THE INITIAL HIGH PITCH IN ENGLISH SENTENCES PRODUCED BY JAPANESE SPEAKERS

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This study attempts to explore an initial high pitch characteristically observed in English sentences produced by Japanese speakers. The experimental results have revealed that about half or more native Japanese participants (college students majoring in English) produced unfocused subject pronouns I, they, you, and it in sentence-initial position at a higher pitch than they did lexical verbs that followed. In three sentence-initial articles, however, the phenomenon was not observed, whereas monosyllabic prepositions showed a smaller degree of the initial high pitch depending on their syllable structures. These results suggest that the transfer of Japanese sentence-initial intonation patterns and interference from Japanese phonological and syntactic structures are involved in the occurrence of the initial high pitch.*

Keywords: the initial high pitch, Japanese intonation patterns, function words, phonological and syntactic structures

1. Introduction

It is frequently observed that Japanese learners of English start an English sentence on a high pitch even if the first word of the sentence is an unstressed function word. This sentence-initial pitch pattern is best exemplified in an utterance of I think, in which Japanese students tend to produce the subject pronoun I on a higher pitch than the following lexical verb think. This intonational feature of Japanese speakers may lead to misunderstanding in English communication since a high pitch on the subject pronoun may be interpreted as the placement of focus or emphasis, such as when intending to contrast I with some

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other potential subject such as you or he.

Although this intonation pattern shared by Japanese speakers has been impressionistically observed (e.g. Tōgo (1989), Date (2003)), no empirical evidence to date has been provided. In the pilot study by Mori in 2003, six native speakers of General American and nine Japanese college students (five males and four females) who majored in English participated in a phonetic experiment. They read 14 test sentences that began with I think, and some dummy words and sentences in random order. It was found that in the speech productions of six out of the nine students, the subject I was consistently higher than the following think.

The purpose of the present study is to explore in more detail the acoustic realization of the initial constituents of English sentences produced by native speakers of English vs. Japanese learners of English. Specifically, this study aims to examine the extent to which Japanese learners tend to produce unstressed function words in sentence-initial position on a higher pitch than the following content words even if focus is located on constituents other than sentence-initial ones. It also attempts to explore the factors involved in the phenomenon and the interference from their native language, Japanese.

2. Experiment 1

2.1. Subjects

Two groups of speakers served as subjects: five native speakers (NS) of General American English (three males and two females), and 30 Japanese second-year students who majored in English. The Japanese students (JS) had taken an English phonetics course that included pronunciation practice, and learned about basic intonation and stress patterns in English sentences.

2.2. Materials

Five test sentences used in this experiment are shown in Table 1, in which items with primary sentence stress were underlined in order to eliminate the effect of varied assignment of nuclear accent on intonation patterns. The first four sentences had contrastive stress on the underlined words of each nominal clause. In test sentence 5, the underlined last word was the one where nuclear accent tended to be placed in neutral context when the whole sentence was in broad focus (cf. Watanabe
(1994), Selkirk (1995), Takebayashi (1996)). Words in italics were target words whose duration and pitch were measured.

Table 1. Test Sentences for Experiment 1

1. *I think it’s* not “a witty idea”, but “a silly idea”.
2. *I thought she* wouldn’t “prevent the accident”, but “foresee the accident”.
3. *They think it’s* not “a witty idea”, but “a silly idea”.
4. *They thought she* wouldn’t “prevent the accident”, but “foresee the accident”.
5. *They bought her* a new dress.

Test sentences that began with an unstressed pronoun *I* or *They* plus a stressed lexical verb *think, thought, or bought* were prepared in order to examine a sentence-initial high pitch characteristic of JS. It was assumed that NS would start a pronoun at a low pitch in normal context (cf. Chafe (1974)) and raise pitch in a lexical verb. Thus, the sentence-initial pitch pattern of NS would make a contrast with that of JS if JS produce the sentence-initial function word on a higher pitch than the following content word. The sentence beginning with *I think* was selected first since the combination of the subject and the verb appeared to be favorably produced by Japanese speakers. Sentences that began with *They* were added to see whether the change of subject pronouns would influence the sentence-initial pitch pattern. *I* and *They* were selected as the subject pronouns since they included intrinsically long diphthongs (Umeda (1975)), which would make it easier to elicit reliable pitch values.

Test sentences 2, 4, and 5 with *thought* and *bought* as the main verbs were created to examine whether the change of lexical verbs would influence sentence-initial intonation. The simple sentence, 5, was included to also examine the effect of syntactic structure on sentence-initial pitch pattern.

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1 Be-verbs and auxiliary verbs were not tested in this study since they were unstressed and low-pitched in normal context. Mori (2004) found that in the sequence of a pronoun subject plus a be-verb, there was no marked difference in sentence-initial pitch pattern between NS and JS.
2.3. Procedures

For NS, five test sentences were written one sentence per card, and mixed with 31 other sentences and words in order to separate the five test sentences as much as possible. This was because NS tended to place a focus on a word that differed from the previous one when reading similar sentences in succession, which would affect the intonation patterns of their readings. Each participant was presented one card at a time in a random order and asked to read it for recording at a tempo comfortable to him/herself with contrastive or normal stress on the underlined items. Every time the subject finished reading all the sentences, the cards were randomized and presented to the subject, for a total of six different randomizations.

For JS, the five test sentences with a few dummy sentences were written on a sheet in eight different orders. The sheets were presented to the students, and the location of nuclear stress was briefly explained. However, no model reading of the sentences was provided to them. Before recording, they were given a few minutes to practice reading these sentences.

The students were asked to read each sentence twice for recording with contrastive or normal stress on each underlined word. When they misread any of the sentences, they were allowed to read it again. Recording was done with each student in a booth in a language laboratory room.

Productions were recorded and digitized at a sampling rate of 11 kHz, and waveforms, wideband spectrograms, and pitch contours were made with a Kay Multi-Speech Model 3700. As a rule, tokens from the second to the sixth readings were measured for NS, and the second token was analyzed for JS.

The mean F0, and the maximum and minimum F0 in the period of periodic waveforms of vowels and nasals of target pronouns and verbs

\[ \text{Mean } F_0 = \frac{N}{(1/f_1 + 1/f_2 + \ldots + 1/f_n)} \]

where \( n \) is the total number of voiced periods and \( f_1 \ldots f_n \) are the frequency values for each period. Mean F0 is the inverse of mean period.

2 "Normal stress" here refers to primary sentence stress assigned on the last content word of an intonational unit of an English sentence in neutral context in which the whole sentence is in broad focus (cf. Watanabe (1994: 80)).

