



Formant Measurement of Indonesian Speakers in English Vowels

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This study investigated the formant measurement of Indonesian speakers in pronouncing English vowels, and aimed to calculate the average level of F1 and F2 to produce the English vowels. The participants were second-semester students at the University of Muhammadiyah Metro in Indonesia, with an age range between 20-22. The data is primarily taken from the recordings of minimal English pairs, such as look-room, cat-kate, set-seat, cut-cute, hope-hope, hall-hurl, live-leave, father-family, get-ego, bear-bar. The results revealed that the pronunciation of English vowels recorded by the Indonesian students seemed to be difficult, particularly in minimal word pairs. The Indonesian speakers found it difficult to distinguish the phonemes /i/ and /ɪ/, /ε/ and /æ/, which are almost all close to /e/ in Bahasa Indonesia. The formants of phonemes /i/, /ɪ/, /ε/, /æ/, and /ʌ/ are relatively produced higher than normal English. The production of English vowel /ʌ/ is identical to Indonesian vowel /a/ and phoneme /ɜ/ is pronounced close to /o/ /ɔ /, /ʊ/ to /u/ in Bahasa Indonesia.

Key Words: *Formant Measurement, English, Vowels, Indonesia*



Introduction

Indonesia is a Republic country in South East Asia that consists of more than seventeen thousand islands from Sabang to Merauke with a combination of land and sea areas and a population of more than 260 million people (Mulyanto, 2018). Indonesia is the Association of Southeast Asian Nations (ASEAN) most populated country and the fourth-largest country in terms of population size on earth (Zein, 2019). It comprises over 40 percent of the entire population of Southeast Asia (Jones, 2014). Indonesia is characterized by multi-ethnic variations with hundreds of different ethnic groups and cultures. There are significant numbers of distinct ethnic groups speaking roughly 2500 languages throughout over 17,000 islands of Indonesia (Paauw, 2009). Nababan (1985) claimed that there are more than 400 languages spoken in Indonesia, and it makes the archipelago diverse, which has been known as *Bhineka Tunggal Ika* which means 'unity in diversity'.

Function and Number of Speakers of Indonesian

Indonesian or Bahasa Indonesia, synonymously with modern Malay or Malay dialect, is the national language since it was declared to change from the Malay Language to Indonesian of the Republic of Indonesia in 1930. It has a function as lingua franca among thousands of different ethnic groups across the archipelago in Indonesia (Widagsa, Agung, & Putro, 2017). It also became the teaching language in schools and is used in formal settings such as news media and official matters, etc (Adisasmito-Smith, 1999; Widagsa, Perwitasari & Sari, 2018). Although the Indonesian language is infused with highly distinctive accents from different ethnic languages, there are many similarities in patterns across the archipelago (Sakti et al., 2008; Perwitasari, 2013; Wardana, 2014). Indonesian is a member of the Malayo-Polynesian (Austronesia) Language Family and remains close to Modern Indo-European language (Hanna, 1974). The linguistic history affects the large and growing vocabularies from European and Indigenous language. Hence, Indonesian is likely to be slightly different to a standard dialect of the Malay Peninsula. The Indonesian statistics census in 2010 published that the total number of Indonesian speakers is 197 million people (Badan Pusat Statistik, 2010).

Figure 1 depicted that in 2010 most people around 5 – 89 are able to speak Bahasa Indonesia. Another study mentioned that the number of Indonesian speakers is increasing significantly ever since its conception (Zein, 2019). In addition, the data published by Ethnologue (2020) mentioned that the speaking population of Indonesian as the first language has reached 23 million, while those who use it as a second language has reached 140 million (Zein, 2019). Hence, the claim of Indonesian as a national language and the usage as a superior in the various setting is undeniable.

