Prosodic Changes Caused by Emphasis in English in Connection with Compensation: A Case in Progressive Form of Sentence Pattern II

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英語の強調発話が反映する韻律変化と補償 ―第２文型進行形の事例―

市　﨑　一　章

要　旨

第二文型（進行形）の英語文を音声資料として、英米各１名の英語母語話者が、各構成要素を強調しながら発話した。中立発話と対照しながら強調発話を構成する項のピッチ、長さ、音圧レベルを測定した結果、強調は、程度の差こそあれ、いずれの韻律特徴にも数値の増大となって反映された。また、ある項が強調され、その数値が大きくなるのと同時に、他の項の数値が小さくなるという補償現象も認められた。補償により、話者は、強調項と強調しない項とにかけるエネルギーを調整しながら、ひとつの文を発話する際には一定量のエネルギーを用いることが推断される。そして韻律特徴の数値変動より、話者は、ある項を強調する際には、文章の意味語群をひとつの単位として意識して発話している様子が示唆された。韻律変化の具体例としては、機能語を強調して発話する際には、しばしば強形が用いられるため、内容語より伸張率が高く、機能語が意味語群の先頭に位置した場合は、特に大きな伸張となった。なお、定冠詞は、後続項の強調（伸張）と共に、伸張したが、これは定冠詞と後続項の連結の強さを示唆するものと考えられる。最後に、今回調査対象とした韻律特徴以外にも、ポーズや音質の変化が強調の誘因となることも例証された。

1. Introduction

How does one give the element prominence when one tries to emphasize some element of a sentence? English is said to be a stress-timed language, so do native speakers of English focus on stress rather than any other prosodic feature in emphasizing also? The major aim of this paper is to show learners of English how English can be emphasized in a sentence. Objective data would be the best aid for them to learn that. Sound

analyzing software, therefore, which offers the data of pitch, duration, and sound pressure level, was utilized in the investigation of the present paper. It would be the shortest way for them to have and digest the data for realizing how emphasis is embodied in English.

2. Investigation and Analysis

2.1 phonetic corpus

A progressive English sentence consisting of nine items was made as the corpus of the present paper. It is "*The brown bear is moving around in the room.*" Since it is intriguing to examine the relation between function words and content words in emphasis, a sentence having modifiers consisting of function words and content words was adopted. Moreover, progressive form offers predicate with a copula plus a verb, that is also a function word plus a content word. Each item of the corpus consists of voiced sounds so as to get clear sound waves and fundamental frequency (F_0 henceforth) contours.

2.2 informants

A British male and an American male, both of whom teach English conversation at a college in Japan, were chosen as informants. Their details were shown in Table 1.

Table 1: Details of Informants

initial	sex	age	nationality	native place	register used (Hz)
R. B.	male	58	U. K.	Somerset	57−225
D. L.	male	53	U. S. A.	California	83−262

2.3 procedure

The informants were shown the corpus (No. 0 as a neutral utterance) and nine kinds of sentences (No. 1-9 as emphasized utterances) which had an underlined constituent to emphasize as follows.

corpus No. 0. The brown bear is moving around in the room.
1. The brown bear is moving around in the room.
2. The brown bear is moving around in the room.
3. The brown bear is moving around in the room.
4. The brown bear is moving around in the room.
5. The brown bear is moving around in the room.
6. The brown bear is moving around in the room.
7. The brown bear is moving around in the room.
8. The brown bear is moving around in the room.
9. The brown bear is moving around in the room.

They were asked to use the speed and natural manner of their daily speech in recording. Their utterances

were recorded onto mini-disk with a microphone and the F_0 contours (pitch), the duration, and the sound pressure level (intensity) were investigated and measured with sound analyzing software "SUGI Speech Analyzer" (Sugito 2000). Since the duration of each sentence uttered by the speakers was naturally different, the durations of corpus No. 1 through 9 of each speaker were intentionally adjusted to the duration of his own corpus No. 0 in the comparison of duration of each constituent. Thus, in the following section, discussion on duration was based on the adjusted data.

3. Results and Remarks

Discussion is to be carried out according to the following prosodic features: pitch, duration, and sound pressure level. There will be mainly provided three kinds of figure and tables: one table listing detailed values measured in the analysis, another table showing compensation, and a figure showing visually how emphasized items changed their prosodic values.

