Pitch Range, Dynamism and Level in Postcolonial Varieties of English: A Comparison of Educated Indian English and British English

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Abstract

Pitch range (difference between maximum and minimum pitch), pitch dynamism and mean pitch level have been shown to differ between varieties of English, and such differences can lead to (un)favourable judgements about a speaker’s attitude and likeability. Little is known about pitch range in nativised varieties of English, which are spoken in postcolonial countries. While in many functional and structural ways they are similar to native varieties, in other ways they resemble learner varieties. Since learners commonly have a compressed pitch range compared to native speakers, this paper investigates pitch range and level in 20 speakers of Educated Indian English (IndE) in order to determine whether IndE is similar to British English or more like learner varieties in this respect.

The analysis reveals that IndE has a smaller pitch range than British English in read speech, but a wider pitch range in spontaneous speech, which is not compatible with results for learner varieties. Moreover, IndE has a higher pitch level than BrE. These prosodic differences might explain reports of cross-cultural communication difficulties. Finally, the comparison of four different L1 backgrounds in IndE also shows small L1-based differences, which, however, are not significant.

Index Terms: Educated Indian English, British English, post-colonial varieties of English, New Englishes, pitch range, pitch level, pitch dynamism quotient

1. Introduction

Previous research has shown that speakers of different languages vary in the long term characteristics of their linguistic use of pitch [1–5]. Specifically, a distinction can be made between (i) pitch level, i.e. average pitch height, and (ii) pitch range or span, i.e. the extent of pitch variation [6] and (iii) pitch dynamism.

A number of studies have revealed cross-linguistic differences in pitch level and range for a certain number of languages, but there is a continued need for more cross-dialectal and cross-stylistic studies in order to refine our knowledge about variation in the production of intonation [7]. Moreover, such results (1) will be useful in the evaluation of models of the development of postcolonial varieties of English [8], and (2) will help forensic and clinical practitioners, who need baseline information on the phonetics and phonology of the languages and dialects their subjects speak, by providing empirical information on under-researched dialects. (3) Finally, differences in pitch range and level can influence listeners’ judgements of the likeability and attitude of the speaker [4, 9]. For example, speakers of German, who have a smaller pitch range and lower pitch level than speakers of English, may sound bored or unfriendly to speakers of English. Conversely, with their comparatively wider pitch range and higher pitch level, English speakers can sound over-excited or aggressive to German speakers [4].

Such attitudinal evaluations may be acutely felt by language learners, who, as a range of studies has shown, tend to have a compressed pitch range compared to native speakers [3, 10–12]. This result has also been confirmed for speakers learning English as a foreign language, such as L1 Swedish or L1 Italian learners of English, who use English mainly for international communication [13, 14].

Apart from international communication, English is also used widely for local purposes in many former colonies such as India, Singapore and Nigeria. These postcolonial varieties of English are used across public domains such as education, politics, the media as well as the economy and also as a link language between those not sharing a local language. While postcolonial varieties of English have emerged in a context of second language acquisition, they have commonly taken a path of nativisation that led them away from the norms of British English (BrE) and towards increasing local acceptance of the emerging standards [8]. Speakers of postcolonial Englishes are often multilingual, with their linguistic repertoire including local languages in addition to the local indigenised variety of English. While competence in English varies along a scale of bilingualism, there is commonly a socially dominant group of highly proficient English speakers [15].

Linguistically, postcolonial varieties of English often share features with both native and non-native varieties. For example, the speakers of Educated Indian English (IndE) studied in [16] received their all of their formal education through the medium of English, which is now their dominant academic language. They are highly proficient in English, which suggests they are fairly similar to speakers of native varieties such as BrE. On the other hand, they also show characteristics that are typical of learners of English. For example, their articulation rate is significantly lower than that of BrE speakers, which is rather typical of learners. More generally, recent studies have also shown that some of the innovations found in postcolonial Englishes are structurally similar to features found in learner varieties [17–19].

Since speakers of postcolonial varieties are in some ways similar to native and in other ways similar to non-native speakers, it will be illuminating to study in how far their use of pitch range and level aligns with either of these groups. Specifically, a compressed pitch range would indicate similarities with learners, while a pitch range similar to that of BrE would point towards similarities with native varieties of English. Previous research on Singapore English, while based on an extremely limited data set, suggests that it in fact has a greater pitch range than BrE [20], whereas a study on New Zealand English found no difference in pitch range between European and Maori New English.
Zealanders [21]. These two studies suggest that postcolonial varieties of English do not have a compressed pitch range, unlike what is found in learner varieties, but further varieties need to be studied in order to confirm this result.