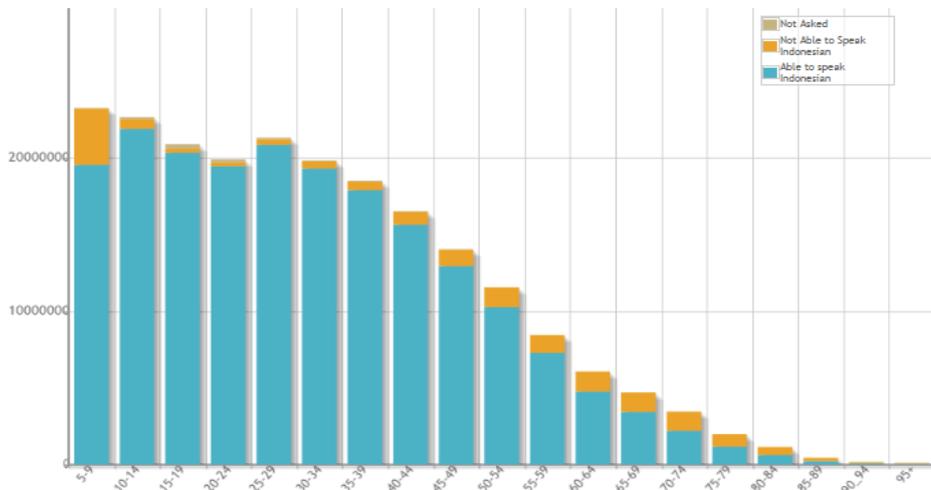


Figure 1. Population 5 Years of Age and Over by Age Group and Ability to Speak Indonesian

Indonesian Vowel System

According to Wijana (2003), the Indonesian vowel inventory is divided into the language of the six vowel system. The vowels are /i/, /u/, /e/, /o/, /a/, and /ə/. Bahasa Indonesia is divided into two different contrasting of front vowels high, higher-mid tongue position, two central mid and low tongue position, and two back vowels contrasting high and higher-mid tongue position (Tilman & Nurhayani, 2015; Zanten & Heuven, 1984).

Furthermore, Table 1 shows that the characteristics of the similarity or parallel distribution and their meaning capacity tend to be the distinctive features of the vowels. The existence of Indonesian vowels is likely to occur in the beginning, middle, and end either open or closed syllables. Vowel /a/ and /ə/ are sounds with no allophonic variation. On the other hand, the other sounds /i/, /u/, /e/, and /o/ have one allophone, /I/, /U/, /ε/, and /ɔ/. Hence, /i/ can come to realize as [i] and [I] in pipi (cheek in English) and kikIr (stingy); /u/ has realization as /u/ in kamu (you) and /U/ sumUr (well); /e/ has variation into /e/ in lele (cat fish) and /ε/ ketek (armpit); /o/ has allophone as /o/ otak (brain) and /ɔ/ təkɔh (figure) (Zanten & Heuven, 1984).

Table 1. Indonesian Vowel System

Position	Front	Central	Back
High	/i/		/u/
Lower-high			
Higher-mid	/e/		/o/
Mid		/ə/	
Lower-mid			
Higher-low			
Low		/a/	

Consonants

According to Sakti (2005), Indonesian consonants are divided into 22 sounds and shown in Table 2.

Table 2. Indonesian Consonants

	Bilabial	Labiodental	Dental/Alveolar	Palatal	Velar	Glotal
Plosives	p, b		t, d		k, g	
Affricates				c, j		
Fricatives		f	s, z	sy	kh	h
Nasal	m		N	ny	ng	
Trill			R			
Lateral			L			
Semivowel	w					

Range Distribution of Indonesian Vowels

A study conducted by Hanna (1974) and Zanten (1983) states the range distribution of the Indonesian vowels formant 1 and 2 distribution, as is illustrated in Table 3 which tests the six vowels with native Indonesian informants. The production analysis has performed a very discernable distribution for each of the vowel phonemes of Bahasa Indonesia.