3.1 pitch

The highest pitch values of each item in every utterance are listed in Table 2-1 (British speaker) and 2-2 (American speaker). Looking at Table 2-1 horizontally, it is noticed that the British speaker made the emphasized item the highest in his every utterance without any exception. Looking at the table vertically, seven items out of nine were the highest compared with the same items in the other utterances, excluding the remaining two items, *The* and *brown*. Since there were only two values available[1)] for *The*, it is excluded to discuss here. Similarly as shown in Table 2-2, the American speaker made six items out of nine which were to be emphasized the highest in his emphasized utterances. The remaining three items were *around*, *the*, and *room*. In addition to that, seven items were higher than the same items through the other utterances. The two exceptions were *brown* and *the* although the latter was nearly equal to the highest item with a difference of 1 Hz. Looking at the values of *brown* in corpus 2, where *brown* is to be emphasized, of both speakers, both *brown*s were not the highest. The British speaker made the *brown* in neutral speech the highest compared with the other *brown*s in emphasized utterances and the American speaker's *brown* in his neutral utterance had considerably high pitch. Moreover, the values of the two *brown*s in their neutral utterances were as high as the *brown*s in their corpus 7, 8, and 9, where the items making the third sense group were to be emphasized. It might mean that the modifier appearing as the second item, with the first item being an article, of the subject reaches up to the highest pitch limit or somewhere near the limit throughout the sentence in a neutral utterance or in the sentences where a speaker paid attention to the item at rightward position. Anyway it is a fact that the second item did not mark the highest pitch even in the emphasized utterance of the item. The speaker in that case would control the other prosodic features to emphasize the item.

Fig. 1-1 and Fig. 1-2 show how emphasis was reflected on pitch changes in nine utterances recorded by the two speakers. (The F_0 contour of the second *the* of the British speaker in his neutral utterance did not appear in the analysis, so no bar was recognized in Fig. 1-1.) The negative changes of two *brown*s in both figures are easily noticed. The last item, *room*, of the British speaker strikingly rose its pitch with emphasis

compared with the other items. As Liberman and Pierrehumbert (1984) pointed out, there is an effect called final lowering besides an effect of declination at the last stressed syllable of affirmative sentence. It seems quite natural that the British speaker's *room* showed a great rate of lengthening with emphasis since its original pitch in neutral utterance is considerably lower. In the case of the American speaker's utterance, on the other hand, the lengthening rate of *room* was not at all so great. This result seems to be because he did not use such a low pitch for *room* in his neutral utterance as the British speaker did. For the remaining items, the British speaker seems to have raised his pitch with a fixed rate with emphasis, while the American speaker comparatively raised his *The*, *is* and *moving*.

Table 3-1 and 3-2 show the rates of pitch raising of each item in their first lines and the degree of compensation in pitch in emphasized utterances in their nine utterances. Since the item *brown* of the two speakers fell in pitch with emphasis, the compensation of the other items in corpus 2 is not discussed here. Although there was no data for *the* of the British speaker, he tended to raise his pitch more in rightward items, *in* and *room*. Meanwhile the American speaker raised his pitch more at the beginning *The* and at the items making a verb in the middle of a sentence, *is* and *moving*. The increase in pitch of the emphasized item is not always compensated with the decrease in pitch of the other items as seen especially in the cases of *bear* and *room* of the British speaker and in the cases of *the* and *room* of the American speaker. As a whole, however, the pitch increase of each emphasized item was well compensated with multi-decrease of two or more other items in many cases. In order to check how a certain item was compensated by the remaining items, there are forty-five values excluding the items which had no data and the columns of *brown* and *the* which fell with emphasis in the case of the British speaker and there are sixty-four values excluding the column of *brown* which fell with emphasis in the case of the American speaker. Out of forty-five items, twenty-three (51%) fell with the rate of 10% or more, thirteen (29%) changed within the rate of 10%, and nine (20%) rose with the rate of 10% or more, while out of sixty-four, twenty-two (34%) fell with the rate of 10% or more, thirty-five (55%) changed within the rate of 10%, and seven (11%) rose with the rate of 10% or more. It would be concluded from the results that the British speaker had a stronger compensation in pitch. This conclusion is also illustrated by individual utterance. The British speaker had three utterances, corpus 1, 4, and 5 whose emphasized item was absolutely compensated by the remaining items, while the American speaker had just one, corpus 3, that had the same degree of compensation. With the limited samples used in the investigation, it is hard to find any further consistent tendency or rule of compensation.

