THE ACOUSTIC CHARACTERISTICS OF STOP SOUNDS PRODUCED BY EAST JAVANESE STUDENTS OF ENGLISH STUDYING AT UNIVERSITY OF 17 AGUSTUS 1945 SURABAYA

by Ozza Sarviya Soetjahyati .

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ABSTRACT: This thesis is a research on acoustic characteristics of stop sounds produced by East Javanese students of English studying at University of 17 Agustus 1945 Surabaya. The aim of this research is to analyse the duration between the closure and the release of stop sounds. The analysis is based on the theory of acoustic phonetic of Peter Ladefoged (2003 & 2010) and Keith Johnson (2003). This study uses descriptive qualitative approach, focusing on the duration of the closure and the release stop sounds. To do the analysis, the writer takes data by making a list of sentences containing stop bilabial English sounds [b] and [p], alveolar [d] and [t] and, velar [g] and [k] in the initial position. The writer records the English stop sounds pronunciation by the subjects. The result of this research are: based on the stop sounds, the sequence of duration that have the longest duration is the sound [d], [g], [t], [p], [b], and [k]. Based on the data, each data has different duration on each sounds, data 1 (N.A) has median duration in sounds [g], [p], and [k], data 2 (A.G) has the longest duration in sounds [g], and [t], the shortest duration in sound [t], data 3 (A.N) has median duration in sound [d], data 4 (M.B) has the longest duration in sound [b], the median duration in sound [d] and the shortest duration in sounds [g], [k], and [b], data 5 (D.A) has the longest duration in sounds [d], [p], and [k], the median duration in sounds [b] and [k]. This study will provide important information and knowledge for the readers and students in department of English Language.

Keywords: Stop sound, acoustic phonetics, VOT.

1.1 Introduction

Phonetic in linguistics is a branch of phonology that studies and identify how we produce a sound. This focuses to explain and analyse the various human voices used in the production. According to Katamba (1989:2), phonetic has several branches such as *articulatory phonetics*, the study of identify precisely which speech organs and muscles are involved in producing the different sounds, *acoustic phonetics,* the study of the physical speech sound using laboratory instruments, and *auditory phonetics*, the study of speech perception.

According to Francis Katamba (1989:2), acoustic phonetics is the study of the physical properties of speech sound using

laboratory of speech perception. In acoustic phonetics, the researchers examine the physical of stop sounds. In order to support their analysis, they use special tool including tape recorder and specific applications.

Most languages use 26 letters as the alphabet including English language which include a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, and z. Each alphabet has phonetic symbols for pronunciation, divided into consonants and vowels. According to O'Connor (1980:8), English has 24 consonants ([p], [b], [t], [d], [k], [g], [s], [z], [m], [n], [f], [v], [l], [r], [h], [w], [j], [ŋ], [ʒ], [θ], [ð], [ʧ], [ʃ], and [ʤ], 12 vowels ([I], [e], [æ], [ʌ], [ɑ], [u], [ɔ:], [ɑ:], [i:], [u:], [ə], [ɜ:]), and 8 diphthongs ([aI], [eI], [ɔI], [əu], [iə], [eə], and [uə]. Compared to Indonesian sound inventory, quoted by Sa'diyah (2015:3), it has 27 consonant ([b], [c], [d], [f], [g], [h], [j], [k], [l], [m], [n], [p], [q], [r], [s], [t], [v], [w], [x], [z], [ŋ],[ń], [ʃ], and [x]), 10 vowels ([i], [I], [e], [Σ], [a], [ə], [ɔ], [o], [U], and [u]), and 3 diphthongs ([ai], [oi], and [ui]. Similar to English and Indonesia, Javanese also has its own sound inventory. According to Wedhawati, et al. (2001:33), Javanese is consisted of 6 vowels ([i], [e], [ə], [ɑ], [u], [o]), and 23 consonants ([p], [b], [m], [f], [w], [t], [d], [n], [l], [r], [ṭ], [ḍ], [s], [z], [c], [j], [ń], [y], [k], [g], [ŋ]. [h], [?]). According to Uhlenbeck (1982:27), Javanese sound inventory has 6 vowels ([A], [O], [E], [U], [I], [ə]). According to Soedjarwo (2009:29-56), Javanese sound inventory has 21 consonant ([p], [b], [t], [d], [th], [dh], [k], [g], [m], [n], [ɳ], [ŋ], [s], [h], [c], [j], [l], [r], [w], [y]). Those classifications are based on the manner of articulation, point of articulation, and the position of vocal.

