

## Investigating the Effectiveness of Prontest Software to Train English Proficiency

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### Abstract

This paper is to investigate the effectiveness of Prontest software to improve English pronunciation and proficiency for Japanese EFL learners. Several parameters such as speech duration, speech power, F0 (pitch), the ratio of vowel and consonant length and power were introduced to find out how much students made progress in English pronunciation and overall English proficiency. The study concluded that the average score of CASEC computer test improved from 532(SD 109.2) in April to 583(SD 83.1) in July after having used this software for six lessons. The differences of parameters between pre and post-recorded readings indicated that this software helped students to improve English pronunciation.

### 1. Introduction

We are now living in the age of internationalization in which English is considered to be one of the important languages in the world. How can Japanese EFL learners learn to speak more intelligible English for international communication? It is commonly said that Japanese speakers tend to speak English with a Japanese accent, which sounds like they are speaking Japanese even though they are speaking English. So in Japan English education plays an important role to make Japanese speakers of English intelligible enough to be properly understood in international communication. In this regard prosodic features such as intonation and the rhythm of the language are crucial to comprehensible speech.

There exist many various factors in evaluating non-native speakers of English. It was pointed out in previous research that rhythmic accent and pauses are more important than segmental features in English utterances to make speech intelligible [1-2]. We conducted an experiment to find out the English utterances of Japanese English speakers using certain methods in order to estimate the effectiveness of software to improve English pronunciation and proficiency for Japanese EFL learners.

In this experiment we carried out a discriminant analysis by focusing on speech duration, F0, duration and power of consonants and vowels to explore the features of English pronunciation of Japanese English speakers.

### 2. Research Methods

This experiment was carried out from April 14, 2008 to July 14, 2008, using 60 Japanese English speakers who were studying at Aoyama Gakuin University in Tokyo. For the first recordings of 60 speakers of Japanese, they were asked to simply read several sentences aloud and their voices were

recorded for the prosody analysis. After they studied six lessons of English pronunciation software for six weeks, they read the same sentences aloud again for comparing prosody analysis of the first and second readings. The following five parameters were used to analyze the prosody of Japanese English speakers.

- (1) Sentence duration
- (2) Ratio of vowel duration over sentence duration
- (3) Ratio of vowel power and consonant power
- (4) Ratio of F0 max/F0 min in the sentence
- (5) Standard Deviation of F0 in the sentence

The computerized assessment system for English Communication (CASEC) was also used to check the improvements of overall English proficiency before and after using English training software developed by Prontest Inc. Only 35 Japanese students (20 male and 15 female) were chosen to read the following sentences before and after using software due to the quality of recordings.

“Hello. I am Raymond Ross. I’m from Rome. I live in Tsukuba, now. I am a researcher, working for one of the institutes in Tsukuba science city. **My apartment is near the replica of a rocket which is in the center of the city.** My friends in Japan are from many places all over the world. Most of them speak English very well, except my Japanese friends. I know they understand English as well as others, but my Japanese friends are a little too shy.”

The students also took pre and post CASEC Computer test (English proficiency test) and pre-score and post-score were compared [3].

### 3. Acoustic Analysis

#### 3.1 Parameters

We focused on speech duration, power, F0 to find out the effectiveness of this software. From our previous research and teaching experiences we hypothesized that as the EFL made progress in English proficiency, the following features would be sampled out [4].

- (1) Speech duration of the sentence overall gets shorter and especially the vowel length gets shorter in readings.
- (2) Consonant power will increase.
- (3) F0 variation (range) will increase.

### 3.2 Phoneme segmentation

Phonetic segmentation is necessary in order to calculate the parameters of vowel and consonant length and power. We used Julius the speech recognition toolkit [5] for phonetic segmentation. The two Japanese advanced English speakers listened to the speech and phonetically transcribed each sound of the sentence based upon the Japanese phoneme set. Japanese monophone defined in the Julius dictation kit was used for acoustic model. The Japanese acoustic model was used for the following reasons; all the participants of this experiment were Japanese and their speaking is closer to the Japanese acoustic model rather than English acoustic model. The results of the segmentation were visually rechecked for manual modification to come up with the right model.

### 3.3 The fundamental frequency (F0)

The fundamental frequency (F0) corresponds to pitch of speech which is one of the important prosodic features. There are many methods to extract F0. We extracted the value of F0 every 10 [msec] based upon the higher peak of the cepstral parameters using the hanning window of 64 [msec].

F0 for men decided to be ranged between 80Hz to 220Hz, F0 for women between 160Hz to 440Hz. If F0 was not between these ranges nor discontinuous, all the F0 data was deleted to come up with the final F0.

### 3.4 Calculation method for parameter analysis

The following calculation methods were used for each parameter [6].

