

The use of pitch and duration on new and given information by native and non-native speakers of English and its pedagogical implications

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ABSTRACT

This study aims to investigate the use of pitch and duration in differentiating new and given information in English by native speakers of British English (BE speakers), Japanese learners and teachers of English (JLEs and JTEs respectively). The participants were recorded while reading aloud English sentences containing given items classified as repeated lexical items. The pitch range was calculated by measuring the difference between the peak F0 values on each target syllable. Duration was compared between the first and second appearance of the same repeated items. The results show that: (i) BE speakers' pitch range on new information was significantly the widest; (ii) JTEs and JLEs reaccented repeated items; (iii) JTEs' given items were the shortest in duration. These findings imply that the use of pitch should be prioritised over that of duration in teaching how to realise new and given information prosodically.

Keywords: intonation, tonicity, pitch, duration, new and given information

1. INTRODUCTION

The accentual function of English intonation plays an important role in signalling new and given information [1], and the nucleus serves as the focus of the new information within the intonational phrase (IP) [2]. The prominence of the nucleus consists of the greater pitch movement, duration and intensity [3].

However, in the Japanese language, new and given information is distinguished not by intonation [4], but by grammatical particles *ga* and *wa* respectively, for example [5]. In the following example, 'otoko' (= man) in the first mention (a) is followed by *ga*, and that in the second mention (b) is followed by *wa* [5].

- (a) otoko *ga* eki ni mukatte aruiteiru.
(A man is walking toward the station.)
- (b) sono otoko *wa* kata ni kamera o kaketeiru.
(The man is carrying a camera over his shoulder.)

The communicative importance of tonicity (i.e., nucleus placement) in English is supported by many scholars (e. g. [6]; [7]; [8]) and it is worthwhile investigating with some phonetic evidence how

tonicity is realised by non-native speakers of English. In this particular study, Japanese speakers of English are the focus.

The purposes of this study are (1) to examine the use of pitch and duration on new and given information in English sentences by BE speakers, JTEs and JLEs, and (2) to provide implications for English language pedagogy.

2. METHODOLOGY

2.1. Participants

BE speakers (university students), JLEs (university students) and JTEs (junior high school teachers) participated in this study, each group consisting of five males and five females. These numbers follow practice in [9] and [10]. All BE speakers and most JLEs were in their twenties (with the exception of one JLE being thirty) and JTEs were in their forties or fifties. The Japanese participants had received all of their education in Japan. English proficiency level was not tested between the two Japanese groups.

2.2. Procedure

Participants were recorded reading sentences in 2.3. Recordings were made at 44.1kHz, 16 bit mono using Audacity and a Sony ECM-MS907 stereo condenser microphone. Before the recordings, the participants checked meanings of the sentences, asked questions if necessary, and practiced reading aloud.

2.3. Materials

The sentences employed for this study were those used in [9]. They include repeated lexical items (Table 1). New information is presented in capital letters and given items (repeated items) are in italics (n.b., only plain text was presented to the participants).

Table 1: Experimental sentences

Sentences	
1	If you have a hundred dollars, then SPEND <i>a hundred dollars</i> .
2	I had a toothache but fortunately it wasn't a BAD <i>toothache</i> .
3	I won't give it to John because I KNOW <i>John</i> .

2.4. Pitch range

The calculation of pitch range was carried out using PRAAT in the following two manners. For the general analysis (3.1.1), the author measured the difference between the peak F0 value on the nuclear syllable and the average peak F0 value of the syllable(s) in the tail. For the detailed analysis (3.1.2), the author measured the difference between the peak F0 values on each target syllable of the nucleus, the head or the tail.

The analysis does not separate males and females because a 2-way ANOVA did not show significant gender-group differences ($F_{2,24} = 1.396$, $p = 0.267$). This allows us to consider the differences between BE speakers, JLEs and JTEs independently of the gender of the participants.

2.5. Duration

The measurement of duration was conducted using PRAAT by taking the stressed vowels of the repeated items, following the practice in [11]. No gender-group difference was examined.