3 Mean F0 is calculated using the formula M=N/(1/f1+1/f2+...+1/fn), where n is the total number of voiced periods and f1...fn are the frequency values for each period. Mean F0 is the inverse of mean period.
were measured by visual inspection. When the periodic period was too short to measure F0, or when waveforms showed no periodicity, no measurement of F0 was done for the token.

Durations were obtained based on waveforms, spectrograms, and listening, for all the target pronouns and verbs, as long as word boundaries were distinct enough to be determined. The burst of the final plosive /t/ of thought was not realized in most of the tokens by NS. Thus, the period of the onset /θ/ plus the vowel /ɔː:/ of thought was measured in order to employ consistent criteria for measuring the word duration. The period of think was measured until the burst of the plosive /k/. The other criteria for determining segmental boundaries were dependent upon the particular phonetic features of the segments (cf. Peterson and Lehiste (1960), Beckman (1982)).

In addition, the pitch range of the underlined items of test sentence 5 was measured in order to confirm that the nuclear tone was realized on the focused word by English and Japanese speakers. In the realization of the contrastive nuclear accent in test sentences 1 to 4, each of the four phrases (a witty idea, a silly idea, prevent the accident or foresee the accident) tended to merge into a single tone unit and the pitch accent of idea or accident was mostly deleted. Thus, the max. F0 and the min. F0 in the period of each phrase were measured excluding the period of particle a or the. When the phrase-final noun (idea or accident) was not de-accented and had a nuclear tone, the token was discarded considering that the contrastive nuclear accent may not have been realized successfully in it, which happened only a few times for each test sentence.

2.4. Results and Discussion
2.4.1. Pitch Change between I and Lexical Verbs

Figures 1 and 2 show typical pitch contours of test sentence 1 produced by a female American and a JS, respectively. It can be seen that in both contours the nuclear tone of contrastively stressed words witty and silly is realized almost in the same way. However, the crucial difference is observed in the sentence-initial shape of the pitch contours from I to think. In Fig. 1, the NS produces I on a relatively low pitch and then the pitch jumps in the following verb think, whereas in Fig. 2, the pitch rises sharply in the initial I, then it drops in think.

Figures 3 and 5 show the mean pitch in the initial parts of test sentences 1 and 2 produced by NS and JS, respectively. The mean F0 of
the sentence-initial constituents is normalized and represented in semitone⁴ using the mean F0 of the initial subject I as a reference point. This eliminates an interspeaker difference in voice pitch.

Fig. 1. Waveforms and pitch contour of *I think it’s not “a witty idea”, but “a silly idea”* produced by a female NS

Fig. 2. Waveforms and pitch contour of *I think it’s not “a witty idea”, but “a silly idea”* produced by a JS

⁴ The mean F0 of each constituent was first transformed into logarithmic scale, then the difference in logarithm between the subject and each succeeding constituent was represented in semitone steps by dividing the difference by \((\log880-\log440)/12\).
It can be seen from Figure 3 that all NS raise pitch from *I* to *think* or *thought*, though the degree of the pitch change greatly varies among the speakers. Then, three out of five speakers lower the pitch towards *it's* or *she*, whereas Speakers R and T maintain almost the same or at a little higher pitch level in *it's/she*.

It can also be seen that in the utterances by the same speaker, the pitch of *think* is consistently higher than that of *thought*. This suggests the difference in intrinsic pitch between a high vowel /i/ and a low vowel /ɔ/ (Lehiste and Peterson (19615)).

By contrast, JS showed two types of pitch patterns. In order to examine whether pitch rises or falls between *I* and *think/thought* in JS, the mean F0 and max. F0 in *I* was subtracted from those of *think* or *thought* in each utterance.

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5 Lehiste and Peterson (1961: 419-420) report that stressed vowel /i/ is on average 14 Hz higher than stressed vowel /ɔ/ in words embedded in a frame sentence produced by five NS of American English.
In Figure 4, the difference in mean F0 is plotted against the difference in max. F0 between *I* and *think* in each utterance of JS. As can be seen from the figure, tokens are roughly divided into two groups. One group consists of tokens whose differences in mean and max. F0 are plus; that is, the mean and max. F0 of *I* are lower than those of *think* or *thought*. The other is composed of the tokens whose coordinates are minus; that is, the mean and max. F0 of the subject are higher than those of the verb. Tokens that belonged to neither group were excluded from the data, which occurred only once or twice for each test sentence.

The students were divided into two groups according to their respec-
tive token patterns. Those who had produced $I$ lower than \textit{think} were designated as Group A. Those who produced $I$ higher than \textit{think} became members of Group B.

As is clear from Fig. 5, the pitch pattern of Group A is similar to that of NS in Fig. 3. In Group B, by contrast, pitch falls by about 3 semitones from the subject to the following verb, and then in the succeeding \textit{it's} and \textit{she} it goes up slightly.

One-way repeated measures analyses of variance (RM-ANOVAs)\textsuperscript{6} and post hoc tests\textsuperscript{7} showed that NS significantly raised pitch from $I$ to \textit{think/thought} ($p<0.001$), but pitch change from \textit{think/thought} to \textit{it's/she} varied among speakers. Group A of JS significantly raised pitch from the subject to the verb and lowered it significantly from the verb to \textit{it's/she} ($p<0.001$). Group B, by contrast, significantly lowered pitch between the subject and the verb and raised it significantly from the verb to the succeeding \textit{it's/she} ($p<0.05$).

A one-way ANOVA with three groups of speakers (NS\textsuperscript{8}, Group A and Group B of JS) as a fixed factor showed a significant effect of speakers. Multiple Scheffé comparisons indicated significant differences between any pair of the three groups of speakers in all the constituents ($p<0.05$) except for \textit{thought}, which showed no significant difference between NS and Group A.

\textsuperscript{6} All statistical analyses in this thesis were conducted by using a SAS StatView. In order to factor out interspeaker variation in voice pitch, a repeated measures analysis of variance (RM-ANOVA) was used to examine within each speaker whether there was a significant difference in pitch among the first three constituents for each sentence.

\textsuperscript{7} A Fisher's PLSD was used as a post-hoc test (multiple comparison) when the numbers of samples were the same, whereas a Scheffé was employed when they were not.

\textsuperscript{8} F0 values obtained for each native speaker were first averaged over repeated productions of the same sentence by the same speaker, and the averaged F0 values were used for further analyses.
2.4.2. Pitch Change between They and Lexical Verbs

Figures 6 and 7 illustrate mean pitch change in semitone from They to think, thought, and bought, and to it's, she, and her, in test sentences 3, 4, and 5, produced by NS and two groups of JS. Both figures show similar pitch patterns to those in Figs. 3 and 5, respectively.

