the production of non-native English remain unclear. Why is /b/ consistently unreleased word-finally while other obstruents are devoiced, i.e., why are these voiced obstruents treated differently? If Telugu doesn't allow obstruents word-finally, then why are the obstruents merely different in TE and not completely absent? Broselow (2018) invokes the notion of markedness to explain the general tendency of voiced obstruents to change into something less marked (in Optimality Theory, this would amount to the high ranking of the VOP 'voiced obstruent prohibition' constraint), but the typical markedness-based reasoning (e.g., that voiced obstruents are harder to articulate than their voiceless counterparts) is clearly insufficient to account for the two questions raised here.

While sources such as Masoko and Trinidad (2017, p. 11) and Fuchs (2016, p. 24) claim that the interdental fricatives /θ/ and /ð/ in IE are realized as [t̪] and [d̪] respectively, our results suggest otherwise. In all words that contain the phonemes /θ/ and /ð/ in a typical GAE speaker's competence (e.g., *thieves, bathtub, smooth, breathe*), the consultant consistently produced the retroflex stops [ʈ] and [ɖ]. Since [θ] and [ð] never surfaced, we conclude that the underlying representations of words like *thieves*, *smooth* etc. contain phonemes /ʈ/ and /ɖ/. In other words, whereas a typical GAE speaker represents *smooth* as /smuð/, we assume that the consultant represents *smooth* as /smuɖ/. In line with the aforementioned word-final obstruent phenomena, specifically with rule (b), such a *word-final* /ɖ/ then undergoes devoicing. As shown in Table 6, *smooth*, *breathe*, *bathe* etc. were all realized with a word-final [ʈ].

The realization of the lateral approximant /l/ was consistent across the consultant's production of TE: retroflex [ɭ] occurred only word-finally, while alveolar [l] occurred elsewhere. This pattern is captured by rule (e).

(e) /l/ → [ɭ] / __#

Babu (1976, p. 37) suggests that /ɭ / never occurs at the beginning of words and contrasts medially and word-finally with /l/ in Telugu. In regard to Telugu English, Babu (1976, p. 54) says that /l/ is realized as a retroflex in word-final positions in some instances; however, he explicitly states that that is an irregular alternation which does not always occur. He also mentions /l/ occurs initially, medially and word-finally (1976, p. 54), thereby indirectly claiming that it occurs everywhere. Apart from Babu's study, previous research on retroflexion of laterals in IE is scarce (cf. Indira 2009). While the results in Table 8 are consistent with Babu's claim that retroflex [ɭ] never occurs word-initially, they also indicate, contrary to Babu, that [l] never occurs word-finally and that the alternation in (e) is applied consistently, since we found no deviation from that pattern. The retroflexion of the lateral approximant is potentially yet another instance of the influence of Telugu (where /ɭ/ is a phoneme) on the formation of L2 TE competence (where /ɭ/ is not a phoneme). This influence is made even more specific by the fact that in Telugu [ɭ] never occurs at the beginning of a word, which may be why rule (e) limits its occurrence to word-final positions.

5. Conclusion

In this paper, we have provided a partial phonological and phonetic description of the segmental structure of Telugu English (TE), a variety of English spoken mostly as a second language in the Indian states Andhra Pradesh and Telangana. The few existing phonological and phonetic descriptions of TE have been carried out in the context of a more general notion of Indian English (IE). Therefore, the properties of TE as distinct from other varieties of IE (e.g., Gujarati English) have largely remained unexplored. IE displays massive phonological variability due to the influence of many different native languages spoken in India. This in turn can obscure many relevant linguistic patterns. To mitigate the situation, we have combined a generative approach to the study of an individual's linguistic competence with linguistic fieldwork as a means of collecting first-hand data. Thus, a single native speaker of Telugu, whose second language is TE, participated in a series of elicitation sessions designed to obtain representative data in both isolated words and in connected speech. The topics explored included the vowel inventory, the distribution of rhotics, word-final obstruent phenomena, retroflexion of [l] and the distribution of [v], [ʋ] and [w].