These previous studies on phonetic pronunciation presented in order to avoid some ambiguous explanation in this thesis afterwards. The writer found three studies that discuss about pronunciation. First, the work from Linda Susanti discussed about how Sundanese students from Department of English pronounce the English sounds in her work entitled *A Study of Pronunciation of English Sound by Sundanese Students of English* (2003). Second, the work from Alfriani Ndandara entitled *A Study English Consonant Pronunciation by Sumbanese Students Live in Kupang and Salatiga* (2009) discussed about pronunciation by Sumbanese students who live in Kupang and Salatiga as informant to pronounce English consonant. Last, the work from Ima Halimatus Sa'diyah entitled *English Pronunciation by Madurese Students in Surabaya* (2015) discussed about how Madurese students in Surabaya pronounce English and Madurese. In previous studies that have been mentioned, it is known that the theme of research is almost the same, but the difference is the area of research.

Based on explanation as mentioned, the writer uses stop sounds as main topic and uses different object which is East Javanese students in Universitas 17 Agustus 1945 Surabaya. Stop sounds will be investigated using Praat application. It is interesting topic to be discussed because it will discuss the phonetic acoustic characteristic of stop sounds. The purpose of the study is to

analyze the characteristics of English stop sounds [b], [d], [p], [k], [t] and [g] in the initial position produce by East Javanese students who live in Surabaya. Specifically, the study will investigate English pronunciation by East Java students who study in Universitas 17 Agustus 1945 Surabaya with English as their major. This research involves 5 students who have studied phonetic. This research uses Praat application to know the interval between the closure and the release of stop sounds. Praat is a program for analyzing, synthesizing, and manipulating speech. This application is available on www.http//praat.org and can be downloaded for free. This software is designed to help linguist to be "phonetician".

1.2 Review of Related Literature

Previous Study

The study of pronunciation had been discussed also by several students of Department of English. The writer found three works which discussed about pronunciation. First, the work from Alfriani Ndandara entitled *A Study English Consonant Pronunciation by Sumbanese Students Live in Kupang and Salatiga* (2009). This work only examined Sumbanese students who live in Kupang and Salatiga as informants to pronounce English consonant and this work was based on Dobrovosky and Katamba (1997). Its scope records of English consonant pronunciation by Sumbanese students. The result of study was there were 27 allophone variations from 24 consonant sounds based on the subject's pronunciation. Second, the work from Linda Susanti entitled *A Study of Pronunciation of English Sound by Sundanese Students of English* (2003). This work discusses about how Sundanese students from Department of English pronounce the English sound and the study based on the theory from Dobrovosky and Katamba (1997). Its scope records of English sound pronunciation by Sundanese students. The result of the study was there were 5 similarities between English and Sundanese consonant sounds based on the manner of articulation, 5 similarities based on the place of articulation and 14 similarities based on the way of sound are produced by speech organs. Thus, there were 5 differences between English and Sundanese consonant sound based on the manner of articulation, 3 differences based on the place of articulation, and 11 differences based on the way production of sounds. Also there were 10 similarities between English and Sundanese vowel sounds and 11 similarities between English and Sundanese vowel sounds. The work from Ima Halimatus Sa'diyah entitled *English Pronunciation by Madurese Students in Surabaya* (2015). This work discussed about how Madurese students in Surabaya pronounce English and Madurese students as informants. This work wa based on the theory from Michael Dobrovosky and Katamba (1996) and Soendjono Dardjowidjojo (2009). Its scope records English sound pronunciation by Madurese students. The result of the study was that there were 10 consonant sounds that have been mispronounced in the initial position, 10 sounds in the middle position, and 12 sounds in the back position. And regarding

