

## Original Paper

**Effects of living in a target language country on the acquisition of English:  
Proficiency in production of rhythmic patterns and TOEIC score**

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**Abstract**

This study investigated the effects of living in the country of a target language on learners' acquisition of English durational patterns with respect to interstress intervals (ISIs). We were interested in finding out what kind of effects the experience of living abroad had and how much effect it exerted on the learners' proficiency level. We were also interested in investigating whether the age of arrival in the country of a target language could be a factor affecting the acquisition of spoken language. Production experiments were carried out to investigate the durational patterns used by four groups of speakers: adult native speakers of American English (AMR), American third graders (G3), Japanese learners of English who had lived in the U.S. (RTN), and Japanese learners of English who had neither lived nor studied in the U.S. (JPN). Two sets of English sentences were devised as the linguistic material, and the sentences in each set differed in the number of nominally unstressed syllables that intervened between a target stressed syllable and the next stressed syllable. The results showed the effect of living in the U.S. on the acquisition of English in respect to not only the proficiency measured by the TOEIC scores but also the acquisition of English durational patterns. We also observed the effect of the age of arrival on the level of proficiency. In addition, we observed the effect of different factors on the production patterns with respect to the first language and the second language. The factors related to the level of acquisition for JPN were whether the target ISI was within a word or between words. The G3 exhibited the effect of utterance style, i.e., conversational style vs. reading style, in the durational control of ISIs.

**Keywords:** English durational pattern, interstress interval (ISI), experience of living abroad, TOEIC score, second language acquisition

**1. Introduction**

The factors affecting second language acquisition include the age of initiation into language learning, experience and period of staying in the country of a target language, age of arrival, period of language learning, motivation for language learning, learning strategy, and others. Regarding the factor of learner's age, the Critical Period Hypothesis (CPH) claims that there is a biologically constrained period in which language can be acquired more easily than at any other time, and beyond which complete mastery of a foreign language is no longer possible. According to Lenneberg (1967)<sup>5)</sup>, the critical period lasts until puberty (around age 12 or 13 years) and is due to biological development. He suggests that language learning may be more difficult after puberty because the brain lacks the ability for adaptation. The theory that the learner's age is a significant factor in restricting language acquisition is also described as the notion of a "Sensitive Period" or "Maturational Constraints" (Oyama, 1976<sup>6)</sup>, Snow, 1987<sup>7)</sup>, Flege, *et al.*, 1999<sup>3)</sup>).

It can be generally agreed that the volume of exposure to the target language is important. Asher (1977)<sup>1)</sup> claims that, on average, children, by age 6, have spent a minimum of 17,520 hours (8 hours a day) listening to their native language. Takefuta (1997)<sup>11)</sup> claims that Japanese learners of English, by age 18, have spent from 1,000 hours to 2,000 hours (20 minutes a day) coming in contact with English.

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Sudo & Kaneko (2005)<sup>8)</sup> report the possibility of acquisition of English rhythm by means of pronunciation training during a short period without the benefit of linguistic environments such as studying abroad. We observed the acquisition process of English rhythmic patterns by two Japanese seventh graders who had started to study English formally in junior high school in different linguistic environments for a period of one year. The study showed that the learner studying in the U.S. displayed the production of weak forms similar to that of American speakers, and as a result, the sentence accent patterns became similar to those of the native speakers. Also, the learner studying in Japan had difficulties in acquiring the durational control of weak forms, which made the acquisition of durational control of sentences less successful than that of the learner studying in the U.S. The study showed conspicuous differences in the acquisition of rhythm between the two Japanese learners, indicating that the volume of exposure to the target language is important, as Asher (1977)<sup>1)</sup> and Takefuta (1997)<sup>11)</sup> claim. In a subsequent study (2006a)<sup>9)</sup>, we investigated the effects of different teaching methods on the acquisition of English rhythmic patterns by Japanese learners, observing the English durational control produced by two groups of Japanese college students; those who attended a class where they received only training in pronunciation for 13 weeks, and those who attended an Oral English class whose focus was conversation and presentation during the same period. Notable differences were observed in the degree of attainment between the two subject groups, and the study demonstrated the possibility of acquisition of English rhythm during a short period without the benefit of linguistic environments such as studying abroad. Also, Kaneko & Sudo (2006)<sup>4)</sup> and Sudo & Kaneko (2006b)<sup>10)</sup> investigated the durational patterns produced by three groups of speakers (adult native speakers of American English, American third graders, and Japanese learners of English) and observed the differences between first and second language acquisition in English durational patterns with respect to interstress intervals (ISIs), especially ISIs within and between words. These studies showed the effectiveness of examining the rhythmic patterns in terms of ISIs and vowel durations.

