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An acoustic analysis of plosive sounds produced by Indonesian ELF university students

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Abstract. This research explores the dimensions of acoustic phonetics in linguistic context with a focus on the analysis of sound sounds in a particular language. The purpose of this research to investigate differences in the pronunciations of consonant sounds between native and non-native speakers of the language. Use a phonetic-acoustic approach by analyzing voice data using the Praat application. The data used in this study consisted of recorded from native speakers and non-native speakers of that language. This research uses qualitative method, from use the recording and use Praat to collect the data. Pronunciation by 11 students from East Javanese.

Keywords: Plosive sounds, Acoustic Phonetics, Consonant sounds.

INTRODUCTION

A plosive is defined as a consonant sound that involves hardness of the mouth which does not allow air to escape from the vocal tract, and compression and inhalation of air. Therefore, there are four stages in plosive production: closure, maintenance, maintenance, and post-release. English has six plosive consonants, there are p, t, k, b, d, g. The sounds /p/ and /b/ are bilateral, that is, the lips are pressed against each other. The sounds /t/ and /d/ are alveolar, so the tongue presses against the gums. The sounds /k/ and /g/ are velar, the back of the tongue pressing against the area between the hard and soft palates. The /p/, /t/, and /k/ sounds are muted. /b/, /d/, and /g/ are usually voiced. The release of a voiceless plosive is followed by an audible explosion and, in the post-release phase, by aspiration. O'Connor (1980:8) explains that the English language consists of a total of 24 consonant sounds. The following consonant sounds are included: [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]. For vowel sounds, the English language includes [l], [e], [æ], [ʌ], [ɑ], [u], [ɔ:], [ɑ:], [i:], [u:], [ə], [ɜ:]. Additionally, diphthong sounds consist of [al], [el], [ɔl], [əu], [iə], [eə], and [uə].

Javanese phonetics have vowel and consonant forms. There are 10 types of vowels, namely vowels [i], [I], [e], [ɛ], [a], [ə], [ɔ], [o], [U], and [u]. All vowels it is related to height of the tongue, the movement of the tongue parts, strictures, and shape of the lips. Second Javanese have 10 consonants, namely consonants bilabi al, labio-dental, apico-dental, apico-alveolar, apico-palatal, lamino-alveolar, lamino-palatal, medio palatal, dorso-velar, and laryngeal. All of the consonants are there voiced (B) and some are voiceless (T). Based on Uhlenbeck's (1982:27) findings, The Javanese language consists of 6 vowel sounds ([A], [O], [E], [U], [I], [ə]). Additionally, based on Soedjarwo's research (2009:29-56), the Javanese language comprises There are a total of 21 consonant sounds in the language, This includes sounds such as [p], [b], [t], [d], [th], [dh], [k], [g], [m], [n], [ɲ], [ŋ], [s], [h], [c], [j], [l], [r], [w], [y]. These categorizations are established based on factors like the method and location of articulation, as well as vocal position.

According to Mulyani (2007:45), the Javanese languages serves as a means of communication of the Javanese people. It's primarily spoken in central and also eastern regions of Java Island. While it's not the originally language in Indonesia. Javanese is recognized as a regional language in the three provinces of Java where there is a significant concentration of Javanese speakers. Moreover, the term "plosive" denotes a speech sound that is produced by completely closing the vocal tract and elevating the soft palate. This closure results in increased air pressure, which is then released abruptly and forcefully, as seen in sounds such as /p/, /b/, /t/, /d/, /k/, and /g/. However, the influence of the mother tongue or regional language can sometimes affect the pronunciation of sounds in a foreign language (Masae, Nadaraning, Baleh, Tamphu, Star, & Pariyanto, 2017), such as English. One example is the influence of Javanese explosive sounds on students' pronunciation of English explosive sounds. Javanese, a widely spoken language in Indonesia, has its own set of unique phonetic features, including distinctive plosive sounds. These plosive sounds differ in terms of articulation and acoustic properties from their English counterparts. When Javanese speaking students of English Literature encounter English words containing plosive sounds, they may encounter difficulties in accurately reproducing these sounds for example when they say "abab", "udud", "budeg," "ujub", "wirid" and "wareg". Previously, research was discussed out by Wardani and Suwartono (2019) investigating the difficulties of pronouncing English sounds by learners with a Javanese mother tongue background. Previous research has agreed on the problem of announcing English explosion sounds posed by Javanese learners. In the previous study, it was also identified the difficulties of Javanese learners in interpreting English consonants and vowels.