the vowel sounds, the researcher also finds there are 8 sounds that have been mispronounced in the initial position, 11 sounds in the middle position, and 6 sounds in the final position. The researcher also finds 8 English consonant sounds from 24 English consonant sounds that are pronounce correctly by the subject.

Acoustic Phonetics

According to Francis Katamba (1989: 2) acoustic phonetics is the study of the physical properties of speech sounds using laboratory instruments

Periodic and Aperiodic Waves

In phonetic acoustic there are two types of sounds: periodic and aperiodic waves. Periodic waves has two types: simple periodic waves and complex periodic waves. Periodic waves has regular wave and aperiodic waves has irregular wave.

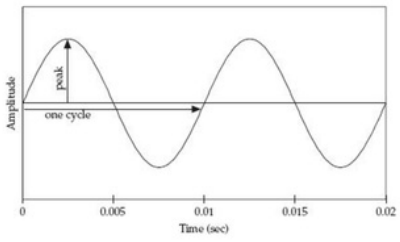

Figure 4: Simple periodic waves by Keith Johnson p. 7

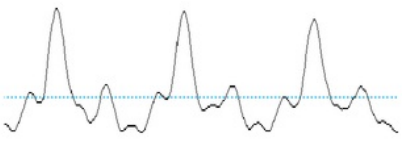

Figure 5: Simple periodic waves by the data

From the pictures above is the visually of periodic waves. Simple periodic waves has regular wave, this wave has regular period repetition. Each repetition of the pattern is called a cycle and the duration of a cycle is its period (Keith Johnson, 7:2003)

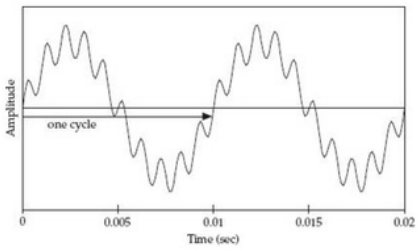

Figure 6: Simple periodic waves by Keith Johnson p. 8

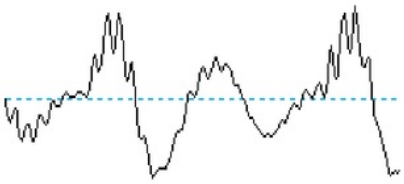

Figure 7: Simple periodic waves by the data

Complex periodic waves has the same characteristic like simple periodic waves. Complex waves has regular wave but forming into dense little waves. It can be found when producing sentences.

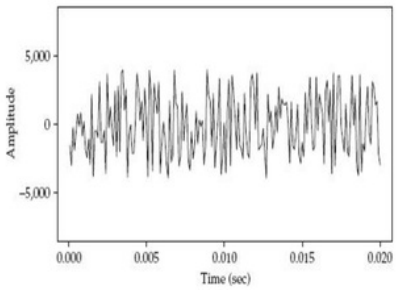

Figure 8: Aperiodic waves by Keith Johnson p. 13

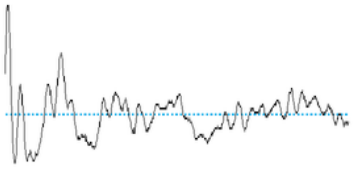

Figure 9: Aperiodic waves by the data

Aperiodic waves is not like periodic waves that have regular waves. This wave has an irregular shape. Can be seen in figure 16. They have either a random waveform or a pattern that doesn't repeat. In the aperiodic waves it may indicate the existence of hissing sound or white noise or these are various types of clanks and busrt which produce a sudden pressure fluctuation that is not sustained or repeated over time. For example door slames, baloon pops, and electrical clicks, or it can be consonants sound. (Keith Johnson, 12:2003).