3. 2 duration

The duration of each item in emphasized utterances (No. 1-9) list in Table 4-1 and 4-2 are tentative values obtained by setting the duration of the whole of those utterances as long as the duration of the whole of the neutral utterance (No. 0[2]). Since the duration of each utterance was naturally different, such conversions were carried out for the sake of easier comparison.

The corpus consists of three sense groups, *The brown bear*, *is moving around*, and *in the room*, and a measurement was made of the ratio in duration of each sense group vis-à-vis the whole sentence in their neutral utterances. In the case of the British speaker, *The brown bear* was 33. 5%, *is moving around* was

38. 6%, and *in the room* was 28. 0%, while in the case of the American speaker, they were 30. 2%, 42. 9%, and 26. 9%, respectively. Thus there is little difference in ratio distribution of duration between the two speakers.

As the values of the top lines of Table 5-1 and 5-2 show, all nine items of the corpus were lengthened with emphasis for both speakers. It is so intriguing to see that three items, *The*, *is*, and *in*, had outstandingly greater rates of lengthening compared with the other items for both speakers. All of the three items are situated at the beginning of each sense group and at the same time they are function words. A function word is usually pronounced with weak forms, i. e. shortening of the duration of a vowel, obscuring a vowel, or elision of a vowel or a consonant. Such phenomena naturally result in smaller duration of each segment of a function word. Once it is emphasized, however, it will be sometimes pronounced with strong forms which are absolutely different from the pronunciation of weak forms above mentioned. Therefore, a function word seems to be easily lengthened with larger rates compared with content words when it is emphasized. Conversely, content words such as *brown*, *bear, moving* and *room*, showed rather small rates of lengthening for both speakers when they were emphasized. This result seems natural when it is recognized that their original duration is longer.

With regard to compensation, there are eight items whose lengthening rates were measured, excluding the item emphasized for every utterance. Thus there are seventy-two items altogether to check for each speaker. Both speakers showed a tendency of compensation with a very similar degree. Out of seventy-two items, thirty-seven items (51%) were shortened with the rate of 10% or more for both speakers when the remaining item was emphasized. Sixteen items (22%) changed within the rate of 10% and nineteen items (26%) were lengthened with the remaining item being emphasized in the utterances of the British speaker, while twenty-three items (32%) changed within 10% and twelve were lengthened with 10% or more in the utterances of the American speaker. Looking at the Table 5-1 and 5-2 horizontally, there was no utterance in which all the other items were shortened with a certain item being emphasized. Looking at the tables vertically, the British speaker had the only item, *moving*, that was always shortened with any other item being emphasized in any utterance, while the American speaker did not have such an item.

It is interesting to see that another item, *in*, was lengthened strikingly with large rates (252% for the British and 136% for the American) even when the following item, *the*, was emphasized by each speaker. Although the discussion on sound pressure level comes in the next section, the changes in sound pressure level for their *in*s were quite small in corpora 8 where *the* was emphasized. Both speakers seem to have pronounced their *in*s with saved energy and the *in*s became, so to speak, preparatory periods just to emphasize the following item, *the*. The American speaker inserted a pause of 231ms without inhalation after *in* which faded out and linked to the pause.

There is another result that was consistent to both speakers. A definite article, *the* appeared at two places in the corpus. When the following items, *brown* and *room*, were emphasized in corpus 2 and 9, both *the*s did not compensate for them but were lengthened, too. The American speaker showed a much greater tendency. This seems to show how tightly the definite article linked to the following item. The two items did not change their values separately but functioned as a unit.

The American speaker used another pause of 618 ms in corpus 6 in addition to the one in corpus 8. It was inserted after *around,* which was the item to emphasize. The pause used in corpus 8 was before *the*. Neither pause had any inhalation and each of them was inserted next to the item to emphasize. Such pauses seem to have been another prosodic factor to bear prominence upon the neighboring item. Meanwhile the British speaker adopted no pause in any sentences.

3.3 sound pressure level

There seems not a little difference in the number of items whose sound pressure level increased with emphasis between the two speakers. Looking at the first lines of Table 7-1 and Table 7-2, eight items out of nine increased their values in the utterances of the British speaker, while there were four items increased, three items were unchanged, and the remaining two items decreased in the utterances of the American speaker.

Therefore, it is far from deciding that the American speaker increases his sound pressure level when he emphasizes an item in a sentence. There were four items, *The*, *is*, *the*, and *room*, that increased their sound pressure levels with emphasis in the utterances of both speakers.