According to Wedhawati et al. (2006: 21-22), the Javanese language, specifically with an East Javanese dialect, is predominantly spoken in various regions of East Java, including Surabaya and its surrounding areas. It is also prevalent in the Horseshoe area, which comprises eastern Pasuruan, Probolinggo, Lumajang, Jember, Situbondo, and Bondowoso. Then, the north side of the East Java section is more inclined to Central Java, while the south side is a possibility only covers the Pacitan, Madiun area and Grobogan. Wedhawati et al. (2001:33) state, furthermore, the Javanese language comprises 6 vowel sounds ([i], [e], [ə], [ɑ], [u], [o]), and in addition to that, it encompasses 23 consonant sounds ([p], [b], [m], [f], [w], [t], [d], [n], [l], [r], [ṭ], [ḍ], [s], [z], [c], [j], [ń], [y], [k], [g], [ŋ], [h]), [?]). It should be noted that this study has certain limitations, as it only focuses on semester 6 students from Surabaya, Bangil, Madiun, Sidoardjo, Tranggalek, and Lamongan.

This study has a problem limitation that focuses on the analysis and understanding of plosive sounds that appear at the end of words with the consonants /b/, /d/, and /g/. In this context, the plosive sound refers to the phonetic characteristic which is indicated by the presence of a 3 explosion of air at the time of pronouncing the final sound of words containing the consonant. This research will study this plosive sound phenomenon in depth, by observing a number of carefully selected word samples. The research focus will be placed on the qualitative differences between the plosive sounds in the consonants /b/, /d/, and /g/ at the end of words.

LITERATURE REVIEW

Maulidina (2012) conducted a previous study titled "The Impact of Banyumas Accent on the Pronunciation Ability of Sixth Semester Students in the English Department of UMP during the Academic Year 2011/2012." This study aimed to investigate how the Banyumas accent affected students pronunciations skills, particularly in pronounce the sounds /b/ and /d/. The study revealed that the Banyumas accent had both positive and negative effects on students' pronunciation, depending on the position of the sound /d/ in words. When /d/ appeared at the beginning of words, the Banyumas accent had a completely positive influence, resulting in a 100% positive transfer effect. This indicated that students' pronunciation of /d/ at the beginning of English words was favorably influenced by the Banyumas accent. However, when it came to pronouncing /d/ at the end of words, the Banyumas accent had both positive and negative transfer effects. The positive transfer occurred when there were no changes in the sound, while the negative transfer happened when /d/ was pronounced as /t/. The percentages for positive and negative transfer were 12.5%, 12.5%, 12%, 12%, and 15%, respectively. Similarly, in terms of pronouncing /b/ at the beginning of words, the Banyumas accent had a 100% positive transfer effect, indicating that students' pronunciation of /b/ at the beginning of English words was positively influenced by the Banyumas accent. However, when it came to pronouncing /b/ at the end of words, the Banyumas accent had both positive and negative transfer effects. The positive transfer occurred when there were no changes in the sound, while the negative transfer happened when /b/ was pronounced as /p/. The percentages for positive and negative transfer were both 22.5%. Based on these findings, the researcher recommended that students pay attention to their pronunciation and be cautious in their speech, while lecturers should be attentive and correct students' pronunciation. Furthermore, the researcher encouraged future studies to explore other influences of the Banyumas accent, as this topic was considered challenging and intriguing.

The second previous study conducted by Maulida (2016) examined the impact of Javanese accent on the English pronunciation of students. The focus was specifically on the /g/ sound at the end of words spoken by Javanese students. The research aimed to determine the extent to which the Javanese accent influenced the pronunciation of English, particularly in the initial, middle, and final positions of the /g/ sound. The findings indicated that when pronouncing the final /g/ sound in both Javanese and English words, 27% of the students did not experience any interference, while 73% were influenced by the Javanese accents. This interference resulted in the /g/ sound being pronounced as /k/ at the end of English words. It was observed that production of the /g/ sound involves vocal cord vibration, creating a voiced stoppage at the end of the words. Conversely, production of the sound /k/ follows a similar process but lacks vocal cord