In the productions by NS (Fig. 6), the mean pitch rises from They to the verbs and then drops in it's and she. However, in the sequence of They bought her, the object pronoun her is realized almost at the same pitch level as the preceding verb.

By contrast, JS showed two kinds of pitch patterns and were classified into Groups A and B by the same criteria as employed in test sentences 1 and 2. As shown in Figure 7, Group A raise pitch from sub-
jects to verbs. In Group B, by contrast, pitch falls from subjects to verbs by about three semitones, and in the following pronouns, pitch falls further in the object pronoun her, but in the subject pronouns it’s and she, it rises a little.

It is also noticeable that the degree of pitch change between the subject and the following verb is a little smaller in *They thought* than in *They think*, and further smaller in *They bought* than in *They think/thought*. This tendency is more evident in the production by NS than JS where mean pitch change between *They* and *bought* is about 1.5 semitones (Fig. 6). The verb *bought* as well as *thought* contained the vowel /ɔ:/ whose intrinsic pitch was lower than that of /i/ in *think* as discussed in 2.4.1. In addition, *bought* was preceded by a voiced plosive /b/, whereas in *think* and *thought* the preceding consonant was a voiceless fricative /θ/. Previous studies have shown that voiced consonants have a lowering effect on the pitch of the following vowel, whereas voiceless consonants are associated with higher pitch in the following vowel (cf. Hombert (1978), Lehiste (1976)). Lehiste and Peterson (1961: 421) report that the average peak of stressed vowel /ɔ/ preceded by /b/ is 161 Hz, whereas stressed vowel /i/ following /θ/ has a much higher peak of 177 Hz. It is suggested that the difference in intrinsic pitch between /i/ and /ɔ/ and the effect of the preceding consonant on the pitch of the following vowel may be reflected on the F0 measurements of these words.

One-way RM-ANOVAs and post hoc tests indicated that NS and Group A significantly raised pitch from *They* to *think/thought/bought* and lowered it from the verb to the succeeding *it’s* or *she* (p<0.05). By contrast, Group B significantly lowered pitch from the subject to the verb (p<0.0001). However, the pitch rise from *think/thought* to *it’s/she* in Group B did not reach a significant level. In the case of the object pronoun her in *They bought her*, both Groups A and B significantly lowered the pitch from *bought* to *her* (p<0.0001), whereas NS neither raised nor lowered *her* significantly from *bought*. A one-way ANOVA showed a significant effect of speakers (p<0.05). Post hoc tests indicated that there was no significant difference in pitch between NS and Group A in all three verbs and *her*.

These results have revealed that high-pitched subject pronouns followed by low-pitched lexical verbs were observed in English sentences produced by Japanese EFL learners even when the subject pronoun changed from *I* to *They* and even in a simple sentence made up of sub-
ject + verb + indirect object + direct object. The results also show that in this initial pitch pattern of JS, the pronoun that followed the main verb tended to be higher than the verb when serving as the subject of the following nominal clause, but lower than it when serving as the object of the preceding verb.

2.4.3. Frequency of Initial High Pitch

Figure 8 presents the number of students in Group A and Group B for each test sentence. Twelve students consistently produced sentence-initial pronouns at a higher pitch than they did the following verbs in all five sentences, while six showed the same pitch pattern in four sentences, and two, the same pitch pattern in three sentences. As is obvious from the figure, about two thirds of JS in each sentence belong to Group B, in which the subject pronouns are higher in pitch than the verbs that follow them. The ratio of Group B ranges from 62.1% in test sentence 1 and 2 to 73.3% in test sentence 4. Although the ratio tends to be higher in sentences that begin with They than in those with I, the difference did not reach a significant level by chi-test.

![Graph showing number of JS for Group A and Group B for each test sentence in Experiment 1](image)

Fig. 8. Number of JS for Group A and Group B for each test sentence in Experiment 1

The ratio of students who showed this pitch pattern is almost the same as that obtained from the pilot experiment. It should be added that in the experiments of this study, sentence-initial position is identical with utterance-initial position in every test sentence.

In sum, the experimental results make it clear that over half of
Japanese learners produced subject pronouns on a higher pitch than the following lexical verb, although this is not the case in NS’s English. This intonational tendency of JS is referred to as “the initial high pitch” in this study. Specifically, “the initial high pitch” is defined here as a tendency to produce sentence-initial function words on a higher pitch than the following stressed syllable of a content word in neutral context characteristically observed in English sentences produced by Japanese speakers.

2.4.4. Pitch Range of Nuclear Stress

Let us now examine how NS and JS realized nuclear pitch accent in the focused words or phrases in the test sentences. The pitch range in dress of test sentence 5 was on average 3.87 semitones for NS, and 4.10 and 4.08 semitones for Group A and Group B of JS, respectively, showing no significant difference between any pair of the three groups of speakers.

Table 2. Mean pitch range in semitone and SD in parentheses of the 1st and 2nd phrases that have contrastive stress in test sentences 1 to 4 produced by NS and Group A and Group B of JS. * and ** indicate significant differences from NS at p<0.05 and p<0.01, respectively.

<table>
<thead>
<tr>
<th>Test sentence</th>
<th>1. I think ...</th>
<th>2. I thought ...</th>
<th>3. They think ...</th>
<th>4. They thought ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phrase</td>
<td>1st</td>
<td>2nd</td>
<td>1st</td>
<td>2nd</td>
</tr>
<tr>
<td>NS</td>
<td>8.37 (3.27)</td>
<td>9.39 (4.36)</td>
<td>7.92 (2.63)</td>
<td>9.81 (4.37)</td>
</tr>
<tr>
<td>Group A</td>
<td>4.07* (1.69)</td>
<td>6.63 (3.60)</td>
<td>4.92* (1.48)</td>
<td>6.22* (2.35)</td>
</tr>
<tr>
<td>Group B</td>
<td>5.19 (2.79)</td>
<td>7.12 (2.40)</td>
<td>5.05* (2.26)</td>
<td>5.48* (1.69)</td>
</tr>
</tbody>
</table>

In the contrastive nuclear tone in test sentences 1 to 4 shown in Table 2, pitch tends to vary more widely in NS than in JS in all the phrases. ANOVAs and Scheffé’s tests showed significant differences in pitch range between NS and either or both groups of JS in six out of eight phrases (Table 2). No significant difference was observed between Group A and Group B in any phrase.

