ATLANTIS PRESS
Advances in Social Science, Education and Humanities Research, volume 329
4th International Conference on Contemporary Education, Social Sciences and Humanities (ICCESSH 2019)

An Empirical Study on the Effectiveness of Speech Visualization Software Praat in Assisting English Phonetic Rhythm Teaching: a Phonetic Study Based on Minnan-accented Learner*

Yanfang Wang
Xiamen Huaxia University
Xiamen, China

***Abstract*—Traditional phonetics teaching mostly relies on the mode that teacher teaches orally and students imitate audio or teachers' pronunciation. However, due to the influence of mother tongue or other factors, students may not be able to hear clearly and learn accurately. The speech visualization software Praat can convert invisible voice into visual spectra, visually display the characteristics of voice, and make voice audible and visible, so that it is convenient for students to learn phonetics. This paper selects some students to find whether the students class can master the phonetic rhythm accurately by Praat, compared with the others students by traditional teaching. At last, the paper puts forward the teaching strategies in learning and teaching rhythm.**

Keywords—Praat; rhythm; teaching strategies

I. INTRODUCTION

In daily English teaching, it can be often found that many students pronounce English words accurately, but when they read articles, their pronunciation seems to be stiff and awkward. This indicates that the distinction between stress and weak reading is not obvious, and the intonation is straight with little fluctuation. What is the reason for this phenomenon? The general answer is that "Chinese people speak English without rhythm". In such situation, under the traditional Chinese teaching models in English phonetics, the English learns mainly listen to audio and teacher's pronunciation, and then imitate it. However, the learning effect is not ideal, which make their listening and speaking ability inadequately. Meanwhile, in traditional teaching, students' pronunciation level is basically determined by teachers' subjective judgment. The final result is affected by the teacher's own pronunciation level, which lacks certain validity and credibility. For students, because of their unsatisfactory results, they may have negative thoughts so as to reduce their enthusiasm for learning English, reluctant to speak English. In addition, it is difficult for teachers to accurately judge students' problems and learning situation by their grades, and to help them correct problems in time. Therefore, if the visualization of speech learning can be realized and the invisible speech can be quantified and visualized, the above problems can be well solved. In my opinion, the ideal visualization technology should include voice input, output and random feedback system, and make some discussions on how to use visualized voice technology to help learners understand and construct voice knowledge. At the same time teachers should also further understand visualized media technology and better apply it to teaching and learning.

II. THE CHARACTERISTICS OF ENGLISH RHYTHM

The rhythm of language consists of intensity, length, speed and timbre. English and Chinese have different rhythms. English is a stress-timed language with the alternative between the heavy and light tones. For example, in the sentence "She plays basketball every morning", there are 9 syllables (plays, bas-, ev-, morn-, for the stressed syllables) (She,-ket-,-ball,-ery,-ing, for unstressed syllables). In grammar, stressing syllables are pronounced harder, louder, and longer, while the weak syllables are minor in strength and volume, fast, vague, and time-consuming. Therefore, stress plays an important role in English phonetics. It is not only the focus of rhythm and intonation, but also one of the main means of speech expression. In English, it can be said that "Stress is the symbol and carrier of rhythm. Without stress, there is no rhythm in English. Perception of English rhythm is the perception of stress in a large part.

By comparing the differences between reading recordings by the Minnan-accented students(MAS)and the standard pronunciation provided by the texts, this paper attempts to summarize the MAS' problems in the rhythm of English, find out the rules and help them improve their sense of rhythm in reading English. Finally, it is hoped that this study will be helpful for all students who want to improve their spoken English and listening. Moreover, Praat can be

*Fund: Research Topic: "An Acquisition Research on the Visual Software Praat Applied in the Negative Transfer of Minnan Dialect on Students' English Pronunciation at the Suprasegmental Level" (Number: 1603); Approved Institution: Company: Xiamen Academy of Education Science

downloaded free of charge with incomparable advantages compared with other commercial voice software.

III. EXPERIMENTAL RESEARCH

A. Participants

The participants involved in this study consist of 30 Minnan-speaking students (15 females, 15 males) from freshmen in English majors in Xiamen Huaxia University. The participants were carefully selected to make sure they were all born and raised in Minnan Area (Quanzhou, Xiamen, Zhangzhou), and can speak Minnan dialects fluently. In order to guarantee the validity of the study, the researcher chose the participants who have not received too much training about English pronunciation before and are in their first year to study English pronunciation in a comparatively systematic way. The project team paid the service fee to every student who participated in the experiment.