vibration, result in unvoiced sound. Maulida's thesis employed qualitative research methods to describing interferences of Javanese accents on students English pronunciations of the g sound. The study focused on 4th semester students in the English Education Program at Purworejo Muhammadiyah University during academic year 2015/2016. Data collection involved documentation, and the research design utilized descriptive qualitative techniques. The analysis process consisted of categorizing students' pronunciation as interfered or not, describing the interference, interpreting, calculating the percentages, then drawing conclusions. The results indicated that when pronouncing the initial and middle /g/ sounds in both Javanese and English words, none of the students experienced interference. However, when it came to pronouncing the final /g/ sound in both languages, 27% of the students did not face any influence, while 73% experienced inteferences. Based on the findings, it was suggested that this knowledge could be applied in teach speaking skills, specially for 10th grade students in senior high school, particularly when discussing favorite songs. Teachers can provide explanations on how correctly pronounce the sound /g/ in lyrics of song.

The next is Subandowo (2017), "A Study of English Phonological Errors Produced by English Department Students", this research is the interference of the mother tongue on the English speak ability of English as a (EFL), especially the influence of the mother tongue their pronunciation. This 7 study found that students made errors in their pronunciation, especially on consonants and vowels, and that the interference was influenced by factors such as environment, motivation, and the sound system of the language. This study also explains the concepts of mother tongue interference, language transfer, and pronunciation, as well as mastery of speaking skills in language learning. To analyze the data, the researchers collected data through questionnaires and recordings of the students' pronunciation. The data were then analyzed based on the students' sounds that were recorded, and the findings were formulated in a table illustrating the spread of the students' interference. The researchers also applied three classifications of English pronunciation to identify the students' sounds. The factors influencing mother tongue interference in pronunciation were identified as the environment where the students live, the school area, and the students' accent of their mother tongue. The study found that the students made mistakes in pronouncing consonants /tʃ/ and /ʒ/, as well as /dʒ/, /v/, /z/, and /r/ . They also made mistakes in pronouncing /b/, /k/, /g/, /θ/, /h/, /m/, /n/, /l/, /w/, /p/, /t/, /d/, /f/, /ð/, /ŋ/, /s/, /ʃ/, and /y/. In terms of vowels, the students made mistakes in pronouncing /u/, /iː/, /æ/, /uː/, /ɜː/, /ə/, /eɪ/, /aɪ/, /əʊ/, /ɪə/, /eə/, /ɑː/, /ɔː/, /ʊ/, /ʌ/, /ɔɪ/, /ʊə/, /e/, /ɒ/, /aʊ/, and /ɪ/. The researchers also found that the students had difficulty in pronouncing consonants /ʒ/ and /tʃ/, as well as plosive and nasal sounds. The differences in symbols used to represent sounds in English also caused confusion for the students. Overall, the study concluded that mother tongue Interference had a significant effect on the students' pronunciation, and factors such as environment, then motivation, and different sounds, and also different sound symbols contributed to this interference. The researchers also noted that the frequency of speaking Javanese in the students' daily activities played a role in the interference. Speaking can be seen as the act of expressing thought, ideas, and feelings by using audible symbols or visible bodily action. In addition, the use of demonstration and audio visual are also could be effectively used to raise speaking skill. Murati (2020), "How is the Awareness of Javanese Language Phonology of Elementary School Teacher Candidates?: Descriptive Qualitative Study", This study shows that prospective Javanese teacher students in elementary schools still experience difficulties in writing the consonants b, d, and g in Javanese. The data for this research

was collected through observation and documentation of student work papers during Javanese language learning lectures in elementary schools. The stages of data analysis included selecting data, identifying errors, classifying errors, analyzing the source of errors, and remediation for errors. The level of phonological awareness was determined based on the linguistic form or the form of written 8 languages. To analyze the data, a descriptive qualitative approach was used. The contrastive technique with an inductive stage was employed for data analysis. This involved analyzing the linguistic units such as words, syllables, onset, rhythm, and Javanese phonemes that appeared in the learning process of Javanese language. The errors in phonological awareness were identified, classified, and quantified to measure the level of awareness. The results of the research showed the level of awareness of Javanese phonology in the students of PGRI Madiun University, specifically in the Elementary School Teacher Education study program. The data analysis provided insights into the phonological awareness of the students and the errors they made in their understanding of Javanese phonology. Overall, the data was collected through observation and documentation, and then analyzed using a descriptive qualitative approach and the contrastive technique with an inductive stage [2][4].