In order to discuss compensation there were sixty-four items to check in the utterances of the British speaker as his *bear* decreased its sound pressure level with emphasis. Thirty-seven items (58%) out of sixty-four decreased with the rate of 10 % or more, twenty-four items (38%) changed within the rate of 10%, and three items (5%) increased with the rate of 10% or more. Meanwhile there were only thirty-two items to check in the case of the American speaker as five items whose change rates were minus or zero were rejected. Out of thirty-two items, fourteen (44%) decreased the sound pressure level with the rate of 10% or more, thirteen (41%) changed within the rate of 10%, and five (16%) increased with the rate of 10% or m ore. In the comparison to check how strong the increased item in each utterance was compensated, the British speaker showed a stronger tendency of compensation.

Looking at Table 7-1, corresponding to the British speaker, horizontally, all the items that were not emphasized in corpus 5 decreased their sound pressure levels and corpus 1, 2, 3, 4, and 8 showed similar results. On the other hand, the American speaker had no corpus in which all the items that were not emphasized decreased but his three corpora, No. 5, 6, and 8 had more items having decreased sound pressure levels. When he emphasized the rightmost item, *room*, the remaining items changed very little.

Then looking at two tables vertically, it can be noticed which items always decreased their sound pressure levels when they were not emphasized. The British speaker had five items: *The*, *brown*, *bear*, *is*, and *around* while the American had two: *bear* and *room*. It is intriguing to see that the British speaker's four items out of the five are from the first to the fourth item appearing in the corpus. When he emphasized *in*, *the*, *room*, in the corpus 7, 8, 9, respectively, the first to the third item, i. e. *The*, *brown*, and *bear*, in every corpus decreased and compensated the increase of the emphasized items. It seems that the British speaker unconsciously saved his energy consumption at the first sense group, *The brown bear*, to keep enough energy until he emphasized the last sense group, *in the room*. Although his three items making the second sense group increased their sound pressure levels with considerable rates, neither the items in the first sense group nor those in the third sense group showed consistent compensation.

3.4 another prosodic feature

Although some discussion was made on strong form and weak form in section 3.2, there is another feature that bore prominence, which results in emphasis. It is sound quality. The British speaker used strong form for *The* in corpus 1 and for *the* in corpus 8. So both items were pronounced [ðiː] instead of [ðə]. Besides the lengthening of the vowel, the quality of the vowel was clarified and tensed with the use of strong form, which made prominence on the items. No strong forms were adopted in the utterances of the American speaker. As mentioned in the section 3.2, the use of pause reinforced the emphasis of the American speaker while the use of strong form reinforced that of the British speaker.

4. Conclusion

Although the informants in this paper have been introduced as a British speaker and an American speaker for convenience, the two speakers are not a typical representative of the two nations but just two samples of them. Needless to say, therefore, many more informants are necessary for the next step to get more reliable results. Even in such a condition the following results would be some useful data for further study.

A speaker tends to combine some items into a sense group and deal with it as a unit to deliver the meaning carefully when some item of a sentence is to be emphasized. A function word is easier to be lengthened compared with a content word as strong form is preferred for the function word to be emphasized. When a function word appears at the first item of a sense group, a greater lengthening is found at that place.

Conversely the rate of lengthening of a content word is limited. A definite article is lengthened with the following item being emphasized and lengthened, which seems to imply how tightly the article and the following item were connected. A speaker sometimes adopts pause or changes the quality of sound for emphasis.

Emphasis in an English sentence produced some positive change in pitch, induration, and in sound pressure level. With such positive changes some negative changes often occurred to compensate for them. And such compensation seems to suggest that there is a definite limit in energy for everybody to utter a whole sentence and that the other items of the sentence are uttered with saved energy when a certain item is emphasized.

Notes

1) It might be caused by aperiodical vibration of vocal cords that some F_0 contours were not able to be identified as Maekawa (1996) pointed out.
2) A tentative duration of emphasized item is: duration of emphasized item × duration of whole sentence in neutral utterance ／ duration of whole sentence in emphasized utterance. For example, the tentative duration of *The* uttered by the British speaker in Table 4-1 is: 285 ms × 2704 ms ／ 2673 ms = 288 ms

References

Liberman, M. and Pierrehumbert, J. (1984) "Intonational invariance under changes in pitch range and length." In M. Aronoff and R. T. Oehrle (eds.) *Language Sound Structure* 10. (pp. 157-233). Cambridge, Mass. : MIT Press.

