

EXPERIMENTAL RESEARCH ON USING PRAAT SOFTWARE TO ASSIST ENGLISH PHONETIC TEACHING

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Abstract - The ultimate goal of learning English is to communicate clearly and effectively with others, so correct phonetics and intonation are the foundation of English learning. This paper conducted an experiment using Praat software to explore the auxiliary role of Praat in English phonetic teaching by comparing the English phonetics of different students. The experimental results demonstrated that the average pitch range value of the experimental recording was 149.68 Hz, which was much lower than 180.79 Hz in standard recording, indicating that the initial pitch fluctuations of the experimental subjects was not significant. From the perspective of word duration and syllable stress difference, the subjects initially made little distinction between stress and unstressed. After training with the analysis results of Praat software, the P values between the second recording of the experimental subjects and the standard recording were both greater than 0.05, the speed was improved by 14.2897 s, the number of linked words was increased by five, and the number of pitch rises and falls was increased by ten. This proves that Praat software can be used in English phonetic teaching to help teachers correct the problems of students in English phonetic learning.

Keywords: Praat software, English phonetic teaching, teaching assistant.

1. Introduction

In English language learning, spoken language plays an important role, and phonetics is the most crucial aspect of spoken language. Students often have problems with incorrect or unclear English pronunciation, which can lead to misunderstandings or misinterpretations in communication. Due to the long-term influence of exam-oriented education, English teaching in China mainly focuses on the imparting of language knowledge, while spoken English teaching is relatively neglected [1]. Some educators have noticed this problem and want to make changes, but the abstract nature of phonetics makes it difficult to achieve satisfactory results. The emergence of Praat software provides visual analysis of phonetic errors in English phonetic teaching, which helps teachers to correct students' phonetic problems. Relevant studies have shown below. Huang et al. [2] used the stratified random sampling method to record speeches expressing different emotions and extracted the parameter values of acoustic features with Praat software. They found that there were differences between seven major acoustic features. Ganie [3] successfully identified the main errors in English phoneme pronunciation by analyzing the English phoneme pronunciation of two students with Acehnese background using Praat software.

Using descriptive and qualitative methods, the pronunciation of the smallest pairs of English front vowels was recorded and compared with the data provided by English as a Foreign Language (EFL) learners in Yemen using Praat software. They found that the pronunciation of Yemen EFL learners was different from that of native English speakers [4]. Kang et al. [5] selected 24 native English speakers and 64 Japanese learners to participate in an experiment and analyzed prosodic features, including intonation, pitch range, and sentence prominence, using Praat software. The results showed that there was a complex interplay between proficiency and study abroad experience on pragma-prosodic production. Jolayemi et al. [6] demonstrated the feasibility and applicability of praat software in language learning through 11 screenshots and proved that praat software could be one of the best and newest software for learning, teaching, and improving English pronunciation ability. This paper used Praat software to analyze the English phonetic problems of students in Chengdu College of Arts and Sciences through experiments and explored the possibility of using Praat software to assist English phonetic teaching. This work lays a theoretical foundation for using Praat software to assist English phonetic teaching and improve the quality and efficiency of teaching in the future.

2. Application of Praat software in English Phonetic Teaching

Students in different regions are inevitably influenced by local dialects when learning English speaking [7], resulting in situations where students may have incorrect intonation or cannot connect words when speaking. In addition, phonetic teaching and detection of students' phonetic level is based on the teacher's own level, which lacks objectivity and credibility. Using Praat software to process and analyze phonetics is a commonly used method nowadays. Its basic function is to annotate and analyze phonetic signals, read audio files, calculate data according to requirements, and finally obtain the data graphs or text tables of pitch, intensity, and first or second formant frequency, as shown in Figure 1.

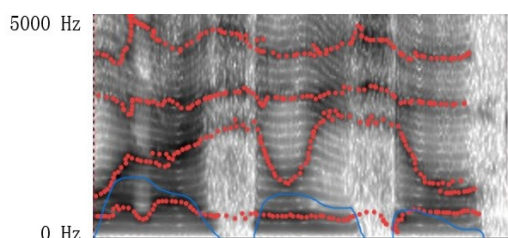


Figure 1: The schematic diagram of audio analysis with Praat software

Teachers can conduct targeted teaching and correction of students' English phonetics based on the data graphs obtained from Praat software, which can improve teaching efficiency and quality. According to relevant studies, the application of Praat software in English phonetic teaching mainly focuses on three aspects: speed, linking, and intonation.

(1) Speed

Speed is often a key factor that affects the learning of English phonetics. Most students use original English movies and TV shows as material for practicing listening and speaking in English [8]. However, in the learning process, they usually encounter a problem – the speed is too fast. This problem makes many students think that they cannot learn English well, which leads to thoughts of giving up on learning English.

It is concluded after analyzing samples using Praat software that Turkish has a low speed and high clarity [9].