IndE provides a particularly interesting case to answer this question. As indicated above, the idea that postcolonial Englishes are in some ways prosodically similar to learner varieties would suggest that IndE has a compressed pitch range (hypothesis 1a). On the other hand, speakers of IndE are said to accent all or most content words, which would suggest that they have greater pitch dynamism than BrE speakers (hypothesis 1b) [22, 23]. Moreover, if there are differences in pitch range and/or pitch level between IndE and BrE (hypothesis 2), these might account for anecdotal reports of intercultural misunderstandings, which are sometimes attributed to distinct intonation systems in the two varieties [22]. Finally, since [23] found differences in pitch range between IndE speakers with L1 Bengali and L1 Kannada, we might expect that IndE is not uniform in pitch range and level (hypothesis 3).

2. Indian English

As is the case with many postcolonial Englishes, IndE is not spoken by all Indians. Around 23% of the population have at least basic knowledge of English and 4% are fluent [24], which suggests that there are around 50 million fluent speakers.

While standard IndE still lacks full official recognition, it is the de facto standard taught in schools and universities [25]. However, this standard has not yet been fully codified, and in such a context the kind of language used by educated speakers can be used to determine what is considered acceptable by the speech community [26]. The phonology of IndE differs in a number of respects from BrE [16, 23, 27–35], likely due to historical transfer from Indian languages [27]. In spite of phonological differences between Indian languages, the phonology of Educated IndE (as opposed to bari- and mesolectal varieties) is relatively homogeneous, regardless of the first languages used by particular speakers [36].

3. Data and Methods

3.1. Data

This study relied on read and spontaneous speech. Recordings of a text read by 10 speakers of Standard Southern BrE (all male) and 20 speakers of IndE (11 male, 9 female) were used. In addition, spontaneous data was collected in a semi-structured interview task. The BrE data was taken from the DyVIS database [37], and the IndE speakers were recorded reading the same text. All speakers were university students at the time of recording. The IndE speakers were equally divided between four different L1 groups, and had either Hindi or Bengali (both Indo-Aryan languages), or Telugu or Malayalam (both Dravidian languages) as first languages (L1, i.e. chronologically first language). Speakers were between 20 and 28 years of age, and, with the exception of one speaker each, had exclusively attended English-medium schools and universities, and had not resided outside of India.

3.2. Extracting f$_0$ Measurements

392 words of the reading passage as well as at least five minutes of the interview task (after discarding the first five minutes) were analysed for each speaker. f$_0$ values were extracted in 10 ms intervals with Praat [38] over voiced parts of all utterances with minimum and maximum parameters appropriate for male and female voices.¹

3.3. Measuring Pitch Level, Range and Dynamism

Pitch level and range have been measured in various ways in previous research. While pitch level indicates average pitch, pitch range accounts for the maximum extent of variation (pitch range proper) and how variable pitch is (pitch range in a wider sense, and more specifically also pitch dynamism). The present study adheres as closely as possible to specific previous studies to allow comparison with their results. Specifically, pitch level will be measured as mean and median f$_0$ in Hz [5, 13], together with the skewness of the f$_0$ distribution [39]. Since previous research found that adult female voices have an f$_0$ that is between 75% and 90% higher than that of male speakers [40], mean and median f$_0$ of the female speakers were divided by 1.82 (i.e. the mean of an increase by 75 and 90%) to normalise them and make them comparable to the male speakers.

Pitch range will be measured (1) as the difference between the 90th and 10th percentile in semitones² (80% range) [5] and (2) with the pitch dynamism quotient (pdq), defined as the standard deviation of the f$_0$ distribution divided by its mean in Hz [14]. Comparisons between experimental conditions were tested for significance with t-tests.

4. Results

4.1. Pitch Level

4.1.1. Mean and Median

The analysis revealed differences in pitch level, and, specifically, that IndE speakers overall tend to have a higher median f$_0$ than BrE speakers, a difference that is significant in spontaneous speech, but only close to significance in read speech, as indicated by t-tests (see Fig. 1; read: 132 Hz vs. 118 Hz, t=1.9, p<0.05; spontaneous: 133 Hz vs. 119 Hz, t=2.3, p<0.05).

Figure 1: Pitch level (median f$_0$) in BrE and IndE speakers with Bengali, Hindi, Malayalam and Telugu as L1 (in read and spontaneous speech).