Acoustic Cues for Consonants

According to Ladefoged (2011: 108) & Keith Johnson (2003: 146) waveform indicate of waves and spectrogram show the energy and pattern of waveform

Duration

In general, duration is the time range of an phenomenon. According Ladefoged (2003:94), phonetics duration is called voice onset time (usually abbreviated VOT). According to Johnson (2003:135), to identify stop sounds there are three stages in the articulation: shutting, closure, and release.

1.3 Research Method

Research Design

In this research, the writer uses qualitative method, the subject of this research is University of 17 Agustus 1945 Surabaya students who is originating from East Java living in Surabaya. According to Creswell (2007: 38) qualitative researchers typically gather multiple forms of data, such us interviews, observations, and documents, rather than rely on a single data source. The writer collects the data by interviewing some Javanese students then record subject's sounds using tape recorder on mobile phone, and asked the objects to mention the stop sounds in English according to their own dialect.

Research Instrument

The instruments of the study are the writer herself as the participant observer and a tape recorder by mobile phone which is used to record the pronunciation while the samples are pronouncing. The writer uses word list containing English stop sounds bilabial [b] and [p], alveolar [d] and [t] and velar [g] and [k] sound in the initial position.

Data Source

The data source of the data is Javanese English students. The criteria for subject selection is they are East Javanese students from different areas and each subjects representing their area, actively using Javanese language in daily communication,

and have studied or are still studying phonetics and phonology classes. There are 6 stop sounds which is divided into bilabial [b] and [p], alveolar [d] and [t], and velar [g] and [k], each stop sound divided into 5 words in frame of sentence. The subject of the data is 5 students from University of 17 Agustus 1945 Surabaya with English become their major.

Data Collection Procedure

All the data are recoded to get the accurate data while the subjects read the 5. The writer saves data record subject into the computer.

6. The writer analyzes the data record by using Praat application.

Data Analysis Procedure

After the data was collected, the writer analyzes the data into 3 sections:

1. Analyze the voiced and voiceless.
2. Analyze burst release stops.
3. Analyze place of articulation.
4. Analyze in the initial and the end position of the stop sounds.
5. Calculate the duration.

1.4 Analysis

This chapter analyse of the data that have been collected. The data are taken from 5 subjects from different areas who pronounce the sentences "I want to say __ words. The data collection takes 20-30 minutes. There are 6 steps of collecting data procedure:

1. The writer chose the students from University of 17 Agustus 1945 Surabaya who is from East Java and their major is English.
2. The writer makes a list of words that contain English stop sounds.
3. The writer makes a list of words form into sentences "*I want to say _ to you*".
4. The writer records the English stop sounds

to you" and the blank space must be filled by bilabial stop [b] (baby, ball, banana, belong, boy) and [p] (perry, pain, pie, pen, pooh), alveolar stop [d] (die, dizzy, damn, deal, denial) and [t] (tail, team, tear, teen, tension), and velar stop [k] (keel, key, kiwi, kid, kookie) and [g] (gain, game, garlic, give, gear) sound. From the sentence, the researcher focuses on bilabial stop [b] and [p], alveolar stop [d] and [t], and velar stop [k] and [g] in initial position. The result of each duration data (VOT) between the closure and the release of stop sounds will be shown in table form. This chapter divided into 6 sub chapters based on the sounds.