The study of Javanese pronunciation has been discussed by "Niasisca Agustina Wardani and Tono Suwartono (2019)", Department of English Language Teaching, Faculty of Teacher Training and Education. This study is entitled "Javanese Language Interference in English Phoneme Pronunciation". This study discusses Javanese language learners who experience difficulties in pronouncing English sounds. This study also discusses the factors that influence Javanese in learning English pronunciation. The results found that Javanese learning English faced challenges when try to pronounce 13 certain sounds of consonants such as /ʒ, v, θ, ð, z, ʃ, f, g, k, d, ʧ, ŋ, j/ as well as many as There are a total of 17 vowel sounds (/æ, ɛə, iː, eɪ, aʊ, əː, ɔː, uː, ɒ, ɪə, əʊ, ʊ, ɑː, ɪ, ʊə, ɔɪ, aɪ/) available in the language. However, they can clearly pronounce the other There are a total of 14 sounds in the English language (/p, b, t, s, h, ʤ, m, n, l, r, w,ʌ, ə, ɛ/). In addition, there are four factors that affect Javanese individuals when learning English pronunciation, namely age then first language, also exposure, and motivation. The research findings indicated that Javanese learner of English faced difficulties in pronounce English phonemes. This data is gathered through a combination of quantitative and qualitative techniques, including a pronunciation test and interviews. The test data was analyzed using a formula to calculate the gained score. The interview data was transcribed, analyzed, reduced, and concluded. The research also identified several factors that influenced the pronunciation abilities of Javanese students. These factors included native language, exposure to English pronunciation outside the classroom, and motivation . The study found that Javanese learners often substituted English consonant sounds with similar sounds or sounds from their native language. To analyze the factors influencing pronunciation, personal semi-structured interviews were conducted with 12 respondents. The interviews aimed to gain deeper information about the factors 9 affecting their pronunciation abilities. The respondents were selected based on their pronunciation test scores, representing those with high, medium, and low scores. In conclusion, the research findings highlighted the difficulty faced by Javanese learner in pronouncing English phonemes then identified factor such as native language, exposure, and motivation that influenced their pronunciation abilities. The data was collected through tests and interviews, and the analysis involved calculations, transcription, and reduction of the data.

Irawan (2021) “Phonetic Grammar Of Plosive Sounds Spoken By Sundanese And Javanese” This journal discusses the phonetic characteristics of plosive sounds in Sundanese and Javanese spoken by native speakers. This study focuses on the sound onset time (VOT) of voiced and voiceless plosives /b, d, g, p, t, k/at word initial positions. The data collected in this study were analyzed using a speech analysis device called PRAAT. The researchers used a broadband spectrogram setting with a window length of 0.005, a frequency range of 0-8000 Hz, and a dynamic range of 60 decibels. The analysis began with spectrographic analysis assisted by visual analysis of the waveform. The researchers examined the characteristics of the plosive sounds pronounced by speakers of Javanese and Sundanese using the VOT (Voice Onset Time) theoretical framework. To obtain the data, the researchers asked the informants (2 men and 2 women with Javanese and Sundanese language backgrounds) to read a vocabulary list containing words with voiced and unvoiced plosives. The list was randomized and inserted with other words that were not the target words. A total of 288 pronunciations of words containing plosives were produced by the informants. The researchers also compared the plosive sound patterns in Sundanese and Javanese languages. The data for this comparison were collected through recording and analyzed using a phonetic grammar approach. The researchers examined the similarities and differences between the plosive sound patterns in Sundanese and Javanese, as well as the diversity of pronunciation of plosive sounds in Indonesian by speakers of different languages. Overall, the data were collected through recording and analyzed using spectrographic analysis, visual analysis of the waveform, and the VOT theoretical framework. The researchers also compared the plosive sound patterns in Sundanese and Javanese languages using a phonetic grammar approach.