B. Experiment Tools

Praat (means peaking or talking in Dutch), one of the most state-of-the-art speech analyzer software, is jointly developed by professor, Paul Boersma and assistant professor, David Weenink, who both work in University of Amsterdam, Holland. Nowadays, Praat is widely adopted in phonetic field so as to complete the task of speech recognition, data analysis and speech synthesis, and so on. This software is easy to operate and has clear and accurate graphical feedback information. Therefore, it can be used as a wide range of voice analysis software for English learners. After simple training, students can use the software to find pronunciation problems, adjust and correct them. Teachers can also objectively evaluate students' pronunciation according to the results of Praat phonetic analysis, so that they can more accurately find students' problems, and propose targeted solutions to improve the teaching effect and efficiency. In addition, the recording equipment is a laptop computer with Philips SHM1500K microphone, together with the recording software Adobe Audition 3.0, sampling rate 22050 Hz, 16 bits, mono channel.

In the study, all recording materials are segmented and labeled with Praat software. The annotation level is divided into three layers: stressed syllable level, unstressed syllable level and pause level. Then the experimental data are extracted by Praat script program, and then statistics, comparison and analysis are carried out by Excel software.

C. Experiment Procedure

There were three steps in this experiment procedure. The author divided the 30 students into two groups, one group called traditional class (TC), and the other called experimental class (EC), who voluntarily took part in the experiment for 5 weeks. The reading material consists of 20 phrases, 10 sentences and 1 short passage, selected from the book *Business English: Viewing, Listening and Speaking*.

Step one, all participants read the prepared reading material one by one recorded by Adobe Audition in a mono channel, who had 10 minutes to prepare before test. The author immediately used Praat phonetics software to analyze the speech spectrum between the standard recording and of the two groups, so as to provide the subjects with the required comparative exercises for the next step.

Step two, in the following 5 weeks, the TC were taught the reading material by the traditional phonetic teaching, while the EC not only learnt the material based on the traditional teaching, but also study how to simply use the Praat software and Adobe Audition 3.0, how to see the speech spectrum diagram and how to compare the speech spectrum of standard pronunciation with that of theirs to correct their pronunciation.

Step three, the two groups were asked to read the same material one by one again by the same tools 5 weeks later, and the author made a comparative analysis with Praat phonetics software.

IV. ANALYSIS OF EXPERIMENT RESULTS

The problems are found that the distinction between stress and reduction are not obvious and the sense of rhythm is weak when students read aloud. In order to present the features, this paper will discuss it from the aspects of the intensity, pitch, duration between the stress and reduction. In view of the accurate characteristics of phonetic experimental research, the analysis of pitch, intensity and duration is based on truncation analysis. Take the sentence "If he ever noticed or was bothered, he never let on" as the example, and judged by the context meaning, the words "ever, notice, bother, never, let" need to be stressed.

TABLE I. THE GAP BETWEEN THE STRONGEST AND WEAKEST VALUES IN INTENSITY

Index \ Items		ASV	AWV	AG
standard recording(SR)		100.68	61.42	39.26
TC	before Praat	83.78	80.56	3.22
	after Praat	90.32	78.51	11.18
EC	before Praat	85.04	82.41	2.63
	after Praat	97.83	64.21	33.62

a. Unit: dB

b. ASV: average strongest Value AWV: average weakest value

c. AP: Average gap between the strongest and weakest values

From the "Table I", it can be clearly seen that compared with standard recording, before using the Praat, the ASV in the two groups are lower that of SR, while the AWV in the two groups are higher than that of SR, which certify the conclusion that there is no comparison of light and heavy sound when the Minnan-accented students (MAS) read English. So the AP between them is quite narrow, 3.22, 2.63 respectively. After using the Praat in TC group, the ASV raises and the AWV falls slightly, the AGs are still lower, just11.18. However, there is a big difference in EC group, the ASV increases and the AWV decreases sharply, which is

approximately to the SR. so the AGs in SR and EC is quite close, 39.26 and 33.62 respectively.

TABLE II. THE GAP BETWEEN THE STRONGEST AND WEAKEST VALUES IN PITCH

Index \ Items		ASV	AWV	AG
SR		269.83	90.56	183.32
TC	before Praat	283.48	146.58	136.9
	after Praat	280.75	120.39	160.36
EC	before Praat	292.11	152.95	139.16
	after Praat	272.36	92.54	179.82

a. unit: Hz

Judged from "Table II", it is also obviously found that before Praat, the ASV and the AWV in TC and EC are closer, so there is a big gap between the two groups and SR. After the Praat, there is a gradual change in TC, but big changes take place in the EC, whose ASW and AWV get that of SR close.