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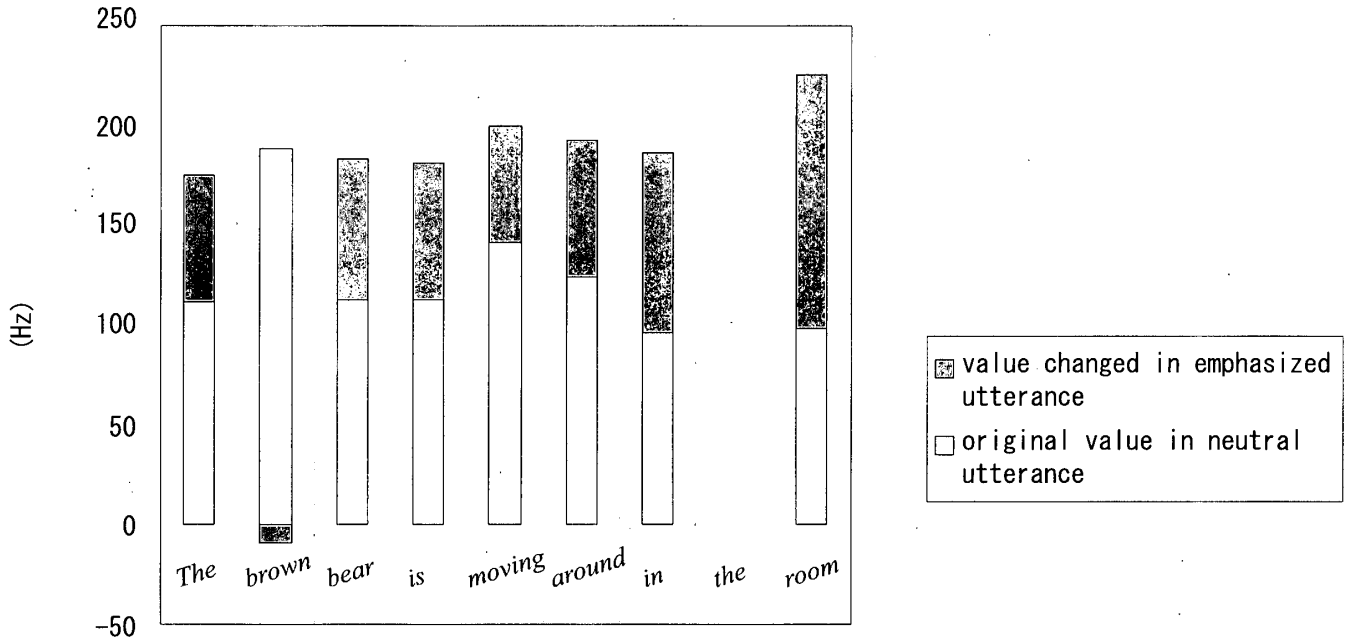

Fig. 1-1: Changes of the Highest Pitch of the Constituent in Emphasized Utterances of a British Speaker