Duration Measurements

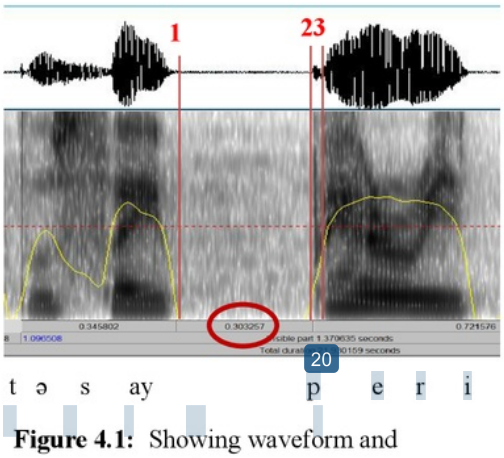

Figure 4.1: Showing waveform and spectrogram

Figure 4.3 shows the waveform and spectrogram of word "*to say perry*". Waveform shows the physical sound in the form of a wave. While spectrogram shows the form of energy in black colour and can form patterns. Both vertical red lines between number 1 and 2 are the closure of stop sound [p], while the vertical red line number 3 is a release of stop sound [p]. The bottom part of the spectrogram shown in the red oval shows the duration number of closure stop sound [p].

Voiced Bilabial Stop [b]

This analysis focuses on part of the words *baby, ball, banana, belong and boy.*

No.	Data	Bilabial Stop Sound [b]				
		Baby	Ball	Banana	Belong	Boy
1	Data 1 N.A	0.010355 s	0.016654 s	0.017061 s	0.014324 s	0.017241 s
2	Data 2 A.G	0.018722 s	0.018107 s	0.011536 s	0.018679 s	0.017398 s
3	Data 3 A.N	0.011147 s	0.016588 s	0.011843 s	0.017618 s	0.020933 s
4	Data 4 M.B	0.018889 s	0.018951 s	0.016667 s	0.005245 s	0.028519 s
5	Data 5 D.A	0.024062 s	0.028049 s	0.009053 s	0.011442 s	0.013653 s

Table 1: The result of length duration voiced bilabial stop [b] from each data in Praat application.

Note: s (second)

Table 1 shows that data 1 (N.A) has the longest duration in the word *boy* (0.017241 s) and the shortest duration is on the word *baby* (0.010355 s). Data 2 (A.G) has the longest duration in the word *baby* (0.018722 s) and the shortest duration is in the word *banana* (0.011536 s). Data 3 (A.N) has the longest duration in the word *boy* (0.020933 s) and the shortest duration is on the word *baby* (0.011147 s). Data 4 (M.B) has the longest duration in the word *boy* (0.028519 s) and the shortest duration is on the word *belong* (0.005245 s). Data 5 (D.A) has the longest duration in the word *ball* (0.028049 s) and the longest duration is on the word *banana* (0.009053 s).

From all of the data above the longest, median, and shortest duration will be taken. Data that has the longest duration is from data 4 (M.B) in the word *boy* (0.028519 s), median duration is from data 5 (D.A) in the word *ball* (0.028049 s), and shortest duration is from data 5 (D.A) in the word *belong* (0.005245 s). They will be described further in form of pictures based

on the energy in spectrogram and waveform.

a. Longest Duration Data 4 (M.B)

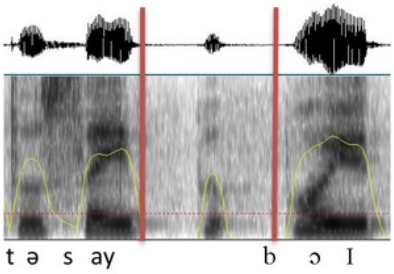

Figure 4.2: Showing the waveform and spectrogram.

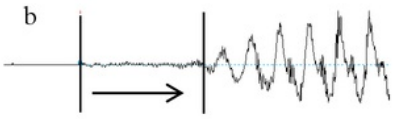

Figure 4.3: The waveform after zoomed in.