In their journal article titled "Wardani and Suwartono (2019)," the authors conducted a study to investigate the difficulties faced by Javanese learners in pronouncing English sounds. The main objective of the research was to examine the specific challenges encountered by Javanese learners when pronouncing consonant and vowel sounds in English. The study took place in the Department of English Language Teaching at Universitas Muhammadiyah Purwokerto (UMP). A survey was employed as the research method, and the participants consisted of 6th and 8th semester students who had already completed courses in pronunciation and phonetics. The sample group specifically included individuals with a Javanese background. Data collection involved conducting a pronunciation test through audio recordings and interviews. The major findings of the study revealed two significant points. Firstly, Javanese learners of English faced difficulties in pronouncing 13 consonant sounds, with a particular emphasis on the challenge posed by /ʒ/. Secondly, the research identified four factors that influenced the pronunciation of English among Javanese learners: age, first language, exposure, and motivation.

Theoretical Review Language acquisition and pronunciation are crucial aspects of second language learning. For non-native speakers, the pronunciation of certain sounds can be challenging due to the influence of their native language. This study focuses on the influence of Javanese plosive sounds on the pronunciations of English plosive sound among students of English Literature. The objective of this study is to investigate the influence of Javanese plosive sounds on the pronunciations of “English” plosive sound by the students of English Literature. Kelly (2000:49) state, In terms of manner of articulation, the sound /g/ belongs to the category of plosive sounds. The theory explained by Kelly (2000:49) discusses the pronunciation of the sound /g/ at the end of words in English. According to this theory, the sound /g/ belongs to the category of plosive sounds,

meaning that it is produced by completely stopping the flow of air in the vocal tract and then releasing it abruptly. In English, the sound /g/ at the end of a word is usually still pronounced as a /g/ sound. For example, the word "dog" (/dɒg/) is pronounced with a /g/ sound at the end.

Kelly (2000:1) states phonemes are distinct sounds found in a language. While there may be minor variations how individuals produce these sounds, we can provide a reasonable accurate description of their production. Plosives are a type of sound that occurs when the vocal tract forms a complete closure, with Additionally, the velum is elevated as well. The air pressure behind the closure increases and subsequently discharged forcefully, as seen in sounds like /p/, /b/, /t/, /d/, /k/, and /g/. In our country, English is considered a foreign language, particularly in Javanese, and it is predominantly taught within the classroom. Consequently, it is rarely used for everyday communication, leading to limited exposure. This lack of exposure can present challenges for students, especially when it comes to mastering English pronunciation.

According to Pallawa (2013: 109), the /g/ sound in English often influence students experience difficulties in pronouncing this “English” words, even though the phoneme /g/ is not aspirated, as well as the phoneme /g/ in Javanese language. Javanese have very few words ending in 'g', and when does appear in the final position, many Javanese speakers will pronounce it as [k]. The relationship between Javanese and Austronesian languages: Abdullah (2007:11) states Javanese belongs to the Austronesian language family. The languages in the Austronesian family share similar characteristics in terms of phonology and pronunciation. Therefore, difficulties in pronouncing certain sounds in Javanese can also be found in other Austronesian languages. The distribution of Javanese speakers is wide, because Javanese has a long history, is used widely, and has many speakers. Speakers of the Javanese language are spread throughout the island of Java, as well as in the migration of the Javanese population to other provinces and other countries where there are Javanese settlements. As a result, variations in pronunciation and phoneme changes in Javanese can appear in various regions with different dialects. Regional influence and contact with other languages, Javanese is affected by regional influence and contact with other languages around it. This can lead to changes in pronunciation and adjustments to certain sounds, such as changing from /b/ and /d/ at the end of words to /p/ and /t/ sounds. This phenomenon can occur due to the influence of surrounding languages which have different pronunciations.

The spectrogram is a tool that can visually present energy and waveform patterns of various sounds, including those produced at the bilabial stop, alveolar stop, or velar stop places of articulation. Ladefoged (2003:131) state, the acoustic dimensions represented by F1, then F2, and F3, and also F4 in the spectrogram don’t directly correspond to the perceptual and articulatory dimensions of vowel height, vowel backness, and lip rounding. However, in the spectrogram, the waveform and formants (specifically F1, F2, F3, and F4) can provide information about these dimensions. Formant 1 primarily indicates vowel height, while Formant 2 represents both vowel backness also lip rounding.