(2) Linking

In English phonetics, linking occur frequently. Some English words are pronounced together for the sake of convenience and to speed up speech; however, this type of pronunciation can cause confusion and misunderstanding in sentences [10]. English native speakers use linking to emphasize some key words in a sentence, but Chinese people tend to pronounce every word clearly, which leads to

poor English pronunciation. Praat software can analyze the linking of every word in a sentence through audio analysis, identify the words that need to be linked, and thus improve the rate of linking.

(3) Intonation

In oral communication, information is conveyed through means such as stress, intonation, and pause [11]. Both English and Chinese use different intonations to express different emotions. In English, there are four types of pitch accents that convey different meanings. Extra high pitch is often used to emphasize key words in a sentence. High pitch is used to express surprise or excitement. Mid pitch is the normal tone. Low pitch is used to express apology or regret. In a research, some subjects receive instruction in intonation form and function based on the British method with the Praat software, and the experiment provides the possibility to reconsider the preference for the Praat software in intonation instruction [12].

3. Case Study

3.1 Experimental Subjects

In this experiment, 30 freshmen from Chengdu College of Arts and Sciences were selected as the experimental subjects. All 30 students were around 18 years old and have been learning English since the third grade, i.e., they have learned English for ten years. The reason for selecting freshmen as the experimental subjects is that they have similar English foundations and learning time, which ensures the validity of the experimental results.

3.2 Experimental Design

Part One of the Experiment: First, a moderately difficult English recording from previous years' English CET-4 listening tests was selected as the standard recording for analysis using Praat software. After listening to the recording five times, the experimental subjects imitated it and recorded their own versions as the experimental recording. After the recording was completed, the audio files of the 30 experimental recordings were imported into Praat software in turn. The experimental data of the experimental recordings and the standard recording were compared and analyzed using the software, aiming to identify differences in syllable stress, pitch range, and word duration.

Part Two of the Experiment: The experimental subjects were asked to imitate the standard pronunciation according to the spectrogram analyzed by Praat software in terms of speed, linking, and intonation. They were supervised and coached by teachers for one hour per day for three days. After the imitation exercises, the experimental subjects recorded their reading again. The newly recorded files were analyzed using Praat software

and compared with the initial experimental recordings to verify whether the students could improve their phonetic proficiency in terms of speed, linking, and intonation by training with the standard spectrogram.

3.3 Experimental Results

In the first part of the experiment, the results of the standard recording and experimental recording were compared in terms of syllable stress, pitch range, and word duration [13]. It was seen from Table 1 that the average strongest value of the syllables in the standard recording was 108.64 dB, while the average strongest value in the experimental recording was 81.66 dB, which was significantly lower than that of the standard recording. In terms of pitch range, the average highest and lowest values of the standard recording were both lower than those of the experimental recording, but the average pitch range value of the experimental recording was 149.68 Hz, which was far lower than 180.79 Hz in the standard recording. The larger the value of the pitch range in Table 1, the greater the magnitude of the pitch change, i.e., the degree of ups and downs of the intonation. The fact that the average pitch range value of the experimental recording was far lower than that of the standard recording indicated that the intonation rises and falls in the English recording by the experimental subjects was not very significant, i.e., the reading lacked emotion. It was seen from the word duration that the standard recording had a duration of 0.4781 s for the words that need to be stressed, while the experimental recording was 0.3152 s, which was significantly shorter than the standard recording. For unstressed words, the standard recording had a duration of 0.2543 s, while the experimental recording was 0.2969 s, which was longer than the duration of the standard recording. Combined with the syllable stress difference values in Table 1, it was found that the difference between the average strongest value and the average weakest value of the experimental recording was 6.37 dB, while that of the standard recording was 54.72 dB, indicating that the experimental recording had almost the same strength for stressed and unstressed words. The syllable stress, pitch range, and word duration all had impacts on the speed, linking, and intonation of English phonetics.

Table 1. Comparison of the results of the standard recording and the experimental recording in the first part of the experiment

		The standard recording	The experimental recording
Syllable stress	The average strongest	108.64	81.66

difference (dB)	value		
	The average weakest value	53.92	75.29
	The average difference	54.72	6.37
Pitch range difference (Hz)	The average highest value	257.38	260.71
	The average lowest value	100.19	158.32
	The average pitch range value	180.79	149.68
Word duration (s)	Stressed word	0.4781	0.3152
	Unstressed word	0.2543	0.2969

It was seen from the resonance peak frequencies shown in Figure 2 that the lowest one was the first resonance peak (F1), followed by the second (F2), third (F3), and fourth (F4) resonance peaks. The resonance peak frequencies changed depending on the position of the tongue (front, middle, or back) and whether the lips were rounded, for example, F1 was related to the height of the tongue, while F2 was related to the front or back position of the tongue. By comparing the resonance peak frequencies of the standard recording and experimental recordings [14], the corresponding standard deviation and P value were calculated. It was seen from the data in Table 2 that after the experimental subjects were trained using Praat software, the frequencies of F1, F2, F3, and F4 in the experimental recording increased by 11.36%, 13.54%, 35.10%, and 21.83%, respectively, approaching the resonance peak frequencies of the standard recording. At the same time, after calculating the standard deviation and P value, it was found that the P values between the experimental recordings trained using Praat software and the standard recording were greater than 0.05, indicating that there was no significant difference between them after the experimental subjects used Praat software for training. This proved that using Praat software could help students learn English phonetics more effectively.