Table 3. Range distribution of F1 and F2 Indonesian Vowels

Phoneme	Formant 1	Formant 2
/i/	300-500 Hz	1500-2100 Hz
/e/	400-625 Hz	1400-200 Hz
/a/	600-750 Hz	1600 – 2300 Hz
/o/	400 – 525 Hz	700 – 1000 Hz
/u/	250-350 Hz	700 – 1000 Hz
/ə/	450 - 550 Hz	1100 – 2300

Previous Studies

There are a number of studies investigating the phonemic distribution of vowels (Hawkins & Midgley, 2005; Hanna, 1974). Phonemic descriptions of Bahasa Indonesia are almost difficult to find, including spectrographic analysis. Spectrographic analysis refers to a sound of language investigation, providing an objective measure of the quality of the sound of a language (Hanna, 1974; Lestari & Tofan, 2019). It includes the qualities produced by a speaker, particularly vowels. Furthermore, an acoustic spectrograph can present a precise quality of vowels.

Hanna (1974) and Laila & Adityarini (2009) stated that Bahasa Indonesia has three front vowels contrasting high, mid, and low tongue position and two back vowels contrasting high and middle tongue position. The investigation aimed to determine a range of free variation of Bahasa Indonesian vowel phonemes, which are situated in a given phonemic environment and conditioned variation from one environment to another (Hanna, 1974; Mutiara, 2014; Wibowo, 2015).

Experimental research related to the acoustic study of Indonesian vowels was done by (Zanten & Heuven (1983). The experiment described a phonetic description of the Indonesian sound system. They argued that Indonesian consists of six monophthongs, which are /i, e, a, o, u, and ə/ (p. 70). The study revealed three results. First, in F1/F2-plane, there is hardly any overlap between the realization of six vowels in context, even when all realizations are taken into consideration. Second, vowel /ə/ seems to be a central vowel in Indonesian and appears to be a more closed vowel, with an F1 which is almost as low as the F1 of the closed vowels /i/ and /u/. Third, the /ə/ formant seems to agree with the formant /i/ and /u/. When the vowel /ə/ is counted among the closed vowels, it might fit with the fundamental frequency (p. 76).

Widagsa (2015) investigated characteristics of English vowel production of Indonesian native speakers (L2) based on formant frequencies. The study was at the University of PGRI Yogyakarta, involving 10 students in the English department who identified as Indonesian

native speaker respondents. The research included the first frequency of first formant (F1) and second formants (F2). The findings of the study, which was done by using Praat software, showed English vowel productions of English-L2 tend to be very close to the nearest Indonesian vowels. The frequency of the vowels included /i/ and /ɪ/ is identical. They ranged F1 403.5 Hz, F2 2070.4 Hz for /i/ and F1 416.5, F2 2065.5 for /ɪ/. Another characteristic, which is close to Indonesian, is the utterance of /ɒ/ and /ɔ/. Thus, the study concluded that vowel /ɒ/ seems to be more front instead of back.

Perwitasari, Klamer, & Schiller(2016) investigated the formant frequency of ten English words influenced by Javanese and Sundanese speakers. The study involved 40 speakers of Javanese (JE) and Sundanese (SE) as well as 10 American English speakers (AmE). They claimed that Javanese and Sundanese speakers should have problems in producing similar vowels such as (/ɪ, ε, ʊ/) and should not have greater L2 differences with new vowels such as (/i:, æ, α:, ɔ:, u:, ʌ, ɜ:/). The results demonstrated that Javanese speakers seemed to have different F1 and F2 values for vowels (/æ, α:, ɔ:/) when compared to the English native speakers. Otherwise, vowels (/ɪ, ʊ/) were considered to be similar vowels in the L1 vowel system. In addition, the production of vowels, either Javanese or Sundanese tended to be slightly smaller than that of the native English speakers. At the same time, a study conducted by Suyudi & Saptono (2016) is aimed to analyze vocal tract speech sound. This acoustic study was inspired by Zanten & Heuven (1983). The data were mainly taken from some informants of native and non-native speakers Bahasa Indonesia by recording technique. These informants produced vowel and consonants by two experiments, which are producing isolated vowels and vocal sounds as well as consonants based on certain words. The result showed vowel sounds were measured in isolation and in words which are then compared. The measurement of F1 and F2 has been successfully carried out by using VisArtico and Praat software. Thus, the calculation of the vocal tract has been obtained a precise value. According to Suyudi & Saptono (2016), vocal quality is specified by the levels of openness mouth. It indicates that constants variables will affect the movement. The more wide-open mouth and articulatory movement are, the longer the vowel will be.