METHOD

This study will employ qualitative research methods. Data will be collected through audio recordings of Javanese-speaking students pronouncing English words containing plosive sounds. The population of this study were 6th semester English literature students. The sampling procedure was to select a sample of 6th semester English

literature students from Madiun, Sidoarjdo, Bangil, Lamongan, Trenggalek, and Surabaya. The data collection technique used is sound recording. The data analysis procedures in this research involved the following steps:

1. Recording the participants voice
2. Save the participant's recording on the laptop
3. Identify the students pronunciations using PRAAT application
4. Showing the spectrogram, and Formant in Praat Application
5. Draw a conclusion

RESULT AND DISCUSSION

This analysis of this data has collected. Researcher present findings of the study, focus on the analysis of 9 words, 3 words for sounds /b/, 3 words for sounds /d/ and 3 words for sounds /g/. Analyze the. Specifically examine the occurrence of the phonemes /b/, /d/, and /g/ within the collected data. The analysis provides insights into the participants' language production and potential speech sound error. In this study, researchers used the Praat application as a tool to analyze differences in pronunciation between native speakers and speakers of Javanese. The researcher included spectrogram images from the Praat application as evidence to show differences in the pronunciation of /b/, /d/, and /g/ sounds between native speakers and Javanese speakers. The spectrogram provides a visual representation of the frequency spectrum of sound over time, which can be helpful in comparing the acoustic characteristics between two groups of speakers.

A. Sound /b/ "Absorb"

The word "Absorb", for participant 1 is 0.145Hz for F1, while the native speaker for F1 is 0.138Hz. There is a slight increase in Participant 1. The word "Absorb", participant 2 is 1.103Hz for F2, while native speakers F2 is 0.117Hz for F2. There is a significant difference in the frequency of form F2 between participant 2 and native speaker. For the word "Absorb," Participant 3 is 0.070Hz for F2 and 0.140Hz for F1. While Native Speaker is while the native speaker for F1 is 0.138Hz and is 0.117Hz for F2. There is a slight increase in Participant 3. For the word "Absorb," Participant 4 has a value of 1.109Hz for F2 and 0.122Hz for F1, while the native speaker has a value of 0.117Hz for F2 and 0.138Hz there is a slight increase in Participant 4. For the word "Absorb," Participant 5 has a value of 1.109Hz for F2 and 0.122Hz for F1, while the native speaker has a value of 0.117Hz for F2 and 0.138Hz for F1. Participant 5 shows higher values for both F2 and F1 compared to the native speaker. For the word "Absorb," Participant 6 has a value of 1.190Hz for F2 and 1.134Hz for F1, while the native speaker has a value of 0.117Hz for F2 and 0.138Hz for F1. Participant 6 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Absorb," Participant 7 has a value of 0.023Hz for F2 and 0.095Hz for F1, while the native speaker has a value of 0.117Hz for F2 and 0.138Hz for F1. Participant 7 shows significantly lower values for both F2 and F1 compared to the native speaker. For the word "Absorb," Participant 8 has a value of 1.109Hz for F2 and 1.543Hz for F1, while the native speaker has a value of 0.117Hz for F2 and 0.138Hz for F1. Participant 8 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Absorb," Participant 9 has a

value of 1726Hz for F2 and 1142Hz for F1, while the native speaker has a value of 0.117Hz for F2 and 0.138Hz for F1. Participant 9 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Absorb," Participant 10 has a value of 1126Hz for F1 and 1212Hz for F2, while the native speaker has a value of 0.138Hz for F1 and 0.117Hz for F2. Participant 10 shows significantly higher values for both F1 and F2 compared to the native speaker. For the word "Absorb," Participant 11 has a value of 1.211Hz for F1 and 1.123Hz for F2, while the native speaker has a value of 0.138Hz for F1 and 0.117Hz for F2. Participant 11 shows significantly higher values for both F1 and F2 compared to the native speaker.