The purpose of the present study was to investigate the effects of living in the U.S. on the acquisition of English regarding English proficiency measured by TOEIC and proficiency measured by production patterns. We also attempted to examine the relationships between first language acquisition and second language acquisition. We were especially interested in investigating the effects of living in the country of a target language on the acquisition of English rhythmic patterns. We also attempted to find out the type and degree of effects which the age of arrival in the U.S. exerted on the learners' proficiency level.

## 2. Methods

### 2.1.1. Subjects

Four groups of subjects participated in this experiment: two groups of Japanese learners and two groups of native English speakers. Regarding Japanese learners of English, we prepared a group of 11 Japanese who had lived in the U.S. (RTN: 7 males and 4 females) and a group of 8 Japanese who had neither lived nor studied abroad (JPN: 4 males and 4 females). As native speakers of English, we prepared a group of 10 adult native speakers of American English (AMR: 2 males and 8 females) and a group of 8 American third graders (G3: 3 males and 5 females). The Japanese learners were all college students. The participants of Group RTN had been in the U.S. for over one year at least, 10 years at the longest. The age of arrival in the U.S. was 0 to 17 (0 to 9 years old: 7 subjects, 13 to 17 years old: 4 subjects).

### 2.1.2. Materials

Two sets of English sentences (a total of 10) were devised as the linguistic material. The sentences in each set differed in the number of nominally unstressed syllables that intervened between a target stressed syllable and the next stressed syllable. The number of unstressed syllables ranged from one to three in Set 1 and one to four in Set 2. These sets of sentences contained two different target stressed

Table 1 Linguistic Materials for the Production Experiment

		Number of syllables in a target ISI
Set 1	1. They <u>bought</u> books by the carload.	1
	2. They <u>bought the</u> books by the carload.	2
	3. They <u>bought up</u> books by the carload.	2
	4. They <u>bought up the</u> books by the carload.	3
Set 2	5. <u>Pete</u> plays the piano.	1
	6. <u>Pete can</u> play the piano.	2
	7. <u>Peter</u> plays the piano.	2
	8. <u>Peter can</u> play the piano.	3
	9. <u>Peterson</u> plays the piano.	3
	10. <u>Peterson can</u> play the piano.	4

vowels [ɔ] in Set 1 and [i] in Set 2, and the ISIs between words in Set 1 and ISIs within and between words in Set 2. The two sets of sentences are listed in Table 1. Underlined are the target ISIs whose durations were measured.

### 2.1.3. Procedures

In order to examine the effects which the experience of living in the U.S. and the age of arrival exerted on English proficiency of the Japanese learners, we measured the learners' English proficiency by the Test of English for International Communication (TOEIC). TOEIC is an English language test designed specifically to measure the everyday English skills of people working in an international environment. It is a multiple-choice assessment consisting of the Listening and Reading sections. They are separately timed sections of 100 questions each. The score range is 5 to 495 for each section and the total score is 990<sup>2)</sup>.

Next, we carried out production experiments to investigate the productions of English durational patterns by Japanese learners and by American speakers. Two groups of Japanese learners (RTN & JPN) served as subjects for the purpose of investigating the effects of living in the U.S. on the acquisition. Both groups of subjects were recorded individually. We held one session for each subject. In the session, they repeated the text five times. The subjects were instructed to produce their best English-like utterance at a comfortable speaking rate and to read each sentence through without pausing. When they made a mistake, they were asked to repeat the sentence from the very beginning. Before the recording, they were provided sufficient time for practice. For each subject, three repetitions of each sentence were selected from the total of five repetitions uttered. Spectrograms and wave forms were made from these recordings. We carried out acoustic analysis of the linguistic materials, measuring durations of target ISIs. ISI durations were defined as the intervals between the onset of the vowel [ɔ] in "bought" (Set 1) or [i] in "Pete" (Set 2) and that of the next stressed vowel. The onset of the vowels was defined as the instant a sharp rise appeared in the power of the first formant.