¹The command in the Praat script was TO MANIPULATION... 0.01 PITCHMIN PITCHMAX, with pitchMin = 75 Hz for male and 100 Hz for female speakers, and pitchMax 300 Hz and 500 Hz, respectively.²f$_0$ measurements were transformed from Hertz to semitones with the formula $\text{FREQ}_\text{ST} = \log_2(\text{FREQ}_\text{HERTZ}/\text{FREQ}_\text{MIN})$, where $\text{FREQ}_\text{ST}$ is the minimum f$_0$ of a speaker in a speaking style.
df = 17.8, p = 0.068; spont.: 128 Hz vs. 108 Hz, t = -3.1, df = 20.6, p < 0.01). Note that similar results are reached even if only male speakers are taken into account (read: t = 1.8, df = 17.7, p = 0.09; spont.: t = 3.0, df = 16.8, p < 0.01). Moreover, L1 Malayalam and Telugu speakers of IndE tend to have a lower median \( f_0 \) than L1 Hindi and Bengali speakers, particularly in read speech, but these differences are not significant. As a consequence, L1 Malayalam and Telugu speakers are more similar in median \( f_0 \) to BrE speakers than L1 Hindi and Bengali speakers. Results are similar if mean instead of median \( f_0 \) is used as a measure of pitch level.

IndE and BrE speakers also differ in the effect of speaking style. BrE speakers on average have a 10 Hz lower median \( f_0 \) in spontaneous compared to read speech, a highly significant difference, while IndE speakers only have a 3 Hz lower median \( f_0 \) in spontaneous speech, which is not significantly different from read speech (BrE: \( t = -6.3, df = 9, p = 0.001 \); IndE: \( t = -1.7, df = 19, p = 0.11 \)).

### 4.1.2. Skewness

In addition to measures of central tendency (mean and median), skewness can help evaluate the shape of the \( f_0 \) distribution, and, in particular, the influence of extreme values. In spontaneous speech, the \( f_0 \) distribution of BrE speakers has a greater (positive) skewness than in IndE (see Fig. 2; 1.83 vs. 0.05; \( t = 3.7, df = 21.5, p = 0.001 \)). L1 Malayalam and Telugu speakers of IndE have a somewhat higher skewness than Hindi and Bengali speakers, but not significantly so. In read speech, skewness is also slightly higher for BrE than for IndE speakers, a difference that is relatively close to significance (0.43 vs. -0.10; \( t = 1.8, df = 27.6, p = 0.076 \)). L1 Malayalam and Telugu speakers of IndE again have an insignificantly higher skewness than Hindi and Bengali speakers.

### 4.1.3. Discussion

The analysis revealed that IndE speakers tend to have a higher pitch level than BrE speakers, and that IndE speakers with L1 Bengali and Hindi have higher pitch levels than speakers with L1 Telugu and Malayalam. Compared to previous results, the BrE speakers in the present study are relatively similar in median \( f_0 \) to the BrE and German speakers in [1] and to the European NZE speakers in [21], but have higher-pitched voices than Maori NZE speakers. The IndE speakers with L1 Hindi and Bengali have a relatively high pitch level (higher than for German and English, but still slightly lower than for Polish and Bulgarian [1]).

Pitch level was further determined by measuring the skewness of the \( f_0 \) distribution. A zero skew indicates that measures of central tendency (mean and median) accurately reflect the distribution of \( f_0 \) values, and a positive skew suggests that the right tail of the distribution is fatter than the left tail, which suggests that there is a higher number of extreme values to the right of the mean or median. As it turns out, those IndE L1 groups with particularly high median \( f_0 \) in read speech have a negative skew and those with lower median \( f_0 \) have a positive skew. This suggests that the IndE L1 groups are actually more similar to each other in pitch level than their median \( f_0 \) suggests. BrE also has a positive skew, but in read speech it is not greater than that of one of the IndE L1 groups, suggesting that the difference in median \( f_0 \) between read IndE and BrE accurately reflects a difference in pitch level. In spontaneous speech the results are more complex, with a much higher positive skew for BrE than for IndE. But this is most likely inconsequential as it just sets off the difference in median \( f_0 \) between BrE read and spontaneous speech, with a significantly lower \( f_0 \) in spontaneous BrE.

In summary, the results reveal that IndE has a higher pitch level than BrE. This confirms hypothesis 2, which stated that there are differences in pitch range or level between IndE and BrE. Furthermore, speakers of North Indian Indo-European languages appear to have a somewhat higher pitch level than speakers of South Indian Dravidian languages, but the analysis of skewness revealed that the differences in median \( f_0 \) might overestimate the extent of the differences within IndE, and the differences are, in any case, not significant. Hypothesis 3, which predicted differences between L1 groups in IndE, can therefore not be confirmed, perhaps due to a lack of statistical power.

