

Pitch accent in Indian-English teaching discourse

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ABSTRACT: The phonetic correlates of accent/stress distinguish Indian English (IE) from American dialects (Spencer, 1957; Kachru, 1983). We examine the realization of accent in IE compared to American English (AE) produced by teaching assistants in similar contexts. In teaching discourse, we find that a lexically accented syllable is often realized in IE with a relative drop in frequency and without a reliable increase in amplitude. In similar contexts, lexically accented syllables in AE reliably increase in both frequency and amplitude. Following the distinction made in Beckman (1986), we conclude that IE acts as a pitch-accent language rather than as a stress-accent language like AE.

We also suggest a source for the distinct prosodies of IE: some Indian languages use a low pitch on accented syllables (Mohanani, 1986; Hayes and Lahiri, 1991; Harnsberger, 1999). We investigate the effect of different first languages on the production of IE using three Indian teaching assistants with different L1 (Bengali, Tamil, Hindi-Urdu), and compare their IE discourse to L1 sentences. The similarity of the results for three different L1 suggests that the phonetic correlates of accent in IE are common to Indian languages.

1. INTRODUCTION¹

Indian-English (hereafter IE) is distinguished from other varieties of English by a number of phonological features, including the use of dentals and retroflexes rather than interdental and alveolars, epenthesis into consonant clusters, r-pronunciation and the use of [v] for [w] (e.g., Sahgal and Agnihotri, 1988; Chaudhary, 1993; Bhatt, 1995; Coelho, 1997). Studies of the prosodic features of IE have tended to focus on intonation patterns and tone groupings, as in Gumperz (1982) and Kachru (1983), generally ignoring the feature of lexical accent² except to point out lexical items which are accented on a different syllable in IE than in other varieties (Chaudhary, 1993; Pandey, 1994; Nair, 1996). However, in an evaluation of the prosodic systems of IE speaking teaching assistants, Pickering (1999) noted that the phonetic correlates of lexical accent may also distinguish this indigenized variety of English from American dialects. This is supported by Spencer's (1957) impressionistic report which suggests that: 'The tendency in Anglo-Indian is for stressed syllables to be accompanied by a fall in pitch; indeed for a fall or low-rise to replace stress, since Anglo-Indian pronunciation does not show such marked variations in syllable intensity as R.P.' (Spencer, 1957).

In this study, we confirm Spencer's observations by a closer examination of the phonetic realization of accent in IE in comparison with American English (AE) produced in similar contexts. In the context of teaching discourse, we find that a lexically accented syllable is often realized with a relative drop in frequency, and without a reliable increase in amplitude in IE. In similar contexts, lexically accented syllables in AE reliably increase in both frequency and amplitude. We conclude that IE acts as a pitch-accent language as opposed to a stress-accent language like AE, following the distinction made in Beckman (1986).

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We also suggest a source for this prosodic distinction of IE. Most sources on the phonology of Indian languages are silent on the phonetic correlates of accent or stress, though some assume that stressed syllables increase in amplitude and frequency, as in Ravisankar (1994) on Tamil. However, as pointed out by Mohanan (1986) for Malayalam, Hayes and Lahiri (1991) for Bengali, and Harnsberger (1999) for Hindi, some Indian languages use a low pitch or a rise in pitch on main accented syllables. In this study, we investigate the effect of different Indian first languages on the production of IE. We use three Indian teaching assistants with different L1 (Bengali, Tamil, Hindi-Urdu) and evaluate the frequency and amplitude of accented syllables in two language contexts: in IE classroom discourse, and in first language sentences. We find that it is possible that the drop in pitch and lack of amplitude change on accented syllables is a transfer from substrate languages and is an Indian areal feature, though due to the limitations of this study we leave more conclusive statements for future research.³

2. METHODOLOGY

Data was gathered from six male teaching assistants at an American University; all six speakers were in their late twenties. Three were IE speakers with different L1s: one Bengali (UT), one Tamil (SH), and one Hindi-Urdu (SF). UT, from a Bengali speaking home, spoke Hindi and English in school in Bombay. SF, whose family spoke Urdu at home, used primarily English in school from age 6 to 16, although Telugu and Hindi were also spoken in school. SH grew up in Tamilnadu and spoke Tamil at home, and had attended English medium schools since Kindergarten. Three native speakers of English, ST, BD, and KN, were also used for teaching discourse data; all were speakers of standard AE from the southern United States.