### 2.2. Results

The English abilities of the Japanese learners were measured by TOEIC. The TOEIC average score of a group of Japanese learners who had neither lived nor studied abroad (JPN) was 454 (Highest score: 515, Lowest score: 395, Listening section: average of 249, Reading section: average of 205). The average score of a group of the Japanese learners who had lived in the U.S. (RTN) was 830 (Highest score: 945, Lowest score: 630, Listening section: average of 458, Reading section: average of 372). It was observed that RTN had much higher scores than JPN in both the total scores and the scores of the Listening and Reading sections of TOEIC (Table 2). We performed a T-test, and the results showed that the differences in the TOEIC scores-both the total scores and the scores of the Listening section and

Table 2 TOEIC Average Scores of JPN and RTN

Subject Group		Total	Listening	Reading
JPN	Average	454	249	205
	Range	(395~515)	(220~270)	(150~250)
RTN	Average	830	458	372
	Range	(630~945)	(390~495)	(235~450)

Table 3 TOEIC Average Scores of RTN 1 and RTN 2

Subject Group		Total	Listening	Reading
RTN 1	Average	887	481	406
	Range	(755~945)	(435~495)	(320~450)
RTN 2	Average	729	416	313
	Range	(630~895)	(390~455)	(235~440)

Reading section between JPN and RTN were statistically significant ( $p < 0.01$ ). The scores of the Listening section were statistically higher than those of the Reading section for both of the two subject groups.

In order to investigate the effects of the age of arrival—a factor thought to be important according to the Critical Period Hypothesis (CPH) in the field of second language acquisition, we divided the subject group RTN into two groups according to the age of arrival in the U.S. (RTN 1: the ages of arrival were 0 to 9, RTN 2: the ages of arrival were 13 to 17) and compared their scores of TOEIC. There were seven students for RTN 1 and four students for RTN 2. The TOEIC average score of RTN 1 was 887 (Highest score: 945, Lowest score: 755, Listening section: average of 481, Reading section: average of 406). The average score of RTN 2 was 729 (Highest score: 895, Lowest score: 630, Listening section: average of 416, Reading section: average of 313). RTN 1 showed higher English proficiency than RTN 2 (Table 3). We performed a T-test, and the results showed that the differences in the total TOEIC scores between RTN 1 and RTN 2 were statistically significant ( $p < 0.05$ ). In addition, the scores of the Listening section of RTN 1 were statistically higher than those of RTN 2 ( $p < 0.01$ ). We did not observe a significant difference in the scores of the Reading section between these two subject groups.

Turning to the production of durational patterns, Figures 1, 2 and 3 show the average overall durations of the ISIs produced by the three groups of subjects; AMR, RTN, and JPN. Figure 1 shows the average overall durations of the ISI between words in Set 1, Figure 2 shows those of the ISI between words in Set 2, and Figure 3 shows those of the ISI within a word in Set 2. In Set 1, as shown in Figure 1, the average duration of the one-syllable ISI produced by AMR was 369 ms ( $SE = 33.43$ ), the one produced by RTN was 306 ms ( $SE = 12.52$ ), and the one produced by JPN was 397ms ( $SE = 26.44$ ). Regardless of the number of unstressed syllables in the ISI, the shortest ISIs were produced by RTN, followed by AMR ( $p < 0.01$ ). There was a significant difference in the durations of the ISI between JPN and RTN ( $p < 0.01$ ), and also a significant difference between JPN and AMR ( $p < 0.05$ ). We could observe a durational tendency related to each of the subject groups. The increment of increase in the durations of the ISIs with the unstressed syllables for the sentences of Set 1 differed among the three groups of subjects. The duration of the ISIs increased by the largest increment for JPN, by a smaller increment for RTN, and by the smallest increment for AMR (Table 4).