We have found that the TE vowel inventory consists of monophthongs /i, ɪ, e, ɛ, æ, ə, u, ʊ, o, ɔ, ɑ/ and diphthongs /aɪ, aʊ, ɔɪ/. This study provides the first spectrographic analysis of TE vowels (see Table 1) and a description of their acoustic spaces (Figure 2) in the vein of Hillenbrand et al. (1995) for General American English (GAE). We have found that all vowels except [ɔ] and [i] are more central in TE than

in GAE (Figure 3).

Unlike the previous literature on the subject (e.g., Wiltshire, 2005) we have successfully determined the principle that governs the distribution of segments [v], [ʋ] and [w]. While the voiced labiodental fricative /v/ is present in a typical GAE speaker's phoneme inventory, the consultant's TE does not include /v/. In all cases where we expected [v] (e.g. *vineyard*), the consultant produced the approximant [ʋ]. Furthermore, we have established that the distribution of [w] and [ʋ] is governed by the rule in (a): /w/ is realized as [ʋ] before front vowels and as [w] elsewhere. We have argued that a specific claim about the distribution of these allophones had not been made in previous research because of the conflation of the production of many millions of speakers spread across many dialects belonging to different language families.

The trill /r/ was realized as either [r] or [ɻ] without a specific pattern, and occasionally as [ɾ] in the intervocalic position. Therefore, we have attributed such a distribution to free surface variation. There were no occurrences of [ɹ], so we have assumed that /ɹ/ is not part of the TE phoneme inventory.

Word-final obstruent devoicing was consistently featured in all voiced obstruents except for /b/, which was realized without an audible release but with preserved voicing. We have assumed that these word-final obstruent phenomena stem from the fact that Telugu is a language of the Dravidian family which generally does not allow consonants in word-final position except for /m/, /j/ and /w/ (Sailaja, 1999, p. 744), but the explanation for the exact nature of the pattern (i.e., its relative unnaturalness) is yet to be found.

Finally, the distribution of the lateral approximant /l/ was predictable and consistent: alveolar /l/ occurred both word-initially and word-medially, but never word-finally; in the word-final position, /l/ was always realized as the retroflex approximant [ɭ].

While the I-language perspective has allowed us to provide new insight into several long-standing problems in the study of IE, the main drawback of such an approach is that, due to its individualistic nature, its implications for the study of inter-speaker variation are very limited. It would therefore be beneficial in future research to employ a comparable methodology (i.e., combining generative linguistics and linguistic fieldwork) in order to eventually arrive at a more complete account of TE both in terms of individual metal grammars and their inter-speaker variation.

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Notes

Note 1. That means that we do not use the more conventional method of drawing statistical conclusions from a sample that represents a population. If we were to do so, then clearly our small sample size would prove to be problematic. But since we are interested in exploring aspects of an individual speaker's internal language and their use (pronunciation) of that language, working with a single consultant is appropriate.

Note 2. In other words, we do not aim to provide a fully exhaustive phonological and phonetic description of Telugu English, but rather focus our efforts on a more modest goal of elucidating some perennial problems in the study of TE, using the I-language approach. While the topics that we deal with (and our methods of dealing with them) may seem disjoint superficially, what unites them is the fact that they haven't been accounted for in previous literature.

Note 3. The length marks in Figure 1 appear as in the original table by Pandey (2015, p. 304).

Note 4. It is unclear why Pandey (2015, p. 305) refers to "the surface" while describing "Vowel phonemes" (as the section title says); the inappropriateness of reference to the surface is also reflected in the appropriate use of slanted brackets which are supposed to capture underlying (and not surface) segments, i.e., phonemes.

Note 5. See Maxwell, & Fletcher (2009, pp. 60-64) for an acoustic analysis of the IE vowels produced by speakers whose L1 is either Hindi or Punjabi. Sirsa, & Redford (2013, p. 399) provide a chart with average F1-F2 midpoints for TE vowels.

Note 6. The significance of these differences could not be tested statistically because the raw formant data on GAE vowels was not available.