Four minutes of discourse from each of the six subjects was videotaped and audiotaped in the classroom during the course of a normal lesson in an introductory science lab class conducted in English. Additionally, 8 to 12 sentences produced in their native languages were recorded for each Indian speaker; most of these sentences included technical vocabulary items for which the speakers were likely to use English terms. The speakers were recorded using a Telex FMR-150C Wireless System and a Telex SCHF745 Headset microphone, with the microphone at a fixed distance of approximately two inches from their mouths. The data were recorded onto a Sony TCD-D8 digital audio tape-corder and acoustically analyzed using the Kay Elemetrics Model 4300 Computerized Speech Lab.

Two- and three-syllable words were chosen from the data. Words which appeared at the boundary of an intonation contour were avoided, as additional phrase final pitch movements, unrelated to lexical accent, may alter the typical phonetic realization of lexical accent in such positions (Hirst and Di Cristo, 1998). We measured for frequency and amplitude on each syllable. Frequency was measured at the middle of the syllable, and amplitude was measured at its peak value in each syllable (Beckman, 1986). In the three-syllable words, only the main accented syllable and one adjacent unaccented syllable were measured, to avoid problems of secondary stress in AE. For the three Indian languages, the speakers had been instructed to mark where they thought they stressed the words. For words in which the speaker did not mark any syllable, we followed descriptions of the languages to determine which syllable should be considered accented (Hayes and Lahiri, 1991 for Bengali; Christdas, 1988 for Tamil; Hayes, 1995 for Hindi).

Table 1a. Frequency (in Hz) in AE teaching assistants' accented vs. unaccented syllables (σ)

Speaker	Item ⁴	Accented $\underline{\sigma}$	Unaccented σ	Ratio $\underline{\sigma}/\sigma$	Difference $\underline{\sigma}-\sigma$
ST	<u>current</u>	116	95	1.22	21
	<u>diode</u>	119	94	1.26	25
	<u>numbers</u>	124	108	1.15	16
	<u>question</u>	125	110	1.14	15
	<u>resistance</u>	135	105	1.28	30
	<u>voltage</u>	118	92	1.28	26
BD	<u>bode</u>	127	111	1.14	16
	<u>example</u>	134	111	1.21	23
	<u>frequency</u>	143	125	1.14	18
	<u>magnitude</u>	135	125	1.08	10
	<u>omega</u>	125	108	1.16	17
	<u>zero</u>	133	114	1.17	19
KN	<u>center</u>	156	118	1.32	38
	<u>clockwise</u>	127	110	1.15	17
	<u>distance</u>	145	128	1.13	17
	<u>equal</u>	165	133	1.24	32
	<u>pivot</u>	145	123	1.18	22
	<u>zero</u>	135	117	1.15	18

Table 1b. Difference in frequency between accented/unaccented syllables in AE discourse

	ST	BD	KN	Overall AE
Mean	22.2	17.2	24.0	21.1
Standard deviation	5.4	3.9	8.1	6.7
N	6	6	6	18

3. RESULTS

3.1 Frequency: American vs. Indian English

First, we analyzed the frequency in the middle of accented and unaccented syllables produced by American teaching assistants. As shown in Table 1a, six words were analyzed for each of the three speakers, ST, BD, and KN from their teaching discourse audiotapes. The frequency in accented syllables was 10–38 Hz higher (mean 21.1 Hz, standard deviation 6.7) than that in unaccented syllables, for the native speakers of American English, an increase of 8 to 32 percent. As frequency differences of 3 Hz are easily perceptible (Beckman, 1986), the increase on the accented syllables is obvious to the listener, confirming claims in the literature that increased pitch is a correlate of stress in AE (Fry, 1955; Bolinger, 1958; Beckman, 1986).

The three speakers varied in the size of their pitch increases and their variability; the difference among them was not significant at the $p=.05$ level. Table 1b presents summaries.

The same analysis was performed for words taken from the audiotapes of the teaching discourse of the speakers of IE. Six words were analyzed for each speaker, and Table 2a presents these examples grouped according to the first language of the speaker.