These results suggest that the JS could realize nuclear tone in the word with normal stress as could NS, but not so widely in words with contrastive stress. In addition, it has been observed that proficiency in realizing nuclear pitch accent does not differ between the two groups of JS in spite of a large difference in the sentence-initial pitch pattern.
between them.

2.4.5. Durational Patterns of Pronouns and Verbs

Let us now examine whether temporal structure shows any great difference between NS and JS. Table 3 presents the mean duration of the subject and verb and the mean ratio of the verb to its preceding subject for each test sentence produced by NS, Group A, and Group B, respectively. One obvious finding from the table is that all mean durations of the subjects and pronouns are shorter for NS than for JS. This indicates that NS spoke much faster than JS.

Another finding from Table 3 is that, in any of the five combinations of subject and verb, the verb/subject ratio (V/S) of Group B is smallest. This means that in Group B, the subject tends to be relatively long, whereas the verb is most often relatively short. However, the difference in ratio reaches a significant level only between Groups A and B for *I think* (p<0.01) and between NS and Group B for *They bought* (p<0.05) by ANOVAs and Scheffé’s tests.

<table>
<thead>
<tr>
<th>Speaker</th>
<th>I think</th>
<th>They think</th>
<th>I thought</th>
<th>They thought</th>
<th>They bought</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS</td>
<td>194.1</td>
<td>218.3</td>
<td>180.5</td>
<td>117.4</td>
<td>85.8</td>
</tr>
<tr>
<td>V/S</td>
<td>2.55</td>
<td>2.28</td>
<td>1.72</td>
<td>2.50</td>
<td></td>
</tr>
<tr>
<td>Group A</td>
<td>407.0</td>
<td>391.9</td>
<td>308.2</td>
<td>186.2</td>
<td>159.1</td>
</tr>
<tr>
<td>V/S</td>
<td>3.43</td>
<td>2.38</td>
<td>1.79</td>
<td>2.04</td>
<td></td>
</tr>
<tr>
<td>Group B</td>
<td>347.6</td>
<td>366.6</td>
<td>307.2</td>
<td>205.4</td>
<td>189.0</td>
</tr>
<tr>
<td>V/S</td>
<td>2.12</td>
<td>1.79</td>
<td>1.65</td>
<td>1.45</td>
<td></td>
</tr>
</tbody>
</table>

3. Experiment 2

Two questions arise from the findings of Experiment 1. The first one is whether the initial high pitch is a phenomenon specific to pronouns or whether it occurs in the other sentence-initial function words as well. The second one is whether this initial high pitch occurs even in monosyllabic function words that contain a short vowel instead of a diphthong. Experiment 2 was carried out in order to examine these questions.
3.1. Subjects
Five NS of General American who had participated in Experiment 1 and another 30 JS served as subjects. JS were all female in the second year of college who majored in English. They had taken English phonetics course and leaned about basic intonation and stress patterns in English.

3.2. Materials
Table 4 presents test sentences for this experiment. They consist of four new test sentences numbered from 6 to 9 and test sentences 1 and 5, which were used for Experiment 1. Sentences 1 and 5 were tested only with JS to examine whether the JS for this experiment had the same tendency for the initial high pitch as the JS did in Experiment 1. Words with nuclear stress were underlined only in test sentences 1 and 5. Words in italics were target words whose mean, max., and min. F0 were measured.

Table 4. Test Sentences for Experiment 2
6. The robot moves just like a man.
7. At seven thirty, I have to leave for Hokkaido.
8. In the room, there were chairs and a big table.
9. On the table, there was a big vase with beautiful flowers.
1. I think it’s not “a witty idea”, but “a silly idea”.
5. They bought her a new dress.

3.3. Procedures
Recording and analyzing procedures were the same as in Experiment 1 except that no measurement of duration was done. The total number of tokens analyzed was 100 (4 sentences × 5 repetitions × 5 subjects) for NS, and 180 (6 sentences × 1 repetition × 30 subjects) for JS.

3.4. Results and Discussion
3.4.1. Pitch Pattern in I think and They bought
Pitch change between I and think and between They and bought tells us whether the initial high pitch observed in JS for Experiment 1 is applicable to this group of JS for Experiment 2 as well.
JS were classified into Groups A and B by the same criteria as used in Experiment 1. In the case of They bought, 20 out of 29 students showed a significantly higher pitch in They than in bought (p<0.001)
and were classified into Group B. This ratio is exactly the same as that of the JS in Experiment 1 (see Fig. 8).

In test sentence 1, however, only 15 out of 30 students showed the initial high pitch in I. The other half produced I on a significantly lower pitch than that in think \((p<0.001)\). Thus, the ratio (50%) of Group B is a little smaller than 62.1% obtained for JS in Experiment 1.

In summary, it can be said that 50% or more of the Japanese participants for Experiment 2 showed the initial high pitch in the subject pronouns as observed in Experiment 1.

3.4.2. Pitch Pattern in The robot moves and At seven thirty

Figure 9 shows pitch change collapsed across speakers in the first three syllables of test sentences 6 and 7 produced by NS and JS. As in Experiment 1, the difference in mean F0 among the first three syllables of the sentences is normalized and represented in semitone using the mean F0 of the initial The or At as a reference point. It is obvious from the figure that there is no great difference in pitch pattern between NS and JS.

One JS, however, produced At on a higher pitch than she did the following syllable in test sentence 7, although the difference in mean pitch between At and /se/ is as little as 0.40 semitone. No other student showed any tendency for the initial high pitch in the two sentences.

A one-way RM-ANOVA was run on mean pitch in semitone among the first three syllables of each sentence. Post hoc tests showed that in the sequence of The robot, JS significantly raised pitch from /\d\alpha/ to /r\omega/
and from /ɾə/ to /bə/ (p<0.0001), whereas NS raised pitch significantly only from /ðə/ to /ɾə/ (p<0.05). In the case of *At seven*, pitch rise was significant only from /ɔt/ to /ʃəl/ in both NS and JS (p<0.001). A one-way ANOVA with two groups of speakers as a fixed factor showed no significant difference between NS and JS in the sequence of *The robot*. Only in the syllables /ʃəl/ and /vən/ of *At seven*, there was a significant difference between NS and JS at p<0.05 level.

Although the magnitude of pitch change in *At seven* was significantly larger in NS than in JS, there was no great difference in pitch pattern between the initial items in both test sentences. Consequently, it can be said that the initial high pitch was hardly ever observed in the sentence-initial article *The* and the preposition *At* followed by the stressed syllables of content words.