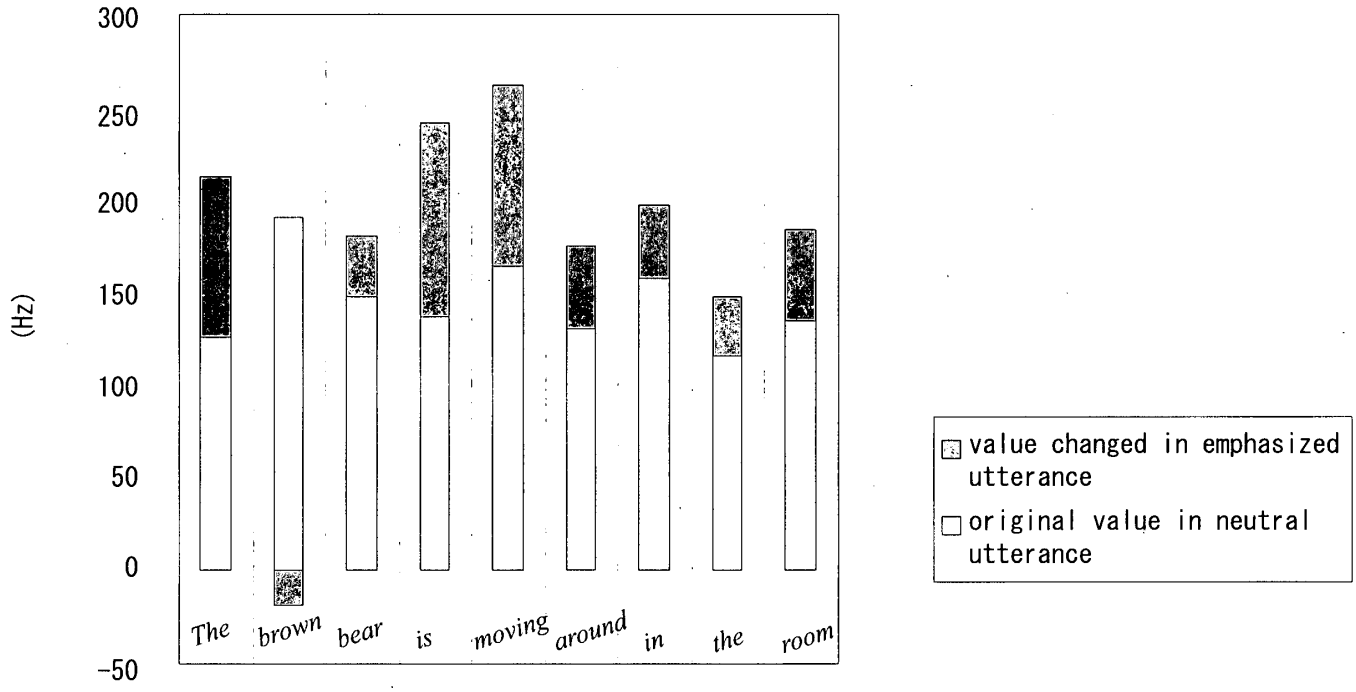

Fig. 1-2: Changes of the Highest Pitch of the Constituent in Emphasized Utterances of an American Speaker

Table 2-1: The Highest Pitches of Each Item Uttered by a British Speaker (Hz)

The symbol ϕ means that the Fo contour of the item was not identified and no data was obtained.

corpus \ item	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
No. 0	111	188	112	112	141	124	96	ϕ	98
No. 1	175	103	80	83	115	101	87	85	93
No. 2	ϕ	179	111	103	94	95	99	103	137
No. 3	ϕ	152	183	ϕ	71	91	112	124	135
No. 4	ϕ	170	68	181	89	91	95	95	ϕ
No. 5	ϕ	140	54	54	200	87	87	85	81
No. 6	ϕ	170	114	110	125	192	85	81	80
No. 7	ϕ	183	125	ϕ	115	119	186	115	91
No. 8	ϕ	188	113	96	100	103	121	197	125
No. 9	ϕ	186	110	104	175	136	126	140	225

Table 2-2: The Highest Pitches of Each Item Uttered by an American Speaker (Hz)

corpus \ item	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
No. 0	126	191	148	137	164	130	158	116	135
No. 1	213	131	120	152	151	119	132	107	125
No. 2	132	172	117	130	128	111	136	111	117
No. 3	120	124	181	137	126	107	130	104	109
No. 4	129	156	141	242	121	107	136	109	117
No. 5	127	159	146	136	262	159	128	105	127
No. 6	120	190	145	127	141	176	130	109	122
No. 7	118	196	160	144	176	139	198	149	124
No. 8	123	205	166	135	175	144	145	148	117
No. 9	121	207	159	142	181	148	135	118	185

Table 3-1: Change Rates in Pitch of Each Item (%) in the Utterances of a British Speaker

The values of the top line are the change rates in pitch in emphasized utterances compared with the values in neutral utterance. The other values are the change rates in pitch of the other items when the top item was uttered with emphasis. The change rate with + 10 or more per cent was shown in □ while that with −10 or more per cent was shown in □. The mark ϕ means that pitch was not measured.

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
	58	-5	63	62	42	55	94	ϕ	130
No. 1	—	-45	-29	-26	-27	-19	-10	ϕ	-5
No. 2	ϕ	—	-1	-8	-33	-23	3	ϕ	40
No. 3	ϕ	-19	—	ϕ	-50	-27	17	ϕ	38
No. 4	ϕ	-10	-39	—	-37	-27	-1	ϕ	ϕ
No. 5	ϕ	-26	-52	-52	—	-30	-9	ϕ	-17
No. 6	ϕ	-10	2	-2	-11	—	-11	ϕ	-18
No. 7	ϕ	-3	12	ϕ	-18	-4	—	ϕ	-7
No. 8	ϕ	0	1	-14	-29	-17	26	—	28
No. 9	ϕ	-1	-2	-7	24	10	31	ϕ	—