Figure 4.1 and figure 4.2 shows the waveform and spectrogram of word "to say *boy"*. Figure 4.1 shown by two red lines is the closure of sound [b]. The release energy of voiced bilabial stop sound [b] on the spectrogram is shown in the form of a thin vertical black line. The initial [b] shows a form of energy of F1 and F2 that meets each other, then in the middle position of sound [ɔ] the energy of F2 goes upward and then form a bit down on sound [I]. The energy of F1 in sound [ɔ] and [I] is getting floats from the bottom. In Figure 4.2 flanked by two vertical lines indicate the duration between closure and release of stop sound [b]. The release wave forms into small waves. After figure 4.2 is zoomed the wave is seen to form aperiodic waves or irregular waves.

b. Median Duration Data 5 (D.A)

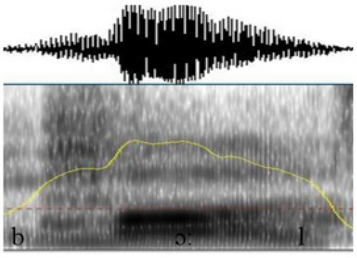

Figure 4.4: Showing the waveform and spectrogram.

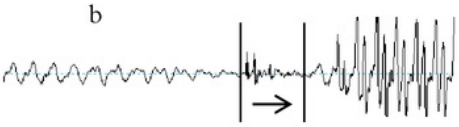

Figure 4.5: The waveform after zoomed in.

Figure 4.3 and 4.4 shows the waveform and spectrogram of word "boy". In figure 4.3, the front energy of the spectrogram shows the release of initial stop sound [b]. Energy of F2 and F1 on sound [ɔ:] they meet each other, but the energy of F2 goes little upward until the end of the sound, then the energy of F1 forms flat pattern and headed slightly towards the bottom of the spectrogram. Figure 4.4 shows duration between closure and release of stop sound [b], on the waveform showing aperiodic waves form into a small waves.

c. Shortest Duration Data 5 (D.A)

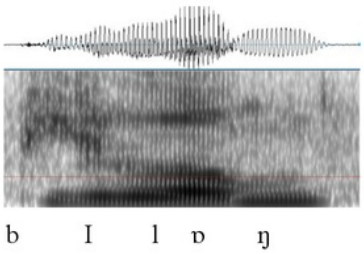

Figure 4.6: Showing the waveform and spectrogram.

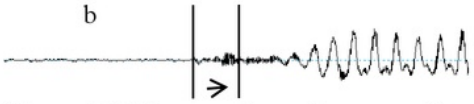

Figure 4.7: The waveform after zoomed in.

Figure 4.5 and 4.6 shows the physical sound of the word "*belong*" in the form of energy and wave. In figure 4.5, the front energy of the spectrogram shows the release of initial stop sound [b] in the form of a faint black vertical line. In sound [I] and [l] the energy of F1 touches the bottom of the spectrogram, while energy of F2 forms a slide from the top to the bottom. The energy of F1 and F2 in sound [ɒ] meets each other. The energy of F1 of sound [g] touches the bottom of the spectrogram and F2 appears to be a vague black color indicating the nasal energy. Figure 4.6 shows duration between closure and release of stop sound [b], on the waveform showing aperiodic waves form into a small waves.

1.5 Conclusion

This chapter is a conclusion of what has been discussed in chapter IV. The conclusion is divided into 2 parts. First, based on the stop sounds, the sequence of duration that have the longest duration is the sound [d], [g], [t], [p], [b], and [k]. Second, based on the data, each data has different duration on each sounds, data 1 (N.A) has median duration in sounds [g], [p], and [k], data 2 (A.G) has the longest duration in sounds [g], and [t], data 3 (A.N) has median duration in sound [d], data 4 (M.B) has the longest duration in sound [b], the median duration in sound [d] and the shortest duration in sounds [g], [k], and [b], data 5 (D.A) has the longest duration in sounds [d], [p], and [k], the median duration in sounds [b] and [k].

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ORIGINALITY REPORT

%12	%11	%4	%8
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Kenyatta University Student Paper	%1
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3	Submitted to University of Kent at Canterbury Student Paper	%1
4	Submitted to Universitas 17 Agustus 1945 Surabaya Student Paper	%1
5	www.educationquizzes.com Internet Source	%1
6	Submitted to Walden University Student Paper	%1
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9	kitwiki.csc.fi Internet Source	%1
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