3. RESULTS AND ANALYSIS

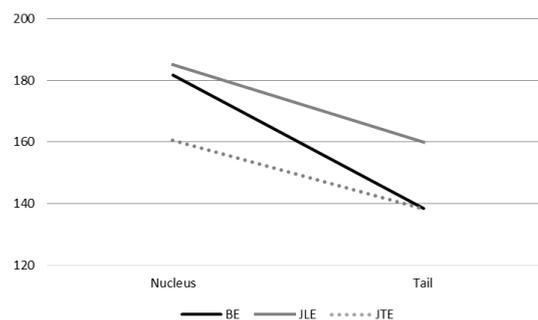
3.1. Pitch range

Firstly, the general tendency of pitch ranges between the nucleus and the tail will be demonstrated, and this is followed by the detailed description of the peak F0 on each syllable of the target sentences.

3.1.1. General result

The general result shows that the average pitch ranges between the nucleus and the tail in the three sentences were 43.7 Hz for BE speakers, and 25 and 22 Hz for JLEs and JTEs respectively (Figure 1). A 2-way ANOVA shows that the difference in pitch range among the three groups was significant ($F_{2,24} = 3.816$, $p < 0.05$). Pairwise comparisons show that the differences between BE speakers and JLEs, and BE speakers and JTEs were significant ($p < 0.05$; $p < 0.05$, respectively) but that there was no significant difference between JTEs and JLEs ($p = 0.728$). This pitch drop from the nucleus to the tail in BE speakers' utterances was significantly steeper than those of JLEs and JTEs, which means that new information was signalled more markedly by BE speakers than JLEs and JTEs.

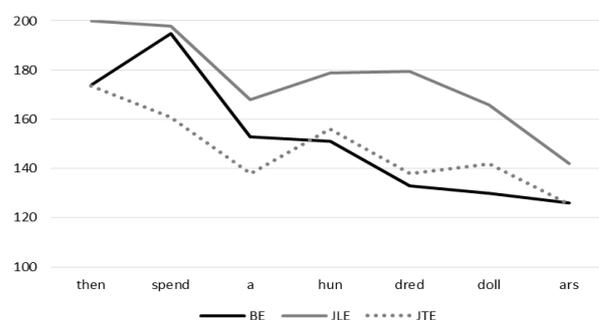
Figure 1: Average Peak F0 results for repeated lexical items (Hz)



3.1.2. Detailed results

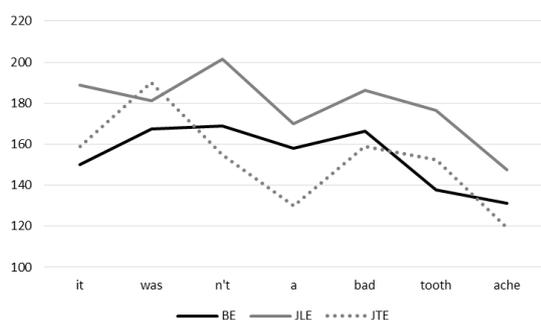
Figure 2 shows the peak F0 value of the syllables in Sentence 1. A pitch drop from *spend* to *a* was identified in all three groups. After *a*, the pitch of BE speakers did not change dramatically, whereas there was an up-step in pitch in JLEs' and JTEs' data between *a* and *hun-*. The pitch dropped greatly in *dollars* in JLEs' performance (by 23.8 Hz) and in both *hundred* and *dollars* in JTEs' data (by 17.7 and 16.6 Hz respectively). Thus JLEs and JTEs actually reaccented the given item *hundred dollars* by producing up-steps and down-steps in pitch on the syllables following the intended nucleus.

Figure 2: Average pitch contour of Sentence 1 (Hz)



In Sentence 2 (Fig. 3), BE speakers produced a steep pitch drop between *bad* and *tooth-*, which indicates that they treated *bad* as new information and attenuated *toothache*. However, JLEs and JTEs produced a large pitch drop between *wasn't* and *a*, by 31.7 Hz and 59.7 Hz respectively, and between *tooth* and *ache* by 29.8 Hz and by 36.1 Hz respectively. This shows that they did not treat *bad* as the nucleus, reaccenting and giving the status of new information to the given item *toothache*, preceded by a large down-step on *wasn't*, (probably due to L1 interference [1] and [12]).