Table 3-2: Change Rates in Pitch of Each Item (%) in the Utterances of an American Speaker

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
	69	-10	22	77	60	35	25	28	37
No. 1	—	-31	-19	11	-8	-8	-16	-8	-7
No. 2	5	—	-21	-5	-22	-15	-14	-4	-13
No. 3	-5	-35	—	0	-23	-18	-18	-10	-27
No. 4	2	-18	-5	—	-26	-18	-14	-6	-13
No. 5	1	-17	-1	-1	—	22	-19	-9	-6
No. 6	-5	-1	-2	-7	-14	—	-18	-6	-10
No. 7	-6	3	8	5	7	7	—	28	-8
No. 8	-2	7	12	-1	7	11	-8	—	-13
No. 9	-4	8	7	4	10	14	-15	2	—

Table 4-1: Durations of Each Item Uttered by a British Speaker (ms)

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*	whole sentence
No. 0	129	412	364	183	406	454	108	168	480	2704
No. 1	285	408	321	195	336	459	144	105	420	2673
No. 2	159	480	381	159	342	384	96	90	570	2659
No. 3	132	451	547	147	336	385	135	126	418	2677
No. 4	111	279	261	357	321	418	114	129	493	2483
No. 5	120	318	180	189	538	460	96	84	490	2475
No. 6	102	292	177	129	322	599	114	123	379	2237
No. 7	129	258	165	123	285	465	264	114	438	2241
No. 8	108	294	180	132	324	297	342	264	495	2436
No. 9	102	289	177	168	307	334	111	171	596	2255

Table 4-2: Durations of Each Item Uttered by an American Speaker (ms)

Corpus 6 had a pause of 618 ms after *around* and corpus 8 had a pause of 231 ms after *in*. The duration of whole sentence of the two corpora includes the pause.

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*	whole sentence
No. 0	185	439	430	240	536	717	219	118	599	3483
No. 1	478	399	532	207	336	653	199	116	532	3452
No. 2	387	635	665	189	332	677	197	105	530	3717
No. 3	256	475	723	227	349	698	193	96	508	3525
No. 4	219	426	456	485	354	705	194	118	561	3518
No. 5	159	378	348	327	626	950	168	79	580	3615
No. 6	143	382	315	222	584	1051	176	100	618	4209
No. 7	172	370	336	185	387	782	416	117	555	3320
No. 8	189	374	475	202	341	648	509	210	484	3663
No. 9	197	358	450	193	336	690	391	273	669	3557

Table 5-1: Change Rates in Duration of Each Item (%) in the Utterances of a British Speaker

The values of the top line are the change rates in duration in emphasized utterances compared with the values in neutral utterance. The other values are the change rates in duration of the other items when the top item was uttered with emphasis. The change rate with + 10or more per cent was shown in □ while that with −10 or more per cent was shown in □. The mark ϕ means that pitch was not measured.

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
	123	18	52	113	45	59	195	74	49
No. 1	—	0	-11	8	-16	2	35	-37	-11
No. 2	26	—	6	-11	-14	-14	-9	-45	21
No. 3	3	11	—	-19	-17	-14	26	-24	-12
No. 4	-6	-26	-22	—	-14	0	15	-17	12
No. 5	2	-16	-46	13	—	11	-3	-45	12
No. 6	-5	-14	-41	-15	-4	—	28	-11	-5
No. 7	21	-25	-45	-19	-15	24	—	-18	10
No. 8	-7	-21	-45	-20	-11	-27	252	—	14
No. 9	-5	-16	-42	10	-9	-12	23	22	—

Table 5-2: Change Rates in Duration of Each Item (%) in the Utterances of an American Speaker

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
	161	36	66	100	13	42	99	81	9
No. 1	—	-8	25	-13	-37	-8	-8	-1	-10
No. 2	96	—	45	-26	-42	-12	-16	-17	-17
No. 3	37	7	—	-7	-36	-4	-13	-19	-16
No. 4	17	-4	5	—	-35	-3	-12	-1	-7
No. 5	-17	-17	-22	31	—	28	-26	-36	-7
No. 6	-25	-15	-29	-10	6	—	-22	-18	0
No. 7	-3	-12	-18	-19	-24	14	—	4	-3
No. 8	4	-13	12	-15	-35	-8	136	—	-18
No. 9	4	-20	3	-21	-39	-6	75	126	—

Table 6-1: Maximum Sound Pressure Levels of Each Item Uttered by a British Speaker (dB)

The sound analyzing software used in this paper sets −60 dB the minimum level and 0 dB the maximum level on the display.