A related study concerning acoustic analysis on English oral vowels has been done by Fata, Fitriani & Yusuf(2017). Their attention is paid to the production of English vowels produced by English teacher candidates. The participants of this study are five females and five males with ages ranging from 18-22 years of old who were born and raised in Aceh Besar, Indonesia. Praat software version 6.0.14 is chosen to analyze the wav file conversion. Finding show males tend to be higher than females in the production of English vowels. On the other hand, there is no significant difference between Acehnese males and females in producing English vowels such as /ɪ/ and /i/, /e/ and /a/, /u/ and /ʊ/, and /ɒ/ and /ɔ/.



Second language (L2) learners might face a problem when they come to learn sound productions. It involves a linguistic difference between their first (L1) and L2. Some phonetic features of L2 that do not occur in L1 tend to be a difficult factor influencing their successful L2 learning (McCallister, Flege, & Piske, 2002). Consequently, producing certain sounds might overlap in some cases. For example, Indonesian learners who speak English as a foreign language experience problems when producing English vowels. In this sense, English and Indonesian vowel systems lead to distinctive vowel production (Widagsa et al., 2017). However, this vowel production distinction can be recognized in format frequency. This argument is supported by (Peterson & Barney, 1952). They argue that format frequencies are reliable for identifying correct pronunciation and intelligibility.

As mentioned above, studies of acoustic analysis have been primary concerns over language systems that highly concentrate on vowels. This research investigation related to Indonesian native speakers producing English vowels seems rather difficult to uncover. This paper is aimed to present another view of acoustic analysis and illustrate the average range of Indonesian speakers when producing English vowels.

Methods

This experiment has conducted by analyzing voice records of the second-semester undergraduate students of the English education department of Universitas Muhammadiyah Metro in Lampung Province Sumatera. Four participants are focusing on the analysis, and they are all female students. The participants are requested to pronounce some English minimal pairs such as *look-room*, *cat-kate*, *set-seat*, *cut-cute*, *hope-hope*, *hall-hurl*, *live-leave*, *father-family*, *get-ego*, *bear-bar*. They are around 22 – 24 years of age. The vowels selected to be analyzed the comparison in producing the sounds /i/ and /ɪ/, /ɛ/ and /æ/, /ʊ/ and /ɜ/, and /ɑ/ and /ʌ/. The sound spectrogram and text grid are combined and analyzed by using Praat. At that point, the data analysis is descriptively written and illustrated in the following diagram.

Results and Discussion

Based on Praat analysis, the explanation related to the issue of formant frequency is formulated to some points. First, there is no significant difference in pronouncing phoneme /i:/, and /ɪ/. Second, Phoneme /ɛ/ tends to be pronounced as /e/ in Bahasa Indonesia. Third, some speakers changed vowel /ɛ/ to /ɪ/, and substituted /æ/ with close /ɛ/ and /e/ respectively. On the other hand, a frequent change also happens to phonemes /ɜ/ to /ɔ /, /ʊ/ to /u/ and /ɜ/ to /o/ that are close to Bahasa Indonesia. This seems to imply that their first language plays a major impact on producing vowel sounds. In this sense, the Indonesian speakers are difficult to distinguish between phonemes /i/ and /ɪ/, /ɛ/ and /æ/, which are almost close to /e/ in

Bahasa Indonesia. The formant of phonemes /i/, /ɪ/, /ɛ/, /æ/ , and /ʌ/ are higher than English. The production of English vowel /ʌ/ is seems identical to Indonesian vowel /a/ and phoneme /ɜ/ is close to /o/, /ɔ /, and /ʊ/ to /u/.