- (1) Sentence duration: length of speech duration excluding silent period longer than 200 ms
- (2) Ratio of vowel duration to sentence duration (Vowel duration/Sentence duration): ratio of the total of vowel duration (/a/, /i/, /u/, /e/, /o/, /a:/, /i:/, /u:/, /e:/, /o:/) to the sentence duration.
- (3) Ratio of Vowel power to Consonant power (Vowel power/Consonant power)
  - Vowel power: average of all vowel segment power values
  - Consonant power: average of all consonant segment powers values (all power-all vowel power)
- (4) Standard Deviation of F0: SD of F0 in the sentence
- (5) Ratio of F0 max /F0 min: the ratio of F0 max and F0 min in the sentence. Silent periods longer than 200 [msec] were excluded from data analysis.

## 4. Results

### 4.1 Results of CASEC

The computerized assessment system for English Communication (CASEC) is an absolute evaluation testing system developed by the STEP Foundation (Society for Testing English Proficiency). This is a Japan's first approach to Internet-based individual oriented assessment for English ability. Based on IRT (Item-Response Theory), this new Computer Adaptive Test (CAT) assessment system determines individual learners' English communication ability with higher accuracy and shorter testing time. In addition, online test administration allows examinees to freely choose when to take tests. The Japan Institute for Educational Measurement, Inc. (JIEM) provides the following description regarding the CASEC test (2008).

CASEC has been correlated with other testing programs such as TOEIC/TOEFL/STEP through sample tests (approximately 2000 subjects). Showing a relatively high correlation, especially the 0.89 it has with TOEIC, CASEC can provide a predictive score for the other tests.

CASEC consists of 4 parts with a total score of 1000 points.

**Section 1: Vocabulary 15 questions**

**Section 2: Conversation 15 questions**

**Section 3: Listening 15 questions**

**Section 4: Dictation 10 questions**

**Total score is 1000.**

**Time: 20 minutes to 70 minutes.**

CASEC test was administered to check the progress of English proficiency from April 14<sup>th</sup> to July 14<sup>th</sup>. CASEC average score improved from 532 in April 2008 to 583 in July 2008 due to the introduction of using Prontest software (Figure 1). There was a significant difference between pre-test and post-test of CASEC in T-test at 5% level.

This study indicated that CASEC test was helpful to check the progress of each student by using it as a pre-test and post-test. At the same time, students seemed to be more motivated to try to obtain a higher CASEC score while also trying to practice English pronunciation.

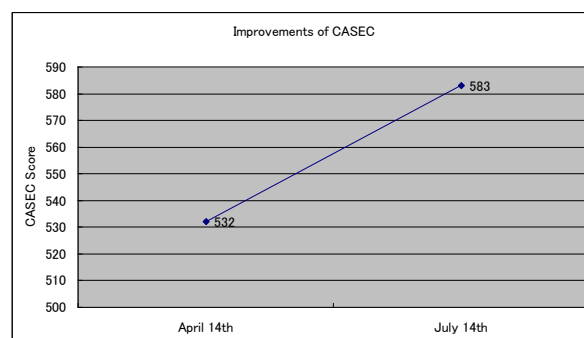


Figure 1. Improvements of CASEC

## 4.2 Results of Prosody Analysis

The speech duration was shortened between pre and post readings after using the software as it was indicated from 5383ms to 4872ms at the significance level of 0.01 among 35 Japanese speakers of English (Figure 2). After they used Pronest software, they could speak English a little bit faster than they used to. Overall their speech rate became faster and better.

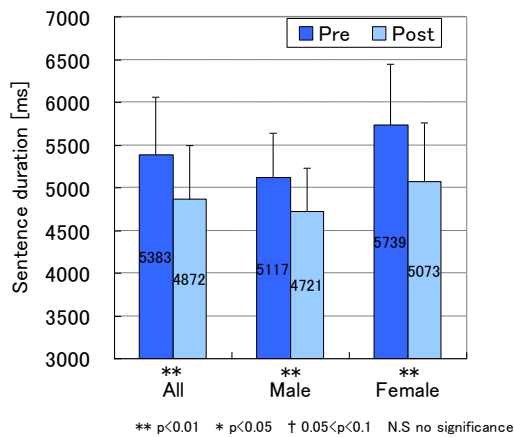


Figure 2. Speech duration

With regard to Vowel duration/Sentence duration, ratio of vowel duration over Sentence duration decreased from 0.51 to 0.49 at the significance level of 0.01 after using the software among 35 Japanese English speakers (Figure 3). Japanese speakers tend to be influenced by five main Japanese vowels when speaking English. However, due to the effect of using the software, vowel ratio over sentence duration became shorter to get closer to the English prosody.