Table 2a. Frequency (in Hz) in IE teaching assistants' accented vs. unaccented syllables in English

L1, Speaker	Item	Accented $\acute{\sigma}$	Unaccented σ	Ratio $\acute{\sigma}/\sigma$	Difference $\acute{\sigma}-\sigma$
Bengali, UT	<u>a</u> mplitude	147	182	.81	-35
	<u>b</u> ode	134	148	.90	-14
	<u>d</u> iff(e)rent	156	182	.86	-26
	<u>f</u> requency	164	192	.85	-28
	<u>o</u> mega	135	159	.85	-24
	<u>v</u> ersus	137	182	.75	-45
Tamil, SH	<u>a</u> ctive	133	167	.80	-34
	<u>c</u> areful	143	161	.89	-18
	<u>e</u> quation	200	218	.92	-18
	<u>i</u> nput	143	166	.86	-23
	<u>n</u> orm(a)lly	170	208	.82	-38
	<u>o</u> utput	151	172	.88	-21
Hindi-Urdu, SF	<u>c</u> athode	163	223	.73	-60
	<u>c</u> urrent	161	185	.87	-24
	<u>d</u> iode	149	193	.77	-44
	<u>j</u> unction	161	197	.82	-36
	<u>p</u> assive	175	234	.75	-59
	<u>v</u> oltage	164	182	.90	-18

Table 2b. Difference in frequency between accented/unaccented syllables in IE discourse

	Bengali-UT	Tamil-SF	Hindi/Urdu-SH	Overall IE
Mean	-28.7	-25.3	-40.2	-31.4
Standard deviation	10.0	7.8	16.0	13.3
N	6	6	6	18

The change of frequency on the accented syllable is of the same order of magnitude as in the Americans' speech, but for all three IE speakers, the accented syllable shows a lower frequency relative to the unaccented syllable, rather than higher. The drop ranges from 14 to 60 Hz (mean -31.4 Hz, standard deviation 13.3), a decrease of 8 to 27 percent compared with the unaccented syllable.

The difference between the American and Indian teaching assistants (TAs) proved significant at the $p < .001$ level in a two tailed t-test.⁵ To illustrate the difference from AE, consider an example of the identical English word spoken by an American TA and an Indian TA. In the word 'Bode' as uttered by the American (BD) and the Bengali speaker (UT), the frequency in the American's utterance drops from 127 to 111 Hz, while UT's rises from 134 to 148 Hz. Thus, a drop in frequency correlates with the accented syllable in IE in certain contexts, rather than the comparable increase as found in AE.

Table 2b shows the individual means for the drop in frequency on accented syllables in the IE of the TAs.

The differences between the speakers of the three different L1s were not significantly different at the $p = .05$ level, though this may be due to the small sample size. Thus the direction of change of frequency on the accented syllable is a consistent feature of IE in

Table 3. Difference in frequency in accented/unaccented syllables in L1 sentences

	Bengali-UT	Tamil-SF	Hindi-Urdu-SH
Mean	-33.9	-24.2	-21.5
Standard deviation	22.6	18.4	15.5
N	10	12	11

general; the degree of change appears consistent here, though it is possible that there are individual or group differences.

3.2 *Pitch: Indian languages*

Given that IE differs from American and British in the use of lower frequency on accented syllables, we investigate whether the difference could arise from the correlates of accent in the languages of India. To test this, we analyzed both English words spoken in the context of Indian language sentences and native words in Indian language contexts. To make these contexts similar to those of their teaching discourse, the TAs translated sentences from their lectures in English into their L1s. Summaries are given for each speaker of IE in Table 3; these summaries combine all productions in L1, whether an English or a native word, since the difference between them did not prove significant. In contrast to the American speakers, but similarly to their own IE productions, all speakers in all the data points used a lowered frequency on the accented syllable. In these sentence examples, all three also showed a wide range of variation in the value of the drop in different words, which may be due to intonation or other contextual factors which were not controlled.⁶

The differences between the three were not significant at the $p = .05$ level. For the Bengali and Tamil speakers, there was no significant difference between their productions in Indian English and their productions in their native languages, supporting the possibility that the drop in frequency on accented syllables in IE originated in transfer from native languages of the area. For the Hindi-Urdu speaker, the difference between his IE and Hindi-Urdu productions was significant at the $p = .05$ level; interestingly, this speaker shows a larger drop in frequency in IE than in his native language. If such effects are found in further research, it may indicate that the large drop in frequency on accented syllables is a property common to General IE which is adopted by its speakers even if it is not present to the same degree in their L1. We leave the question open for future research.

Thus, compared to AE, in which accented syllables have increased frequency in these contexts, IE shows a distinct use of a decrease in frequency in accented syllables in similar contexts. This use of low frequency on accented syllables can also be found in Indian languages, suggesting a possible source. Table 4 summarizes the data discussed so far.