The average number of F1 and F2 Indonesian speakers when producing English vowels is various and fluctuates. It is evident that the first language is considered an influencing factor in producing a formant frequency of English vowels. The following diagram in Figure 2 illustrates how Indonesian speakers encounter some problems, even confusion when producing English vowels.

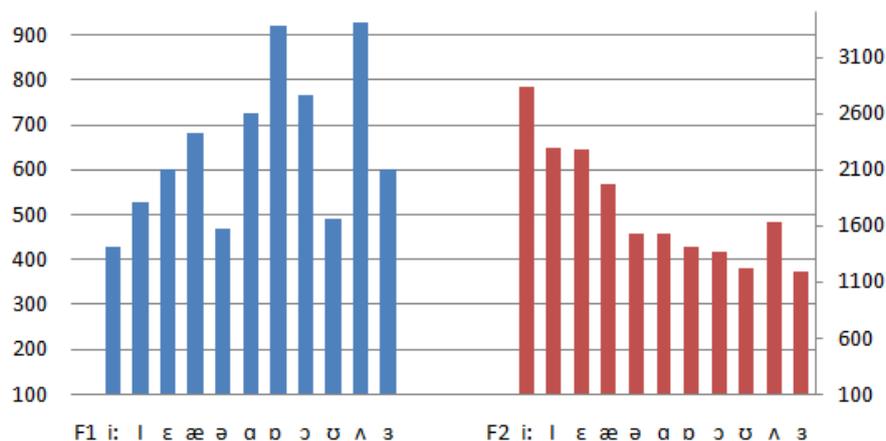


Figure 2. The Average of F1 and F2 of Indonesian Speakers

The average data of F1 and F2 performed by the students' record has shown a fluctuating chart. The categorization of the average is illustrated by each word of minimal pairs pronounced by the participants. There are precisely eleven phonemes depicted from the records. The highest average of F1 is /ɒ/ and /ʌ/ that are documented more than 900 hertz, and the lowest phonemes are /i:/, /ə/ and /ʊ/. By contrast, the phoneme /i:/ sound for F2 has reached the highest level into nearly 800 hertz followed by /ɪ/, /ɛ/ at the same level on more than 600 hertz. Besides, the /ə/, /ɑ/, /ɒ/, /ɔ/, /ʌ/ tend to locate more than 1200 hertz, and ʊ and ɜ have raised to more than 1100 hertz.