### 3.4.3. Pitch Change in *In the room* and *On the table*

In test sentences 8 and 9, a large pitch change was observed in *room* and *table* presumably due to the nuclear accent assigned on them. Thus, it can be assumed that the max. F0 of *room* and *table* could represent pitch pattern in the initial part of the sentences more faithfully than the mean F0 (cf. Eady and Cooper (1986)).

Figure 10 shows the topline of pitch in semitone collapsed across speakers in the first three syllables of test sentences 8 and 9 using the max. pitch of the initial preposition *In* or *On* as a reference point. As is clear from the figure, there is no great difference in pitch pattern between JS and NS in both phrases. The article *the* is produced on almost the same pitch level as, or a little lower than, the level of the preceding preposition *In* or *On*, and max. pitch rises by about 2.5 semitones in the noun *room* or the syllable /tei/ of *table* that follows.

However, as the error bar suggests, one out of five NS drew a different topline from the others. She started high in *In* and *On* and further raised max. pitch in *the* by about one and a half semitones, then lowered it in /ruːm/ or /tei/ of *table*. Presumably, she placed a focus on the initial function words. In the utterances by JS, only four JS realized a pitch peak in *In* or *the* higher than in /ruːm/, and three JS produced *On* or *the* at a higher pitch peak than they did /tei/ of *table*. 

A one-way ANOVA with speakers (NS vs. JS) as a fixed factor showed no significant effect of speakers in any syllable. A one-way RM-ANOVA was performed on max. pitch (semitone) of the first three syllables of each sentence. Post hoc tests showed that JS realized a pitch peak in the nouns room or table significantly higher than in the preceding function words (p<0.0001).

The results have revealed that Japanese learners of English showed no tendency for the initial high pitch in the sequences of In the room and On the table equivalent to that observed in the sentence-initial pronouns. This finding is worth noticing since in these phrases not only the first but also the second syllables are function words.

4. Experiment 3

Experiment 2 has made it clear that monosyllabic prepositions and articles were hardly ever produced with the initial high pitch. The problems to be considered next are whether the frequency variation in the initial high pitch is attributable to the syntactic categories or to the syllabic or segmental structure of the function words, and what factors are involved in the presence or absence of the initial high pitch. Experiment 3 was conducted to address these problems.

4.1. Subjects

Four new NS of General American and one NS who had participated in Experiments 1 and 2 served as native subjects. Japanese subjects were the same 30 students from Experiment 2.
4.2. Materials

Table 5 lists test sentences for this experiment. The words with primary sentence stress were underlined in order to eliminate intonational differences due to different stress assignment by the speakers.

Table 5. English Test Sentences for Experiment 3

<table>
<thead>
<tr>
<th>Test sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. <em>A tall</em> man jumped into the <strong>pond</strong>.</td>
</tr>
<tr>
<td>11. <em>An American</em> lady started <strong>talking</strong> to me.</td>
</tr>
<tr>
<td>12. <em>It barked</em> <strong>noisily</strong> all night.</td>
</tr>
<tr>
<td>13. <em>It snowed</em> <strong>heavily</strong> last year.</td>
</tr>
<tr>
<td>14. <em>You bought her</em> a <strong>new</strong> dress.</td>
</tr>
<tr>
<td>15. <em>By the window</em>, they put the <strong>table</strong>.</td>
</tr>
<tr>
<td>16. <em>To the station</em>, they <strong>hurried</strong>.</td>
</tr>
</tbody>
</table>

Japanese Test Sentences for Experiment 3

<table>
<thead>
<tr>
<th>Test sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. <em>Anata-wa kanojo-ni doresu-o katte-ageta</em> ‘You bought her a new dress.’</td>
</tr>
<tr>
<td>18. <em>karera-wa kanojo-ni doresu-o katte-ageta</em> ‘They bought her a new dress.’</td>
</tr>
<tr>
<td>19. <em>sore-wa hitobanjuu urusaku hoete-ita</em> ‘It barked noisily all night.’</td>
</tr>
<tr>
<td>20. <em>Watashi-wa sore-wa yoi kangae-dato omoi-masu</em> ‘I think it’s a good idea.’</td>
</tr>
</tbody>
</table>

Test sentences 10 and 11 were prepared to examine whether articles *a* and *an*, which have different syllable structures (V and VC) from that of *the* (CV), would show the initial high pitch.

In test sentence 14, the pronoun subject *You*, which contained a long vowel /u:/, was selected in order to compare the frequency of the initial high pitch in this pronoun with that of the sentence-initial preposition *to* in test sentence 16, which had the same vowel and syllable structure.

Similarly, the other sentences were added to make a comparison between sentence-initial monosyllabic function words that had the same syllable structure but belonged to different parts of speech. Specifically, the results would be compared between the preposition *By* in test sentence 15 and the pronoun *I* in test sentence 1 in Experiments 1 and 2, and between the pronoun *It* in test sentences 12 and 13, and the preposition *At* in test sentence 7 of Experiment 2.

Two sentences that began with *It* were constructed to see whether the semantic difference of *It* would affect the occurrence of the initial high
pitch. Words in italics were target words whose mean, max., and min. F0 were measured.

In addition to these English sentences, Japanese test sentences 17-20 with anata ‘you,’ karera ‘they,’ sore ‘it,’ and watashi ‘I’ as the subject were constructed in order to compare Japanese sentence-initial pitch patterns with the English counterparts that the JS produced.

4.3. Procedures

Recording and analyzing procedures for English test sentences were the same as in Experiment 2. The mean F0, and the max. and min. F0 of each target word in English test sentences were measured in the period of a vowel, semi-vowel /j/ or /w/, nasal /n/ or /m/, and lateral /l/. The total number of English tokens analyzed was 175 (7 sentences × 5 repetitions × 5 subjects) for NS, and 210 (7 sentences × 1 repetition × 30 subjects) for JS.

The four Japanese sentences were read only by JS. For these sentences, the pitch contour was extracted for each token in order to examine the pitch and accent pattern of each Japanese pronoun in sentence-initial position.

Although in test sentence 14 the primary sentence stress was supposed to be placed on the underlined dress, in one or two utterances by two NS the focus was placed on the subject pronoun You. The two NS also occasionally produced a few readings of the sentence with a rising interrogative intonation. However, after they did it, they realized that they misread the sentence, and reread it with the focus on dress. All of this suggests that in normal context the focus of test sentence 14 would be placed on the subject, or that the sentence should be interrogative, since the sentence was about what the listener actually did and thus considered given information to the listener (cf. Chafe (1974)).