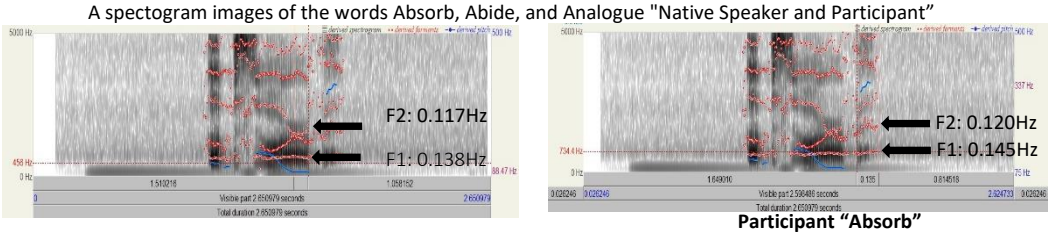
B. Sound /d/ "Abide"

For the word "Abide," Participant 1 has a value of 0.080Hz for F2 and 0.086Hz for F1, while the native speaker has a value of 0.084Hz for F2 and 0.076Hz for F1. Participant 1 shows slightly lower values for both F2 and F1 compared to the native speaker. For the word "Abide," Participant 2 has a value of 0.110Hz for F2 and 0.012Hz for F1, while the native speaker has a value of 0.084Hz for F2 and 0.076Hz for F1. Participant 2 shows higher values for both F2 and F1 compared to the native speaker. For the word "Absorb," Participant 3 has a value of 0.070Hz for F2 and 0.140Hz for F1, while the native speaker has a value of 0.084Hz for F2 and 0.076Hz for F1. Participant 3 shows slightly lower values for F2 and higher values for F1 compared to the native speaker. For the word "Abide," Participant 4 has a value of 1.129Hz for F2 and 1.122Hz for F1, while the native speaker has a value of 0.084Hz for F2 and 0.076Hz for F1. Participant 4 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Abide," Participant 5 has a value of 1.132Hz for F1 and 1.623Hz for F2, while the native speaker has a value of 0.076Hz for F1 and 0.084Hz for F2. Participant 5 shows significantly higher values for both F1 and F2 compared to the native speaker. For the word "Abide," Participant 6 has a value of 1.109Hz for F1 and 1.111Hz for F2, while the native speaker has a value of 0.076Hz for F1 and 0.084Hz for F2. Participant 6 shows significantly higher values for both F1 and F2 compared to the native speaker. For the word "Abide," Participant 7 has a value of 1.211Hz for F1 and 1.276Hz for F2, while the native speaker has a value of 0.076Hz for F1 and 0.084Hz for F2. Participant 7 shows significantly higher values for both F1 and F2 compared to the native speaker. For the word "Abide," Participant 8 has a value of 1.056Hz for F2 and 1.109Hz for F1, while the native speaker has a value of 0.084Hz for F2 and 0.076Hz for F1. Participant 8 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Abide," Participant 9 has a value of 1.121Hz for F1 and 0.982Hz for F2, while the native speaker has a value of 0.076Hz for F1 and 0.084Hz for F2. Participant 9 shows significantly higher values for both F1 and F2 compared to the native speaker. For the word "Abide," Participant 10 has a value of 1.077Hz for F2 and 1.255Hz for F1, while the native speaker has a value of 0.084Hz for F2 and 0.076Hz for F1. Participant 10 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Abide," Participant 11 has a value of 1.290Hz for F1 and 1.129Hz for F2, while the native speaker has a value of 0.076Hz for F1 and 0.084Hz for F2. Participant 11 shows significantly higher values for both F1 and F2 compared to the native speaker.