The difference between AE and IE was highly significant ($p < .001$); the differences among Indian speakers was not, and the differences between their productions in English and their first languages was significant only for the Hindi-Urdu speaker (at $p = .05$).

3.3 *Amplitude: American vs. Indian English*

In the speech of native speakers of American and British English, accented syllables also generally increase in amplitude or loudness (Beckman, 1986; Fry, 1955). We measured the amplitude of the same syllables, accented and unaccented, from the teaching discourse of

Table 4. Summary of Tables 1–3: Frequency

		Mean Ratio $\frac{\sigma}{\sigma}$	Mean Difference $\frac{\sigma}{\sigma}$	s.d.	N
American English	ST,BD,KN	1.19	21.14	6.7	18
Indian English	UT,SH,SF	0.83	-31.4	13.3	18
Bengali (UT)	IE	0.84	-28.7	10.0	6
	Bengali	0.82	-33.9	22.6	10
Tamil (SH)	IE	0.86	-25.3	7.8	6
	Tamil	0.87	-24.2	18.4	12
Hindi-Urdu (SF)	IE	0.81	-40.2	16.0	6
	Hindi-Urdu	0.86	-21.5	15.5	11

Table 5a. Amplitude (in dB) in AE TAs' accented vs. unaccented syllables

Speaker	Item	Accented σ	Unaccented σ	Ratio $\frac{\sigma}{\sigma}$	Difference $\frac{\sigma}{\sigma}$
ST	<u>current</u>	71.97	64.07	1.12	7.90
	<u>diode</u>	72.73	66.65	1.09	6.08
	<u>numbers</u>	74.67	72.04	1.04	2.63
	<u>question</u>	77.61	71.22	1.09	6.39
	<u>resistance</u>	73.41	66.41	1.10	7.00
	<u>voltage</u>	73.24	68.12	1.08	5.12
	BD	<u>bode</u>	78.38	72.83	1.08
<u>example</u>		72.12	69.56	1.04	2.56
<u>frequency</u>		71.94	67.92	1.06	4.02
<u>magnitude</u>		71.21	63.36	1.12	7.85
<u>omega</u>		73.69	66.46	1.11	7.23
<u>zero</u>		71.92	68.89	1.04	3.03
KN	<u>center</u>	69.00	62.41	1.11	6.59
	<u>clockwise</u>	68.20	63.03	1.08	5.17
	<u>distance</u>	72.48	67.17	1.08	5.31
	<u>equal</u>	70.43	67.83	1.04	2.60
	<u>pivot</u>	70.35	66.82	1.05	3.53
	<u>zero</u>	67.67	58.04	1.16	9.63

our native speakers of AE, to get a baseline for comparison. The results are shown in Table 5a. As expected from the literature, the difference in amplitude between accented and unaccented syllables for American speakers of English is consistently positive, ranging from 4 to 16 percent, mean difference 5.46 dB (s.d. 2.02). A difference in amplitude of 3 dB is easily perceptible (Beckman, 1986 and sources therein), so that the amplitude of accented syllables provides a reliable correlate for listeners. The three speakers varied slightly, but not significantly; Table 5b presents a summary.

For the IE speakers, such consistent positive differences do not appear to be present. Table 6a shows the values of amplitude for the accented/unaccented syllables in the words taken from the teaching discourse of the three IE teaching assistants, again grouped by first language of the speaker. The IE amplitude data differs both qualitatively and quantitatively from AE. IE speakers often do not increase amplitude on accented syllables;

Table 5b. Difference in amplitude between accented/unaccented syllables in AE discourse

	ST	BD	KN	Overall AE
Mean	5.85	5.04	5.47	5.46
Standard deviation	1.67	2.01	2.45	2.02
N	6	6	6	18

Table 6a. Amplitude (in dB) in IE teaching assistants' accented vs. unaccented syllables in English