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
No. 0	−23	−18	−16	−22	−24	−20	−26	−29	−24
No. 1	−19	−18	−21	−26	−27	−25	−26	−29	−27
No. 2	−29	−17	−18	−30	−33	−26	−33	−34	−23
No. 3	−30	−20	−18	−31	−24	−26	−30	−28	−23
No. 4	−27	−19	−17	−16	−23	−23	−29	−32	−25
No. 5	−35	−19	−18	−24	−19	−24	−29	−33	−29
No. 6	−31	−18	−19	−23	−19	−18	−26	−30	−29
No. 7	−34	−20	−21	−23	−26	−23	−20	−26	−27
No. 8	−36	−21	−20	−25	−28	−22	−24	−18	−25
No. 9	−34	−20	−19	−23	−20	−21	−25	−27	−20

Table 6-2: Maximum Sound Pressure Levels of Each Item Uttered by an American Speaker (dB)

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
No. 0	−17	−13	−14	−17	−11	−16	−14	−16	−14
No. 1	−13	−16	−19	−15	−11	−18	−15	−17	−16
No. 2	−15	−16	−18	−16	−14	−18	−14	−17	−16
No. 3	−17	−17	−14	−14	−15	−19	−17	−21	−19
No. 4	−14	−12	−16	−12	−13	−17	−12	−16	−15
No. 5	−18	−13	−16	−20	−11	−16	−17	−22	−16
No. 6	−18	−12	−16	−20	−12	−18	−16	−18	−16
No. 7	−17	−14	−17	−19	−11	−14	−14	−14	−15
No. 8	−19	−13	−17	−21	−12	−16	−13	−14	−19
No. 9	−16	−13	−15	−17	−10	−15	−13	−17	−11

Table 7-1: Change Rates in Sound Pressure Level of Each Item (%) in the Utterances of a British Speaker

The values of the top line are the change rates in sound pressure level in emphasized utterances compared with the values in neutral utterance. The other values are the change rates in sound pressure level of the other x items when the top item was uttered with emphasis. The change rate with + 10or more per cent was shown in □ while that with − 10 or more per cent was shown in □.

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
	[17]	5	[-13]	[27]	[21]	[10]	[30]	[34]	[17]
No. 1	—	0	[-31]	[-18]	[-13]	[-25]	0	0	[-13]
No. 2	[-26]	—	[-13]	[-36]	[-38]	[-30]	[-27]	[-17]	4
No. 3	[-30]	[-11]	—	[-41]	0	[-30]	[-15]	3	4
No. 4	[-17]	-5	-6	—	4	[-12]	[-12]	[-10]	-4
No. 5	[-52]	-6	[-13]	-9	—	[-20]	[-12]	[-14]	[-21]
No. 6	[-26]	0	[-19]	-5	[21]	—	0	-3	[-21]
No. 7	[-49]	[-11]	[-31]	-5	-8	[-15]	—	[10]	[-13]
No. 8	[-57]	[-17]	[-25]	[-14]	[-17]	[-10]	8	—	-4
No. 9	[-48]	[-11]	[-19]	-5	[17]	-5	4	7	—

Table 7-2: Change Rates in Sound Pressure Level of Each Item (%) in the Utterances of an American Speaker

item / corpus	*The*	*brown*	*bear*	*is*	*moving*	*around*	*in*	*the*	*room*
	[23]	[-23]	0	[29]	0	[-13]	0	[13]	[21]
No. 1	—	[-23]	[-36]	[11]	0	[-13]	-7	-6	[-14]
No. 2	[12]	—	[-29]	6	[-27]	[-13]	0	-6	[-14]
No. 3	0	[-31]	—	[18]	[-36]	[-19]	[-21]	[-31]	[-36]
No. 4	[18]	8	[-14]	—	[-18]	-6	[14]	0	-7
No. 5	-6	0	[-14]	[-18]	—	0	[-21]	[-38]	[-14]
No. 6	-6	8	[-14]	[-18]	-9	—	[-14]	[-13]	[-14]
No. 7	0	-7	[-21]	[-12]	0	[13]	—	[13]	-7
No. 8	[-12]	0	[-21]	[-24]	-9	0	8	—	[-36]
No. 9	6	0	-7	0	9	6	7	-6	—