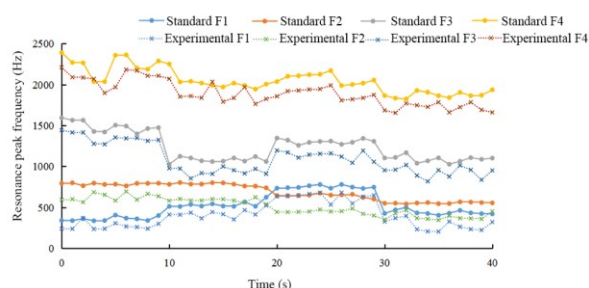


Figure 2: The comparison of the resonance peak frequencies between the standard recording and the experimental recording

Table 2. Analysis of resonance peak frequencies

	Standard recording (Hz)	Experimental recording (Hz)		Standard deviation	P value
		Before using Praat	After using Praat		
F1	339.67	269.64	300.26	10.09	0.826
F2	793.59	669.58	760.22	10.25	0.885
F3	1593.67	1063.59	1436.95	12.39	0.743
F4	2389.27	1834.51	2234.99	12.12	0.767

Finally, the results of Praat analysis for three aspects of recordings, namely speed, linking, and intonation, were compared. As shown in Table 3, there was a huge gap between the imitation recording made by the experimental subjects before using Praat software and the standard recording, with a difference of 17.8675 seconds in speed, eight words in linking, and 15 rises and falls in intonation. After receiving English phonetic coaching using Praat software, it was clearly observed that the experimental subjects' phonetics had significantly improved in terms of speed, linking, and intonation, with a decrease of 14.2897 s in speed, an increase of five words in linking, and an increase of ten rises and falls in intonation. This indicated that after imitating the standard recording using Praat software, the experimental subjects' English phonetic proficiency had greatly improved in all aspects, demonstrating that Praat software has a significant short-term effect on improving English phonetic learning and can be a useful tool for teachers in English phonetic teaching.

Table 3. The comparison of the recording analysis results with Praat software

		Speed (s)	Linking (n)	Intonation (time)
Standard recording		69.6571	15	23
Experimental recording	Before using Praat	87.5246	7	8
	After using Praat	73.2349	12	18

4. Discussion

Phonetics is crucial for English oral communication. If there are errors in intonation or word pronunciation during communication, misunderstandings can easily arise, leading to poor communication. This article conducted an experiment using Praat software to analyze the experimental subjects' reading recordings and

compared them with the standard recording to identify the differences. The experimental subjects were then trained based on the standard recording generated by Praat software analysis results, and their reading was recorded and compared with the standard recording again. The results suggested that the average pitch range value of the experimental recordings was 149.68 Hz, which was significantly lower than 180.79 Hz in the standard recording, indicating that the initial pitch variation of the experimental subjects was not significant. From the perspective of word duration and syllable stress, there was little distinction between stressed and unstressed for the experimental subjects. After training based on the analysis results of Praat software, the P values between the second recording of the experimental subjects and the standard recording were both greater than 0.05, the speed was reduced by 14.2897 s, the number of linked words was increased by five, and the number of pitch rises and falls was increased by ten. Therefore, based on the results of this experiment, the following suggestions are proposed to improve English phonetic teaching.

(1) Teachers can use Praat software to check students' English phonetic skills, rather than relying solely on their phonetic level, making the test results more accurate. In addition, teachers can use the analysis results generated by Praat to more precisely identify the specific problems every student may have in their English phonetics, such as incorrect pronunciation, inability to distinguish between stressed and unstressed words, and difficulty in linking. With this information, teachers can provide targeted coaching and guidance to help students improve their English phonetics to the fullest extent using Praat software in a scientific and effective manner.

(2) The Praat software can be downloaded for free [15]. The program is simple and easy to operate, and there are no time or space restrictions, allowing students to download it to their laptops. In their spare time, students who want to improve their English phonetics can operate it on their own, choose different materials for practice based on their learning abilities and progress in English phonetics, use Praat software to identify their shortcomings in English phonetics, and correct them one by one to better improve their English phonetic skills.

5. Conclusions

The paper introduced the application of Praat software in English phonetic teaching and conducted experiments based on this software. The authors analyzed different English reading audio files through the Praat software, found the gap between the experimental recording and the standard recording, trained the experimental subjects based on the Praat analysis of the standard recording, and

compared their reading with the standard recording again. The experimental results suggested that there was a large gap between the experimental recording without phonetic coaching through the Praat software and the standard recording. However, after using Praat for English phonetic coaching, compared with the standard recording, the speed was shortened by 14.2897 s, five linked words was increased, and the number of rises and falls of intonation was increased by ten, which greatly narrowed the gap between the experimental recording and the standard recording. It proves that using Praat software to analyze students' English phonetics can help teachers understand the problems that students have in oral English more clearly and assist teachers in providing targeted English phonetic teaching.

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