4.4. Results and Discussion

4.4.1. No Initial High Pitch in Articles A and An

Table 6 presents mean pitch change in semitone between the sentence-initial function word and the stressed syllable of the following content word for each test sentence. As in Experiments 1 and 2, the mean F0 is normalized using the mean F0 of the initial function word as a reference point. As can be seen from the table, in the sequences that begin with the articles A and An, JS are not divided into two groups since no student showed the initial high pitch. Both NS and JS
significantly raised pitch from the articles to the following stressed syllables *tall* and */me/* of *American* (RM-ANOVAs, p<0.05), and there was no significant difference in the pitch pattern between NS and JS. The results from Experiments 2 and 3 have revealed that all the three types of articles are not subject to the initial high pitch.

### 4.4.2. Initial High Pitch in Pronouns *It* and *You*

Fig. 11 shows the number of students for Groups A and B for each test sentence in Experiments 2 and 3. As in Experiment 1, Group B consists of the JS who showed the initial high pitch, and Group A is comprised of those who did not. In all the sequences of the pronoun plus the verb and in *At seven*, both mean and max. F0 were used to determine which of the two initial items was higher. As can be seen from the figure, in sentences that start with *It*, more than half of the students belongs to Group B, while in the sequence of *You bought*, the students of Group B are a little less than half.

RM-ANOVA indicated that NS and Group A significantly raised pitch from the subject pronouns *It* and *You* to the following lexical verbs, whereas Group B significantly lowered the pitch between the two items (*You bought* and *It barked*: p<0.05, *It snowed*: p<0.001). In any of the three sentences there was no significant difference in the pitch pattern between NS and Group A, whereas Group B was significantly different from the other groups (ANOVA and Scheffe’s post hoc tests, p<0.01).

<table>
<thead>
<tr>
<th>Speakers</th>
<th>A tall</th>
<th>An American</th>
<th>You bought</th>
<th>It snowed</th>
<th>It barked</th>
<th>To the station</th>
<th>By the window</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS</td>
<td>3.91 (1.91)</td>
<td>2.14 (1.26)</td>
<td>1.87 (1.07)</td>
<td>3.01 (0.90)</td>
<td>2.69 (2.11)</td>
<td>1.96 (2.41)</td>
<td>2.24 (1.13)</td>
</tr>
<tr>
<td>Group A</td>
<td>3.06 (1.23)</td>
<td>2.52 (1.52)</td>
<td>2.00 (0.89)</td>
<td>2.09 (0.90)</td>
<td>1.78 (0.89)</td>
<td>1.93 (1.09)</td>
<td>2.13 (1.17)</td>
</tr>
<tr>
<td>Group B</td>
<td>-2.99 (1.56)</td>
<td>-2.77 (2.03)</td>
<td>-2.52 (1.75)</td>
<td>-1.57 (1.81)</td>
<td>-1.63 (2.21)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The results have demonstrated that the initial high pitch is observed in subject pronouns it and you almost as frequently as in i and they. It should be noted that the pronoun it consists of the short vowel /i/ and the plosive /t/, whereas i and they contain diphthongs. This finding shows that subject pronouns in sentence-initial position are susceptible to the initial high pitch regardless of segmental and/or syllabic structures.

4.4.3. Initial High Pitch in Prepositions By and To

Fig. 11 presents the frequency of the initial high pitch in the sequences of by the window and to the station and that in the other prepositional phrases in Experiment 2. In by the window and to the station, the mean F0 of the first three syllables in each phrase was used to determine which syllable had the highest pitch among the three. In phrases in the room and on the table, the max. pitch was used for comparison since the pitch range within the syllables /ruːm/ and /tei/ was large. Students whose tokens showed the highest pitch in the prepositions or the articles were classified into Group B. Those who realized the highest pitch in the stressed third syllables were members of Group A. Fig. 11 indicates that nine out of 29 JS showed the initial high pitch in to the station, and five out of 30, in by the window.

In three tokens of by the window and in another three of to the sta-
the mean F0 was highest in the article *the*. In all of these tokens, however, the second highest items were the sentence-initial prepositions and the difference between *the* and the preposition *By* or *To* was less than 10Hz. The same is true about one token in *In the room* and another in *On the table* where the pitch of article *the* was the highest. Since these articles were so short and tonally unified with the preceding prepositions, it can be assumed that the highest pitch in *the* was attributable to the high pitch in the preceding prepositions.

One-way RM-ANOVAs indicated that in *By the window* and *To the station*, Group A significantly raised pitch from the preposition and the article (*By the* and *To the*) to the third syllable (p<0.0001), whereas Group B showed a significant pitch fall only in *To the station* (p<0.05). NS significantly raised pitch from *By the* to */WIN/* (p<0.01), whereas their pitch change in *To the station* was not significant. This is because one NS consistently produced the initial preposition *To* at a higher pitch than he did the following stressed syllable */steil/*. Presumably, he placed a focus on the initial preposition.

One-way ANOVAs with three groups of speakers as a fixed factor for *By the window* and *To the station* showed no significant difference in pitch pattern between NS and Group A in both phrases, whereas Group B significantly differed both from NS and Group A (p<0.05).

5. General Discussion

5.1. Effects of Syllable Structure and Syntactic Category

It was found that the initial high pitch so markedly observed in pronouns was absent in sentence-initial articles. In the case of monosyllabic prepositions, the occurrence of the phenomenon was not so straightforward.

As can be seen in Fig.11, the number of students of Group B gradually increases from the bottom to the top. In *At seven*, at the bottom, only one student produced *At* on a higher pitch than */seil/* in *seven*. In the phrases *On the table* and *In the room*, three and four students showed the initial high pitch, respectively. The number from Group B further increases to five in the sequence of *By the window*. In *To the station*, nine students showed the initial high pitch. When the preposition *to*, which is most susceptible to the initial high pitch, is compared with the least susceptible one (*at*), phonetic and phonological differences between them are evident. The preposition *to* has an onset */t/*
and a long vowel /u:/ (CVV) whereas at consists of a short vowel /æ/ and a coda /t/ (VC).

Selkirk (1984) assumes that “monosyllabic function words are clearly susceptible to Monosyllabic Destressing” (p. 355), “a rule that eliminates the basic beat alignment of a single syllable, under certain conditions” (p. 337). She claims that this destressing rule is sensitive to the syllable structure. That is, “the farther a syllable type is down the hierarchy” (C)V-(C)VR-(C)VC-(C)VCC-(C)VV-(C)VVC, the syllable is less likely to be destressed. (“R” represents a resonant consonant.) (p. 355)

Table 7 presents the syllable structure and syntactic category of each sentence-initial test word in Experiments 1 to 3.