L1, Speaker	Item	Accented $\underline{\sigma}$	Unaccented σ	Ratio $\underline{\sigma}/\sigma$	Difference $\underline{\sigma}-\sigma$
Bengali, UT	<u>amplitude</u>	73.45	75.45	0.97	-2.00
	<u>bode</u>	72.99	75.89	0.96	-2.90
	<u>diff(e)rent</u>	78.03	74.96	1.04	3.07
	<u>frequency</u>	74.09	71.86	1.03	2.23
	<u>omega</u>	70.67	73.40	0.96	-2.73
	<u>versus</u>	69.21	70.29	0.98	-1.08
Tamil, SH	<u>active</u>	71.56	76.04	0.94	-4.48
	<u>careful</u>	76.08	74.64	1.02	1.44
	<u>equation</u>	75.79	79.57	0.95	-3.78
	<u>input</u>	71.12	75.34	0.94	-4.22
	<u>norm(a)lly</u>	77.03	75.42	1.02	1.61
	<u>output</u>	76.17	76.39	1.00	-0.22
Hindi-Urdu, SF	<u>cathode</u>	76.95	80.33	0.96	-3.38
	<u>current</u>	75.05	74.30	1.01	0.75
	<u>diode</u>	76.33	76.32	1.00	0.01
	<u>junction</u>	73.96	74.47	0.99	-0.51
	<u>passive</u>	76.81	79.66	0.96	-2.85
	<u>voltage</u>	74.11	75.82	0.98	-1.71

Table 6b. Difference in amplitude in accented/unaccented syllables in IE discourse

	Bengali (UT)	Tamil (SH)	Hindi-Urdu (SF)	Overall IE
Mean	-0.57	-1.61	-1.28	-1.15
Standard deviation	2.36	2.62	1.50	2.26
N	6	6	6	18

the overall mean change in amplitude is -1.15 dB (s.d. 2.26), a small decrease in loudness. Whether the amplitude is higher or lower on an individual syllable, the degree of difference from accented to unaccented is usually smaller than it was for AE speakers (range -4.22 to $+3.07$ for IE, vs. 2.56 to 9.63 for AE).

The difference in amplitude changes between AE and IE is significant at the $p = .001$ level. A comparison of the individual values for amplitude, given in Table 6b, reveals that the three speakers of IE did not differ significantly from each other, so that this lack of strongly increased amplitude on accented syllables was a shared property. Thus, amplitude does not seem to be used as a reliable correlate to accent in IE, as it is in American and British varieties. As noted in Fry (1955), loudness generally has the least effect on the

Table 7. Difference in amplitude in accented/unaccented syllables in L1 sentences

	Bengali (UT)	Tamil (SH)	Hindi-Urdu (SF)
Mean	-0.91	-0.44	+0.41
Standard deviation	1.53	2.72	1.52
N	10	12	11

perception of stress; the strongest effects were achieved by modifying the pitch contour. As IE appears to use large pitch excursions, the lack of a consistent change in loudness need not interfere with the perception of prosodic prominence for native speakers. The characteristics of IE are thus similar to descriptions of pitch-accent languages, like Japanese (Beckman, 1986), in which pitch changes alone are a consistent and reliable indicator of prosodic prominence.

3.4 Amplitude: Indian languages

Similarly to our study of frequency in section 3.2, we compare the L1 use of amplitude in accented vs. unaccented syllables with the lack of increased amplitude on accented syllables in IE, to see whether this unusual feature for a variety of English could be based on native languages of India. Table 7 presents a summary of results for the three speakers. Similarly to their amplitude values when speaking IE, all three speakers showed small and variable changes in amplitude on the stressed syllable; the differences among the three were not significant at the $p = .05$ level. For the Bengali and Tamil speakers, the L1 data did not vary significantly from their own productions in IE. For the Hindi-Urdu speaker, again the first language productions differed from his own IE productions, significant at the $p = .05$ level; as with pitch, this speaker's IE more closely resembles the IE of the other speakers, rather than his native L1.

Overall, as with English words in IE teaching discourse, words in the Indian L1 sentences lacked reliable, large increases in amplitude in accented syllables; accented syllables may show increased or decreased amplitude relative to unaccented syllables, but the magnitude of the change is rarely large. The results for amplitude are summarized in Table 8. Again the difference between AE and IE was highly significant ($p < .001$), while the differences among IE speakers was not. Furthermore, the differences between each speaker's productions in English and their L1 was not significant for the Tamil and Bengali

Table 8. Summary of Tables 5-7: Amplitude

		Mean Ratio $\frac{\bar{\sigma}}{\sigma}$	Mean Difference $\bar{\sigma} - \sigma$	s.d.	N
American English	ST,BD,KN	1.08	+5.46	2.02	18
Indian English	UT,SH,SF	0.98	-1.15	2.26	18
Bengali (UT)	IE	0.99	-0.57	2.36	6
	Bengali	0.99	-0.91	1.53	10
Tamil (SH)	IE	0.98	-1.61	2.62	6
	Tamil	0.99	-0.44	2.72	12
Hindi-Urdu (SF)	IE	0.98	-1.28	1.50	6
	Hindi-Urdu	1.01	+0.41	1.52	11

speakers, and significant at $p = .05$ for the Hindi-Urdu speaker. Thus, like frequency differences, the amplitude differences in IE seem to be a property of General IE, and may have resulted from transfer from some Indian languages.