In Set 2, as shown in Figures 2 and 3, the average duration of the one-syllable ISI produced by AMR

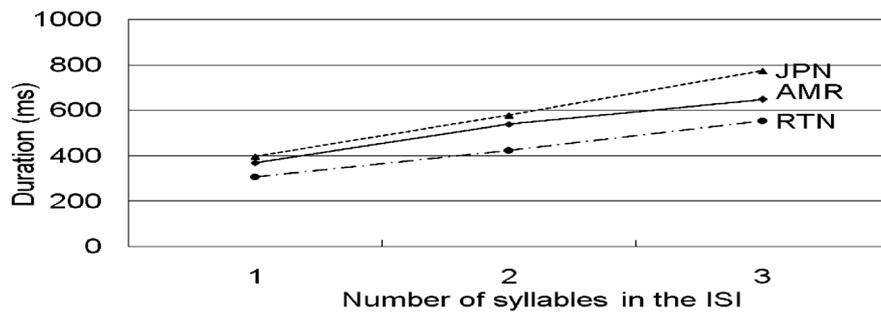


Figure 1. Durations of ISI (Set 1)

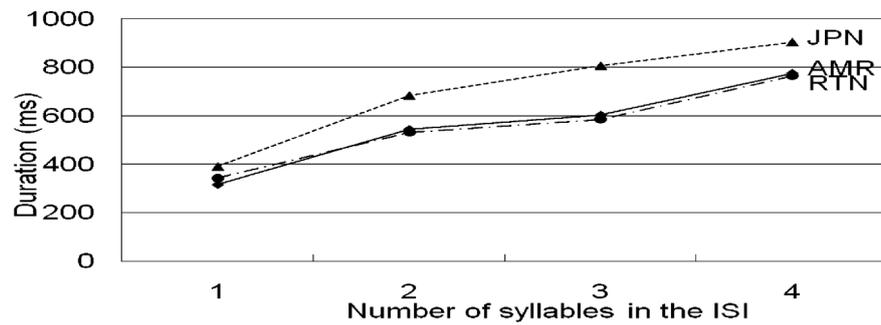


Figure 2. Durations of ISI between words (Set 2)

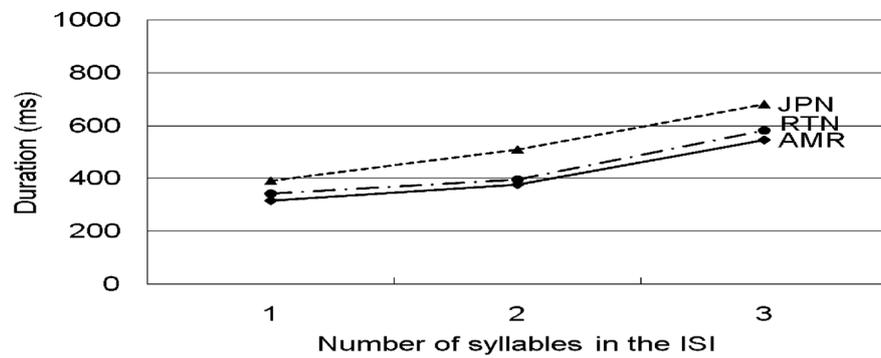


Figure 3. Durations of ISI within a word (Set 2)

Table 4 Percentage of Increase of ISI Durations (%)

	AMR	RTN	JPN
Set 1 (between words)	75	81	95
Set 2 (between words)	91	71	106
Set 2 (within a word)	73	70	74

was 315ms (SE = 31.91), that produced by RTN was 343ms (SE = 15.73), and that produced by JPN was 391ms (SE = 29.73). There was no significant difference in the durations of the ISI between RTN and AMR, regardless of whether the ISI was between words or within a word. It should be noted that JPN produced much longer ISIs when the ISI was between words. JPN showed a significantly longer duration than both RTN ( $p < 0.01$ ) and AMR ( $p < 0.05$ ) in the durations of ISI between words (Figure 2). A similar tendency was observed for the durations of ISI within a word (Figure 3). JPN showed a significantly longer duration than RTN and AMR ( $p < 0.01$ ). In addition to a durational tendency related to each of the subject groups, we observed a factor which exerted influence on the durational control by JPN. The increment of increase in the durations of the ISIs with the unstressed syllables for the sentences of Set 2 differed among the three groups of subjects. Regardless of whether ISIs were within or between words, the duration of the ISIs increased by the smallest increment for RTN, which was similar to the increasing tendency of AMR. The duration of the ISIs increased by the largest increment for JPN, especially in the durations of the ISI between more than two words (Table 4). It was observed that the difference in the structure of ISIs, i.e. whether the target ISI was within a word or between words, was a factor affecting the durational control of ISIs by JPN.