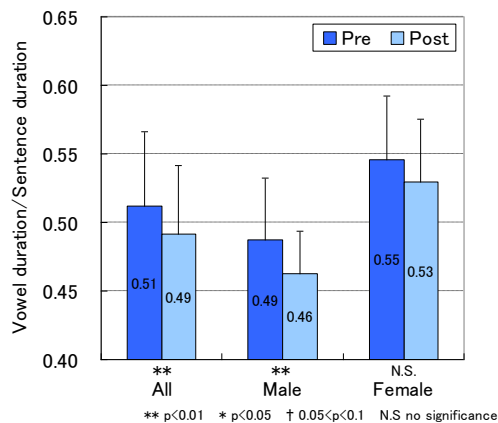


Figure 3. Vowel duration/Sentence duration

With regard to ratio of consonant power over vowel power, after using the software, ratio of consonant power over vowel power increased from 0.32 to 0.39 at the significance level of 0.01 among 35 Japanese English speakers (Figure 4). When

the Japanese English speakers speak English, they tend to pronounce consonants with less stressed accent. However, the software helped Japanese English speakers to produce consonants better than they used to.

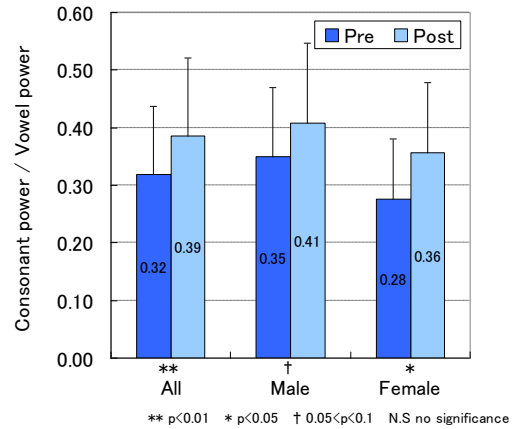


Figure 4. Consonant power/Vowel power

With regard to ratio of maximum F0 over minimum F0, there is no significant difference between before and after using the software at all (Figure 5). Among 35 students, 16 students improved F0 after using the software. However, overall using the software did not help 19 Japanese English speakers to improve the F0 when speaking English.

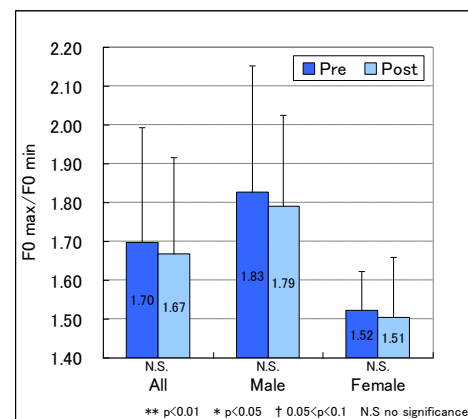


Figure 5. Maximum F0/Minimum F0

With regard to comparison of average SD of F0 between pre and post readings, there is no significant difference between before and after using the software at all (Figure 6).

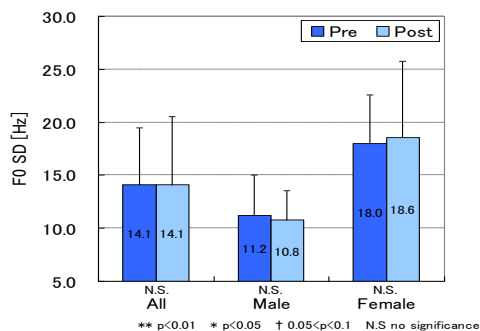


Figure 6. Comparison of Average SD of F0

## 5. Conclusion

This research indicated that English pronunciation training software is useful in learning EFL from the results of improvements of CASEC score and prosody analyses. At the same time, students seemed to be more motivated to achieve a higher score of CASEC while they tried to make good English presentation with PowerPoint and with the help of prosody analysis.

The effectiveness of using the software is as follows:

- (1) The speech duration was shortened between pre and post readings. Overall their speech rate became faster and better.
- (2) The ratio of vowel duration over Sentence duration decreased and vowel ratio over sentence duration became shorter to get closer to the English prosody.
- (3) The ratio of consonant power over vowel power increased.
- (4) With regard to ratio of maximum F0 over minimum F0, there is no significant difference between before and after using software at all.

The experiment showed us the unique characteristics in utterances of Japanese speakers of English, and indicated that in the second readings of 35 male and female Japanese, they tended to read English sentences faster than the first readings with less vowel duration and with more consonant power. However, as for the F0, among 35 students, 16 students improved F0 after using software. It is because this English training software put much emphasis upon training segmental features rather than on prosody.

The limitation of this research is that there was no direct standard estimation to judge whether the pronunciation is good or bad, so we could not come up with correlation between parameters and good pronunciation. In the future research, we may have to find out a sort of correlation between subjective judgments of native speakers of English and this model.

## 6. Acknowledgements

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## 7. References

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