4. DISCUSSION

We have examined two of the correlates of word accent in AE which seem to be used differently in the IE variety. IE accented syllables tend to drop in frequency and do not show regular amplitude increases; both tendencies are found in the same contexts in which AE speakers raise frequency and amplitude on the accented syllable. Furthermore, preliminary study suggests that the correlates found in IE have a basis in the native languages of India, three of which showed a tendency to use dropped frequency as a correlate of accent on a syllable. Mohanan (1986) observed this to be true for Malayalam and possibly all Dravidian languages, and we have extended his observation to include the Indo-Aryan languages Bengali and Hindi-Urdu, so that it is possibly an areal feature.

IE therefore seems to function as a pitch-accent language as opposed to stress-accented American/British English. Beckman (1986), in defining the difference between the two, notes that while a stress-accent language may use pitch, it also uses other cues such as amplitude and duration more than a pitch-accent language does. For example, she shows that Japanese is a pitch-accent language which uses a rise in pitch on the syllable with the word accent, like AE, but no reliable amplitude increase, like IE. Thus we are suggesting that there are two differences between IE and AE in the phonetic realization of word accent. First, AE is a stress-accent language, and uses cues such as amplitude and duration as well as frequency, while IE uses pitch-accent, and relies primarily on the frequency to indicate an accented syllable. Second, AE indicates an accented syllable with a high frequency, while IE marks it with a low. Our findings for IE thus indicate an additional parameter for variation in the realization of accent: low vs. high pitch.

Finally, when compared to the AE data, these distinct frequency and amplitude patterns found in the IE data have implications for the intelligibility of IE speech to speakers of other varieties of English. From the perspective of British and American listeners, the low-high (L-H) pitch melody and lack of reliable amplitude cues constitute a mismatch in phonetic cues that violate listener expectations of a H-L melody and increased amplitude; this mismatch potentially contributes to misunderstandings between IE speakers and AE or British English (BE) listeners. Mohanan (1986: 114) notes, for example, that 'It may be pointed out that the nature of the word melody makes the perception of word stress in Dravidian languages very difficult for those who are used to the phonetic realization of stress in Indo-European languages.' Pandey (1994) provides some examples of misinterpretations that result when accent falls on a different syllable in IE than in AE:

	IE says	AE/BE hears
defense	DEfence	difference
rendered	renDERed	endured

Our research suggests that even in contexts in which IE and AE agree on the location of accent in a word, AE listeners may misinterpret the location of the accent due to its phonetic realization in IE. Within the context of longer stretches of discourse, such as the lectures which form the basis of this study, this kind of misinterpretation reduces the explicitness of the discourse message and increases the processing load for the hearers. Our

findings of the phonetic differences in the realization of accent in different Englishes suggests a potential source for miscommunication, and reinforces the importance of continued investigation into the phonetic differences among varieties of English.⁷

NOTES

1. The authors' names appear in alphabetical order. We are grateful to the Institute for Advanced Study of the Communication Processes at the University of Florida for the use of their equipment, as well as to the Graduate School at UF for an Equipment Grant to the first author. We also thank K. P. Mohanan and participants of SALA 99 for comments on an earlier version of this work, and take responsibility for any errors that remain.
2. We use the term accent here as a neutral term covering both stress and non-stress (pitch) accents; this distinction is discussed in section 4.
3. We do not discuss length here, although an increase in syllable length is a correlate of accent in American and British English. Other research has suggested that Indian English acts like a syllable-timed language, with similar length for segmentally similar syllables, regardless of their being accented or not (Balasubramanian, 1980; Crystal, 1995). While this is also a source of variation among different Englishes, and may be a factor in intelligibility (Bush, 1968; Kachru, 1983), we do not discuss it here since it has already been noted in the literature.
4. For each lexical item, the accented syllable is underlined and the unaccented syllable that we measured is in italics.
5. We used Students' t-distributions to adjust for the small sample sizes (Black, 1999).
6. In choosing data for the English and IE comparison, we were able to choose words in contexts in which we were confident that there was no unusual prosodic interference. We were unable to apply this criterion in the non-English data, as we are not native speakers; we believe that this makes the consistent drop in frequency found in our data even more striking.
7. Questionnaires administered and other relevant data are available from the authors.

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