TABLE III. THE DURATION IN STRESSED SYLLABLES

Index \ Stressed syllables		Notice	bother	never
standard recording		0.4541	0.4169	0.2746
TC	before Praat	0.4099	0.3532	0.2547
	after Praat	0.4235	0.3898	0.2598
EC	before Praat	0.4078	0.3645	0.2635
	after Praat	0.4501	0.4098	0.2716

a. unit: s

TABLE IV. THE DURATION IN WEAK SYLLABLES

Index \ stressed syllables		or	was
standard recording		0.1337	0.2521
TC	before Praat	0.1643	0.2989
	after Praat	0.1587	0.2734
EC	before Praat	0.1689	0.2924
	after Praat	0.1330	0.2531

a. unit: s

As is known to all, only when stress and weakness alternate, can rhythm be formed. Before Praat used, the figures between the two classes in stressed syllables and weak syllables are not obvious, the former not enough, the latter obviously too high, as shown in "Table III" and "Table IV". For example, judging from the "Table IV", the figures 0.1643 and 0.1689 in TC and EC are bigger than that of standard recording, 0.1337. This data also fully reflects the negative transfer of the habit of putting average effort on each word to English reading. However, after Praat used, the figures in EC are quite close to the figures of standard recording both in stressed syllables and weak syllables.

To sum up, from the above tables, it can be seen that the stress level of the two groups has improved, especially for the EC group, whose stress value is almost the same as the original tone. This also fully illustrates the feasibility and effectiveness of using Praat to assist phonetics teaching and after-class practice. Teachers can use voice analysis software to analyze students' problems intuitively and students can directly see their own problems, which not only makes up for the teacher's limited energy that can not take care of each student's shortcomings, but also make students test their own pronunciation learning ability at any time.

V. PRACTICAL PROBLEMS IN THE APPLICATION OF AUXILIARY VOICE TEACHING

Although Praat software has great advantages in assisting English phonetics teaching, there are still several problems to be paid attention to in using Praat. First of all, it is easy to operate and intuitive graphics, but it still knows some relevant professional knowledge. Otherwise, it can not understand the meaning of various parts of the language map, such as pitch, intensity and other professional terms, so it needs a simple training for students. There are also some requirements for sound recording. If the sound is not recorded well, Praat software can not accurately analyze the voice, and may also get inaccurate results. Secondly, teachers' professional competence: because students lack relevant knowledge after all, they need the help of teachers to understand the atlas and analyze the differences. Therefore, Teachers should be familiar with and master the use of the software, which is the basis of assisted teaching. Voice teaching requires higher professional quality of teachers. In addition, teachers should know the phonetics knowledge, and be able to properly integrate language knowledge with practical operation, plan curriculum design, and effectively use Praat voice software. Before making students practice, they should help students learn theory first, then do the phonetic training from words to sentences, from segments to stress, then to intonation. Finally, in order to use voice analysis software in the teaching process, schools must equip with appropriate equipment. Therefore, there are still a series of problems in popularizing the application of voice software in teaching, but the combination of voice software teaching may become an important method in the future.

VI. CONCLUSION

Compared with the traditional teaching model in English phonetics, using Praat phonetics software in English teaching has several obvious advantages. First, teacher can find out their problems in pronunciation and provide scientific and effective guidance. Second, voice assessment has become more simple and feasible, and even more reasonable and fair. Third, students have extra-curricular aids for independent learning. At last, the vivid learning effect is conducive to arousing their interests in practicing pronunciation. If English learners can use the software for voice-assisted exercises in a large scale, it will be more convenient and fast for Chinese English learners to improve their overall pronunciation and intonation level.

REFERENCES

[1] Arvaniti, A. The usefulness of metrics in the quantification of speech rhythm. Phonerica 66, 2009: 46-63

[2] Thomas, E.R & P.M. Cater. Prosodic rhythm and African American English. In English World-wide 27, 2006: 331-355

[3] Ladefoged P.A. *Course in Phonetics* [M]. New York: Harcourt Brace Jovanvich College Publishers. 1993.

[4] Ellis, Rod. *The study of Second Language Acquisition* [M]. Shanghai Foreign Languages Education Press, 1994.

[5] Odlin, Terence. *Language Transfer — Cross-linguistic Influence in Language Learning* [M]. Shanghai: Shanghai Foreign Languages Education Press, 2001.