Table 7. Syntactic category and syllable structure of test words

<table>
<thead>
<tr>
<th>Syntactic category</th>
<th>(C)V</th>
<th>(C)VC</th>
<th>(C)VV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pronouns</td>
<td></td>
<td>it</td>
<td>I, they, you</td>
</tr>
<tr>
<td>Prepositions</td>
<td></td>
<td>at, in, on</td>
<td>by, to</td>
</tr>
<tr>
<td>Articles</td>
<td>a, the</td>
<td>an</td>
<td></td>
</tr>
</tbody>
</table>

It can be seen from the table that in the prepositions tested there is an effect of syllable structure on the frequency of the initial high pitch. The prepositions by and to, which contain a diphthong and a long vowel, respectively, and have CVV syllable structure, are more likely to show the initial high pitch than those that have VC syllable structure. However, unlike in the destressing hierarchy proposed by Selkirk, the frequency of the initial high pitch is higher in in and on, which have the resonant coda /n/, than in at, whose coda is non-resonant. There is a possibility that a Japanese moraic nasal /N/ may have an effect on the phonetic realization of English /n/ produced by JS. It is also possible that the intervening article the in the initial prepositional phrases may partly contribute to the occurrence of the initial high pitch in the preceding prepositions due to the rhythmic alternation of stressed and unstressed syllables in English.

The articles and pronouns, by contrast, showed no marked effect of

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9 Although in the sequence of By the window only five students showed the initial high pitch, in Mori (2004) ten out of thirty JS showed the initial high pitch in a test sentence that began with “By the way.” All of these results suggest more frequent initial high pitch in by than in at, in, or on.
syllable structure. In all three types of articles, no single JS realized sentence-initial articles on a higher pitch than the stressed syllables of the following nouns. All the pronouns, in contrast, showed the initial high pitch despite variation in syllable structure.

When items with the same syllable structure are compared, the effect of parts of speech is evident. The pronoun *it* was realized at a higher pitch than the following lexical verb in over half of JS utterances, even though the pronoun consists of a short vowel and non-resonant consonant. By contrast, the preposition *at*, which has the same syllable structure and coda as *it*, showed almost no initial high pitch. Similar comparisons can be made between *I* and *by*, and between *you* and *to*. In both cases, the pronoun and preposition contain the same vowel (/ai/ or /u:/), with the pronoun showing the initial high pitch more frequently than the preposition.

These findings clearly indicate the effect of the syntactic category (pronouns, prepositions, or articles) on the frequency of the initial high pitch.

5.2. Interference from Japanese Intonation Patterns

The results from the three experiments have revealed the strong tendency for the initial high pitch in sentence-initial subject pronouns. The first question addressed herein is why Japanese learners of English showed a tendency to realize these pronouns on a higher pitch than they did the following lexical verbs. It is suggested that their inherent Japanese intonation patterns interfered with the English intonation they produced.

The pitch contour of a Japanese declarative sentence is characterized by a slight initial pitch rise and the succeeding gradual pitch fall in Tokyo Japanese (cf. Beckman and Pierrehumbert (1986), Fujisaki (2002)). In addition, lexical pitch accents are retained and reflected on the intonation contour of a Japanese sentence unless they are de-accented by the influence of the preceding accent. In Tokyo Japanese, when a word is initially-accented, the word-initial mora (a CV syllable) has phonological high tone. If a word is unaccented or medially- or finally-accented, the second mora has phonological high tone. Thus, the typical intonation contour of a Japanese sentence shows phonological high tone around the first or second mora of the sentence, which is phonetically realized as the initial pitch rise and succeeding pitch peak in sentence-initial position.
Most of the JS who participated in the current experiments were speakers of the Kansai dialect. However, when they read written sentences, they tended to speak in Tokyo Japanese (Standard Japanese). The pitch analyses of the Japanese sentences produced by JS in Experiment 3 revealed that the sentence-initial *Watashi-wa* was produced either as LHHH or HHHH, and *Sore-wa* as LHH or HHH. (“H” and “L” represent phonological high and low tone, respectively.) The sentence-initial phrases *Anata-wa* and *Karera-wa*, whose accent patterns are the same in the Tokyo and Osaka dialects, were consistently realized as LHLL and HLLL, respectively.

Figs. 12 and 13 illustrate typical pitch contours of *Anata-wa kanojo-ni doresu-o katte-ageta* produced by JS O

![Waveforms and pitch contour of Anata-wa kanojo-ni doresu-o katte-ageta produced by JS O](image)

Fig. 12. Waveforms and pitch contour of *Anata-wa kanojo-ni doresu-o katte-ageta* produced by JS O

Figs. 12 and 13 illustrate typical pitch contours of *Anata-wa kanojo-ni doresu-o katte-ageta*, and *Sore-wa hitobanjuu urusaku hoete-ita* produced by Japanese speakers O and I, respectively. It can be seen from Fig. 12 that pitch rises in *Ana*, the first two sentence-initial moras, and then starts falling in *tawa*, the second half of the initial phrase. The sentence-initial pitch contour demonstrates a typical contour of a Japanese declarative sentence, which consists of the initial pitch rise and the succeeding pitch fall.

The JS of Group B, however, did not always show a sharp rising and falling pitch pattern in the initial part of Japanese sentences. Another typical pitch contour of a Japanese sentence is illustrated in Fig. 13, where the speaker starts high and only slightly lowers the pitch in the sequence of *Sore-wa*, reflecting the accent pattern HHH of the sentence-
The initial pitch patterns of Japanese sentences produced by the JS demonstrated either of the above two types of pitch patterns or a combination of the two: an initial pitch rise or an initial high pitch followed by an abrupt or gradual pitch fall.

The initial pitch patterns of Japanese sentences produced by the JS demonstrated either of the above two types of pitch patterns or a combination of the two: an initial pitch rise or an initial high pitch followed by an abrupt or gradual pitch fall.
Figs. 14 and 15 illustrate typical pitch contours of English sentences, *You bought her a new dress* and *It barked noisily all night* produced by the same Japanese speakers, O and I, respectively. It can be seen in Fig. 14 that pitch rises in *You* and starts falling in *bought*. Figure 2, which illustrates the pitch contour of *I think it’s not “a witty idea”, but “a silly idea”* produced by a JS, also shows a sentence-initial pitch pattern similar to the one in Fig. 14. When compared with the pitch contour of the Japanese sentence in Fig. 12, the resemblance of the initial pitch contours among *You bought*, *I think*, and *Anata-wa* in Fig. 12, is evident. The pitch pattern shared by these figures consists of the initial pitch rise and the succeeding pitch fall. These findings suggest that the JS unconsciously transferred the sentence-initial pitch pattern in Japanese to their production of English sentences. It is also noticed from Fig. 2 and Fig. 14, that in these pitch contours, the pronoun and the following verb formed a unified accentual phrase as *Anata-wa* in the Japanese sentence did (Fig. 12), which is marked by the initial pitch rise and the boundary low pitch (Beckman and Pierrehumbert (1986)).