Figure 3: Average pitch contour of Sentence 2 (Hz)



For Sentence 3 (Fig. 4), all three groups produced a down-step in pitch from *know* to the peak of *John* and within *John*. However, their pitch ranges were different. As Table 2 demonstrates, in BE speakers' performance, the range between *know* and the peak of *John* was wider than the range within *John*, which means *John* was treated as the tail. However, in JLEs' and JTEs' cases, the ranges between *know* and the peak of *John* were narrower than those within *John*, which indicates that they treated *John* as the nucleus, i.e. new information. That is, the given item *John* was reaccented rather than being attenuated.

Figure 4: Average pitch contour of Sentence 3 (Hz)

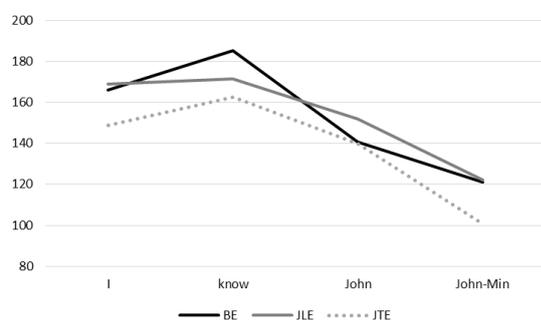


Table 2: Average pitch change from *know* to the peak of *John* and the pitch range within *John* (Hz)

	<i>know</i> - peak of <i>John</i>		John: peak - min.
BE	44.3	>	19.5
JLEs	19.4	<	29.7
JTEs	22.9	<	38.9

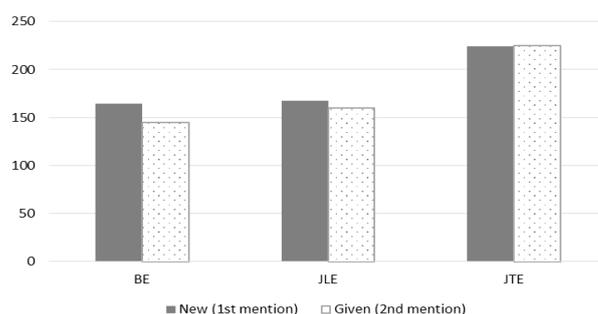
Thus, all the given items in the experimental sentences were reaccented instead of being attenuated by JLEs and JTEs, which was not the case with BE speakers.

3.2. Duration

Figure 5 presents the average duration of stressed vowels in *hundred dollars* in Sentence 1. The figure

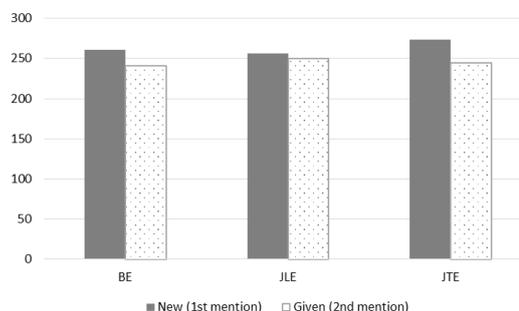
shows that, although JLEs and JTEs showed little difference in their stressed vowel durations of new and given items, BE speakers produced a shorter duration for given information more clearly than JLEs and JTEs. A paired *t*-test showed that the difference in vowel duration of new and given items for BE speakers was significant ($df = 9, t = 6.828, p < 0.01$). The durational differences for JLEs and JTEs, however, were not found to be significant ($df = 9, t = 0.998, p > 0.05; df = 9, t = -0.401, p > 0.05$).

Figure 5: Average duration of stressed vowels in 'hundred dollars' (msec)



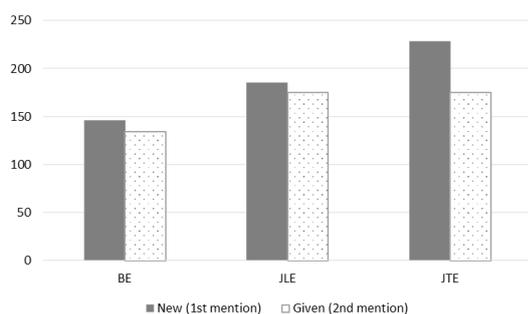
For Sentence 2 (Fig. 6), JLEs showed the least difference between the stressed vowel durations of new and given words. JTEs exhibited the biggest difference in duration between new and given items. A paired *t*-test shows that there was no significant difference in duration between these items as produced by BE speakers and JLEs ($df = 9, t = 1.460, p > 0.05; df = 9, t = 0.536, p > 0.05$, respectively). On the other hand, the durational difference in JTEs' production was significant ($df = 9, t = 3.404, p < 0.01$).