### 4.2. Pitch Range and Dynamism

#### 4.2.1. 80% Range

In read speech, BrE speakers have a somewhat higher 80% range than IndE speakers, a difference that is close to significance (see Fig. 3; 6.7 st vs. 5.8 st; \( t = 1.9, df = 21.0, p = 0.07 \)). L1 Hindi speakers of IndE have a particularly low 80% range of 5.1 st, but the difference to the other L1 groups is not significant. By contrast, in spontaneous speech, BrE speakers have a significantly lower 80% range than IndE speakers (4.8 st vs. 6.2 st; \( t = 2.3, df = 28.0, p < 0.05 \)). Furthermore, L1 Malayalam speakers of IndE have a particularly high 80% range of 7.6 st, but again the difference to the other L1 groups is not significant.

#### 4.2.2. Pitch Dynamism Quotient

In read speech, the BrE speakers have a slightly and insignificantly higher PDQ than IndE speakers (see Fig. 4; 0.166 vs. 0.159; \( t = 0.6, df = 22.3, p = 0.57 \)), and the four IndE L1 groups are fairly similar in PDQ. By contrast, in spontaneous speech, PDQ is significantly lower for BrE than for IndE (0.154 vs. 0.182; \( t = 2.1, df = 24.7, p < 0.05 \)). While none of the differences between L1 groups are significant, it is noteworthy that PDQ is particularly high for L1 Malayalam speakers of IndE (0.207) and particularly low for L1 Telugu speakers of IndE (0.159).

#### 4.2.3. Discussion

The analysis of 80% range measurements suggests that IndE has a smaller pitch range than BrE in read speech but a wider pitch range than BrE in spontaneous speech. However, this is mostly due to the fact that 80% range for BrE is markedly smaller in spontaneous than in read speech. Overall, the values for the BrE speakers (in read speech) are below those that [4] found for BrE, but greater than what they found for German.

In read speech, BrE and IndE hardly differ in pitch dynamism as measured by PDQ. Both have higher PDQ scores than French and German speakers [11]. By contrast, in spontaneous speech, PDQ is higher for IndE than for BrE, indicating a wider pitch range. The analysis of PDQ in spontaneous speech also revealed certain L1-based differences in IndE that were not found in read speech.

Both PDQ and 80% range also suggest certain L1-based differences. Specifically, L1 Hindi speakers of IndE appear to have a particularly low pitch range in read speech, while L1 Malayalam speakers appear to have a particularly high pitch range in spontaneous speech. However, these differences are largely dependent on speaking style and are not significant.

The results revealed that hypothesis 1, stating that IndE has a compressed pitch range, cannot be fully confirmed. While in read speech there is evidence of a smaller pitch range for IndE,
in spontaneous speech it appears to be wider than in BrE. However, these results, even though they are style-dependent, provide evidence for hypothesis 2, which stated that there are differences in pitch range and level between IndE and BrE. Moreover, there is very limited evidence for hypothesis 3, stating that there are L1-based differences in IndE.

5. Conclusion

This study compared the pitch range and level of IndE and BrE in the read and spontaneous speech of 20 speakers of IndE and 10 speakers of BrE. The analysis revealed that IndE has a smaller pitch range than BrE in read speech, but a wider pitch range in spontaneous speech. This is unlike the results for learner varieties, which showed a compressed pitch range regardless of speaking style.

The results also provide evidence of differences in pitch range and level between IndE and BrE in other respects. In particular, pitch level appears to be higher in IndE than in BrE. As previous research showed, cross-language and cross-varietal differences in pitch range and level can lead to negative evaluations of a speaker’s attitude and likeability [4,9]. Differences in pitch range and level (in addition to differences in the choice of tunes and overall melodic patterns) might explain reports of cross-cultural communication problems between speakers of IndE and other varieties [22]. Finally, the analysis also showed small but non-significant L1-based differences (comparable to [36]), but it is unclear in how far these can be generalised to the larger population.

The result that IndE differs in pitch range and level from BrE, but that there is little L1-based variation within IndE, confirms descriptions of its development in models of postcolonial Englishes [8]. Moreover, the results also provide empirical data that might prove useful for clinical and forensic practitioners, who require empirical data on dialectal variation.

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7. References