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10 Beckman and Pierrehumbert (1986: 261–262) describe an “accentual phrase” in Japanese that is marked by “two delimitative tones”: “the phrasal H (high)” and “the boundary L (low).” These two tones together produce “a rising pitch shape” at “the beginning of every new accentual phrase,” and “the F0 merely glides smoothly downward ... between the initial phrasal H and the following boundary L.”
Fig. 15 illustrates another type of initial pitch contour frequently observed in English sentences produced by JS, in which the JS realizes the sequence of *It barked* on almost the same pitch level, although the mean and max. F0 of *It* is higher than those of *barked*, and thus she was classified into Group B. Comparison of the two sentence-initial pitch contours in Figs. 13 and 15 suggests that another typical pitch pattern of a Japanese sentence composed of an initial high pitch and a slight pitch fall interfered with English sentences produced by JS.

The above examples clearly demonstrate the resemblance of the sentence-initial pitch patterns between Japanese and English sentences, and the interference of Japanese sentence-initial pitch patterns with those of English sentences produced by JS.

However, I do not intend to claim that every student of Group B consistently transferred her exact pitch pattern of sentence-initial Japanese words that correspond with English ones on a word-for-word basis. It can be seen from Table 6 that in test sentences produced by Group B the standard deviation of pitch change between sentence-initial pronouns and the succeeding verbs is relatively high. This indicates a wide interspeaker variation in the degree of pitch fall from the pronouns to the verbs. The same tendency is observed in tokens produced by Group B shown in Fig. 4, in which the difference in F0 value between *I* and *think* varies widely among the tokens. Actually, some students produced a subject pronoun on a high pitch and then abruptly dropped the pitch in the following lexical verb. Some started high in a personal pronoun and slightly lowered the pitch in the following lexical verb. In both cases, JS of Group B produced the initial subject pronouns on a higher pitch than they did the following lexical verbs, showing the initial high pitch characteristic of Japanese speakers.

In addition, there are students who scarcely showed the initial high pitch in their English sentences despite the fact that their Japanese sentences consistently showed a high pitch in the initial position. All of the JS who participated in the experiments had learned about basic English stress and pitch patterns and mastered them to various degrees. Thus, it could be assumed that the typical sentence-initial pitch patterns from their native language interfered with those of the English productions of JS to a differing extent depending on their proficiency in English intonation.

It follows from all of these findings and discussions that the interference from Japanese intonation patterns leads to the initial high pitch in
the subject pronouns of English sentences produced by JS.

5.3. The Effect of Phonological and Syntactic Structures

The next question to be answered is why the frequencies of the initial high pitch differed so greatly among the parts of speech tested. In English rhythmic structure in which stressed and unstressed syllables alternate, content words such as verbs or nouns are assumed to be stressed in normal context, whereas function words such as prepositions, articles, and pronouns are unstressed in sentential context.

As pointed out in 2.4.5, however, in utterances by Group B, the initial pronouns were not only high-pitched but also relatively long, whereas the following verbs were low-pitched and relatively short. These findings suggest that JS in Group B did not destress the subject pronouns.

There is no classification of stressed and unstressed words in Japanese. However, there are words in Japanese that have their own accent patterns and can form an accentual phrase when suffixed with particles or when occurring by themselves, as well as words that cannot. Japanese pronouns belong to the former group of words. All the findings from the current study suggest that the JS of Group B assigned lexical pitch accent on the English pronouns and realized them on a high pitch presumably due to the interference from Japanese accent system in which pronouns have their own accent patterns.

It is also possible that the syntactic properties of Japanese pronouns contribute to the occurrence of the initial high pitch. Pronouns are likely to be in sentence-initial position in Japanese syntax and carry sentence-initial (utterance-initial) pitch rise as well as a high pitch that follows. This suggests that Japanese learners of English may unconsciously transfer the intonation pattern of sentence-initial subject pronouns in Japanese to the English pronouns in sentence-initial position and realize the initial high pitch in them. Since in English, pronouns are unstressed and low-pitched in neutral context, this leads to a marked difference in pitch pattern between NS and JS.

By contrast, English articles have no corresponding part of speech in Japanese. The article the is sometimes translated as sono 'that,' a demonstrative, in Japanese. However, the grammatical properties and functions of English articles greatly differ from those of Japanese demonstratives. As for prepositions, their approximate Japanese counterparts would be particles. Japanese particles are, however, attached to
the end of other words and hardly form accentual phrases by themselves. In addition, they never stand in sentence-initial position. Thus, it seems that JS found little difficulty in recognizing English articles or prepositions as unstressed words due to Japanese phonological and syntactic structures. Consequently, the transfer of the Japanese sentence-initial pitch pattern scarcely occurs in these articles and prepositions.

The influence of Japanese syntax would provide another interpretation of the pitch fall in the main verbs observed in some of the tokens produced by the JS of Group B. In Japanese, verbs are generally placed in the final position in declarative sentences, and tend to be pronounced with low pitch unless a focus/emphasis is put on them. Thus, JS may unconsciously transfer this pitch pattern of Japanese verbs to their productions of the English verbs.

Lastly, in the semantic aspects of pronouns, there is a large difference between English pronouns and Japanese pronouns. In English, subject pronouns are “GIVEN materials, which the speaker assumes is already in the addressee’s consciousness” (Chafe (1974: 112)). In Japanese, by contrast, it is generally said that subject pronouns tend to be omitted except for emphasis or for clarification. Kai (2000) analyses the verbalization pattern of personal pronouns serving as subjects in Japanese discourse and points out factors involved in their verbalization such as “contrast,” “exclusion,” or “unpredictability.” That is, subject pronouns in Japanese are more likely to be verbalized when they have contrastive or exclusive meaning, or in a situation in which the subject pronoun is not easily inferred from the context. There is a possibility that this semantic feature of Japanese pronouns may indirectly affect the initial high pitch in English subject pronouns produced by JS.

In sum, all of the results from the present experiments suggest that the initial high pitch characteristic of Japanese EFL learners’ English reflects not only Japanese intonational structure, but also the differences and similarities in phonological and syntactic properties of sentence-initial parts of speech between English and Japanese. Moreover, these findings provide us with clues to revealing the intrinsic differences in the function of these parts of speech between the two languages.
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