Figure 6: Average duration of stressed vowels in 'toothache' (msec)



In Sentence 3 (Fig. 7), JTEs again showed the greatest difference in duration, which was, according to a paired *t*-test, significant ($df = 9, t = 5.700, p < 0.01$). On the other hand, the durational differences for BE speakers and JLEs were not statistically significant ($df = 9, t = 0.312, p > 0.05; df = 9, t = 0.302, p > 0.05$, respectively).

Figure 7: Average duration of stressed vowels in 'John' (msec)



These results reveal that JTEs were more likely to make durational differences when signalling new and given information. BE speakers did not rely on this cue to the same extent in comparison to JTEs. JLEs were the least likely to depend on it.

Table 3: Summary of the significance of the durational differences in Sentence 1, 2 and 3

	Sentence 1	Sentence 2	Sentence 3
BE	*		
JLEs			
JTEs		*	*

4. DISCUSSION AND PEDAGOGICAL IMPLICATIONS

It has been revealed that there was a significantly different employment of pitch between BE speakers and JLEs and JTEs which may be perceived as re-accentuation of given items by Japanese groups.

Though it was identified that they did accentuate new items such as *spend* and *know* by using pitch, the second or third accented items (i.e., repeated given items) were likely to be considered as the nucleus by listeners. Either that, or the whole utterance in each case could be viewed as having two IPs.

Within the framework in [13], the nucleus is supposed to be on the last lexical item in an IP. Therefore, the accented items closer to the end of an IP such as *dollars*, *(tooth)-ache* and *John* would be perceived as the nucleus as long as they are accented, while the first ones such as *spend* and *know* as part of the head. That is, although JTEs and JLEs made the new item prominent by pitch, it is unlikely to be considered as the nucleus. Another possible interpretation is that there are two IPs in the utterance by dint of having two nuclei, in which case the new items are considered as the nucleus. In this sense, the nucleus was realised properly by JTEs and JLEs. However, as a whole, the utterance delivers too much information as a result of the repeated items (given

information) also functioning as the nucleus (new information), which is against listeners' expectation that there would be one nucleus in a short utterance.

With regard to the use of pitch and duration, BE speakers were found to be more dependent on pitch than duration in indicating new and given information. Therefore, according to norms of BE speakers, the use of pitch plays a greater role in differentiating new from given information than that of duration.

Thus, although JTEs decreased duration on given items more than the other groups, they would have to be capable of presenting pitch differences in order to make their speech more intelligible.

From the perspective of English language teaching, therefore, it would be reasonable to say that the use of pitch should be prioritised over that of duration in teaching how to differentiate new and given information. The accentual function of intonation is important for non-native speakers of English communicating with native speakers of English [10] and with other non-native speakers of English, i.e. in a situation of English as a Lingua Franca (ELF) ([6]; [14]).

5. CONCLUSION

The aims of this study were to examine how BE speakers, JTEs and JLEs signalled new and given information by the use of pitch and duration and to provide suggestions in teaching English intonation.

For the first aim, it is necessary to conduct further research on the realisation of tonicity in utterances that contain different types of new and given information as examined in [15]. It is also of great importance to collect more data so as to delve into the meaning of the increased pitch on given items by the Japanese speakers of English.

For the second aim, the next step is to investigate how pre- and in- service teachers can be trained so that they will be able to teach, with confidence, intonation, particularly tonicity.

As for pre-service teachers, phonetics and phonology (or pronunciation) modules on the teacher preparation programme at university will play a great part, and it is hoped that the programme will provide the trainees the opportunity to practise teaching tonicity as well as to learn its theoretical description. In this session they should be given opportunities to listen to L2 speech, to identify learners' needs, to select appropriate teaching materials and to give feedback, for example.

Regarding in-service teachers, including novice teachers, although they have strict time constraints with their work, it is preferred that they participate in any quality workshop or seminar about teaching English pronunciation.

6. REFERENCES

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