We then investigated the effect of the age of arrival on the production of durational patterns. RTN 1 and AMR showed very similar durational patterns of ISIs in both Set 1 and Set 2. Regarding the durational patterns of RTN 1, we observed the “overdoing” of RTN 1, i.e., excessive increase in the ISI durations. Regarding the differences in the structures of ISIs in Set 2, it was observed that the production patterns of RTN 1 were similar to those of AMR in the durations of the ISIs within a word and their rate of increase.

In order to observe the differences between first and second language acquisition in English durational patterns with respect to ISIs, we compared the production patterns of JPN and RTN with those of American third graders (G3). In Set 1, the average duration of the one-syllable ISI produced by G3 was 422 ms. Regardless of the number of unstressed syllables in the ISI, the longest ISIs among four groups of subjects were produced by G3. Regarding the increment of increase in the durations of the ISIs with the unstressed syllables for the sentences of Set 1, the duration of the ISIs increased by the largest increment for G3. In Set 2, the average duration of the one-syllable ISI produced by G3 was 335 ms and it was shorter than that of RTN and JPN but longer than that of AMR. The differences in the results between Set 1 and Set 2 for G3 seem to be related to sentences of the two sets. Sentences in Set 1 are not supposed to be familiar to G3 while sentences in Set 2 are regarded as those used in the everyday life of G3. G3 appeared to have used a reading style when they produced sentences in Set 1 while they used a conversational style when they produced those in Set 2. It was observed that the differences in utterance styles were factors affecting the durational control of ISIs by G3.

### 3. Conclusion

In the present study, we were interested in finding out the effects of living in the country of a target language on the acquisition of English. We measured English proficiency of the Japanese learners of English by two means: TOEIC and the production patterns. The results showed that the TOEIC scores of RTN, both in the Listening section and Reading section, were much higher than those of JPN. Significant differences were also observed in the proficiency measured by the production patterns between RTN and JPN. RTN showed very similar durational patterns of ISIs to those produced by native speakers of English in both Set 1 and Set 2. The RTN's high level of English proficiency was reflected in their durational patterns. It is suggested that the experience of living in the country of a target language has a positive effect on not only speaking proficiency but also listening/reading proficiency. Dividing RTN into two groups according to the age of arrival in the U.S., we compared their TOEIC scores. It is noteworthy that listening proficiency measured by TOEIC for RTN 1 was significantly higher than

listening proficiency for RTN 2, while there was no significant difference in the reading proficiency between RTN 1 and RTN 2. Learners seem to be able to acquire reading proficiency even when they are past the critical period of acquisition.

Judging from the result that RTN and AMR showed very similar durational patterns of ISIs, the experience of living in the U.S. exerted a profound effect on the acquisition of English rhythmic patterns. We investigated the effects of the age of arrival on the production patterns by RTN 1 and RTN 2, and observed that those whose ages of arrival were early (RTN 1) showed durational patterns similar to those of AMR, while those whose ages of arrival were late (RTN 2) showed durational patterns similar to those of G3. The level of acquisition for RTN 2 was shown to be close to that for G3 with respect to the durational control. It was observed that in regard to the first and second language acquisition of English, RTN and G3 were at approximately the same level of acquisition, and that RTN 1 reached an advanced stage.

We also observed the effect of different factors on production patterns among groups of subjects. The differences in the structure of ISIs, i.e. whether the target ISI was within a word or between words, were observed as a factor affecting the durational control of ISIs by JPN, while the differences in utterance styles, i.e. conversational style vs. reading style, were observed as a factor affecting the durational control of ISIs by G3. RTN exhibited overlengthening of ISI durations. Overlengthening is one type of “overdoing” which can be observed in second language acquisition and it seems to be a necessary step for attaining a target language.

The present study demonstrated the profound effect of living in the country of a target language on the acquisition of English rhythmic patterns. It also proved that the age of arrival had a greater effect than the number of years of exposure to a target language. This should contribute to a better understanding of the speech acquisition process.

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