C. Sound /g/ "Analogue"

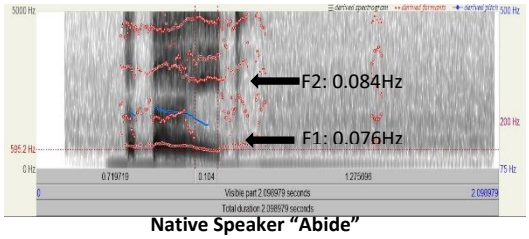
For the word "Analogue," Participant 1 has a value of 0.163Hz for both F1 and F2, while the native speaker has a value of 0.160Hz for F1 and 0.162Hz for F2. Participant 1 shows slightly higher values for both F1 and F2 compared to the native speaker. For the word "Analogue," Participant 2 has a value of 1.145Hz for F2 and 1.080Hz for F1, while the native speaker has a value of 0.162Hz for F2 and 0.160Hz for F1. Participant 2 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Analogue," Participant 3 has a value of 1.110Hz for both F1 and F2, while the native speaker has a value of 0.162Hz for F2 and 0.160Hz for F1. Participant 3 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Analogue," Participant 4 has a value of 1.180Hz for F2 and 1.169Hz for F1, while the native speaker has a value of 0.162Hz for F2 and 0.160Hz for F1. Participant 4 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Analogue," Participant 5 has a value of 1.125Hz for F1 and 1.178Hz for F2, while the native speaker has a value of 0.162Hz for F2 and 80 0.160Hz for F1. Participant 5 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Analogue," Participant 6 has a value of 1.109Hz for F1 and 1.228Hz for F2, while the native speaker has a value of 0.162Hz for F2 and 0.160Hz for F1. Participant 6 shows higher values for both F1 and F2 compared to the native speaker. For the word "Analogue," Participant 7 has a value of 1.135Hz for F2 and 1.132Hz for F1, while the native speaker has a value of 0.162Hz for F2 and 0.160Hz for F1. Participant 7 shows significantly higher values for both F2 and F1 compared to the native speaker. For the word "Analogue," Participant 8 has a value of 1.115Hz for F1 and 1.152Hz for F2, while the native speaker has a value of 0.162Hz for F2 and 0.160Hz for F1. Participant 8 shows significantly higher values for both F1 81 and F2 compared to the native speaker. For the word "Analogue," Participant 9 has a value of 1.121Hz for F1 and 1.109Hz for F2, while the native speaker has a value of 0.162Hz for F2 and 0.160Hz for F1. Participant 9 shows significantly higher values for both F1 and F2 compared to the native speaker. For the word "Analogue," Participant 10 has a value of 1.212Hz for F1 and 1.121Hz for F2, while the native speaker has a value of 0.162Hz for F2 and 0.160Hz for F1. Participant 10 shows significantly higher values for both F1 and F2 compared to the native speaker. For the word "Analogue," Participant 11 has a value of 1.134Hz for F1 and 1.143Hz for F2, while the native speaker has a value of 0.162Hz for F2 and 0.160Hz for F1. Participant 11 shows higher values for both F1 and F2 compared to the native speaker.

A spectogram images of the words Absorb, Abide, and Analogue "Native Speaker and Participant"

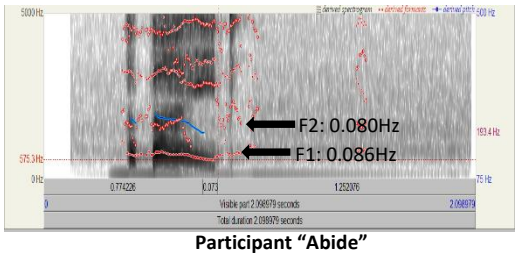


Participant "Absorb"

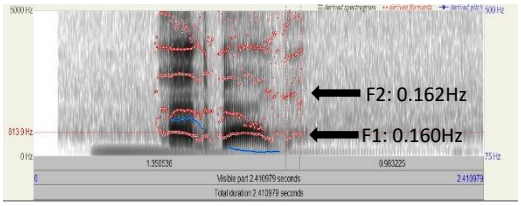
Native Speaker "Absorb"



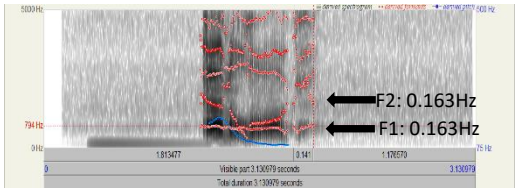
Native Speaker "Abide"



Participant "Abide"



Participant "Analogue"



Participant "Analogue"

CONCLUSION

Increase or decrease in F1 frequency, some participants showed an increase or decrease in F1 frequency compared to the native speaker. This indicates variation in the pronunciation of the observed sounds at the end of words. Increase or decrease in F2 frequency, similar to F1, some participants exhibited an increase or decrease in F2 frequency compared to the native speaker. This suggests variation in the pronunciation of the observed sounds at the end of words. Variation among participants, although there is variation among participants, not all participants exhibited similar patterns in the pronunciation of sounds at the end of words. Each participant has unique characteristics in the pronunciation and frequency values of F1 and F2. Individual influence, differences in the pronunciation of sounds at the end of words may be influenced by individual factors such as accent, language background, and personal pronunciation preferences of each participant.

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