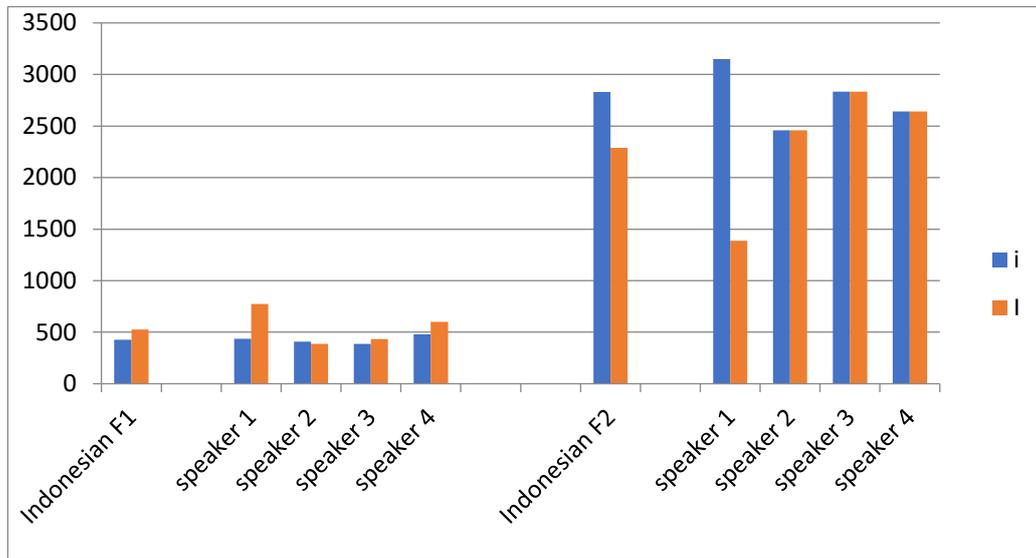


Figure 3. F1 & F2 of phoneme /i/ and /I/ produced by Indonesian Speakers

From Figure 3, there is no significant difference in pronouncing phoneme /i/ and /I/ unless the speaker 1 who stressed only in phoneme /i/. The F1 either /i/ or /I/ is relatively close to roughly 400 Hz and 500 Hz. The F2 shows /i/ is 2500 Hz and /I/ is less than 3000 Hz.

In Figure 4, Phoneme /ε/ tends to be pronounced as /ε/ in Bahasa Indonesia. Speaker 3 has changed the phoneme /ε/ to /I/, substituted /æ/ with close /ε/ and /e/ respectively. The F1 of vowel /ε/ tends to be more than 500 Hz, and it is relatively similar to /æ/ which is less than 800 Hz. The F2 shows that vowels /ε/ and /æ/ reach the highest level more than 2500 Hz and 2300 Hz, respectively.

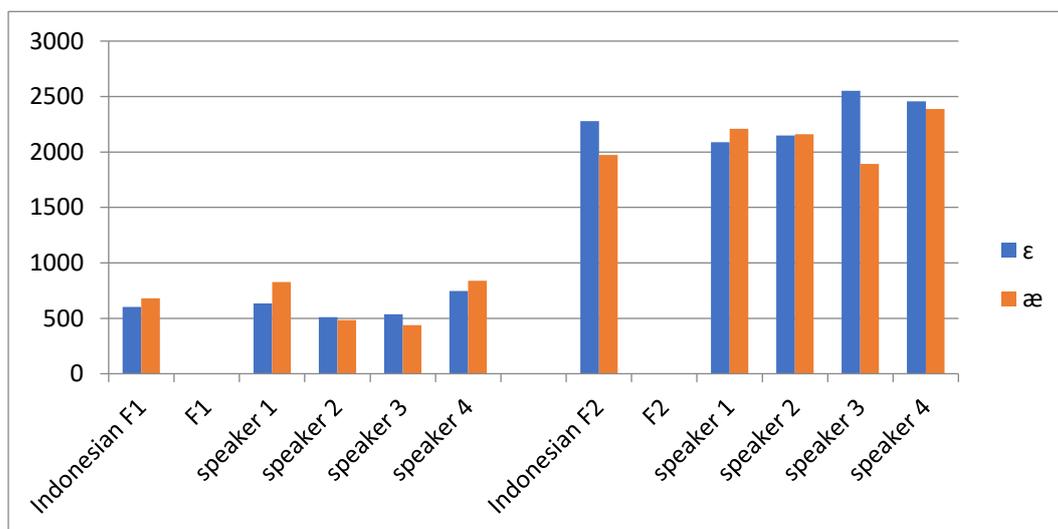


Figure 4. Phoneme /ε/ & /æ/

From Figure 5, the speaker of 1, and 3 seem to change /ɔ/ to /ɔ̃ /, /ʊ/ to /u/ and /ɜ/ to /o/ that are close to Bahasa Indonesia. It indicates that the first language has an impact on producing the sounds. The F1 of vowels /ʊ/ and /ɜ/ are estimated 500 Hz and 600 Hz. On the other hand, a fluctiative chart has shown by both sounds for F2, which is related to 1200 Hz.

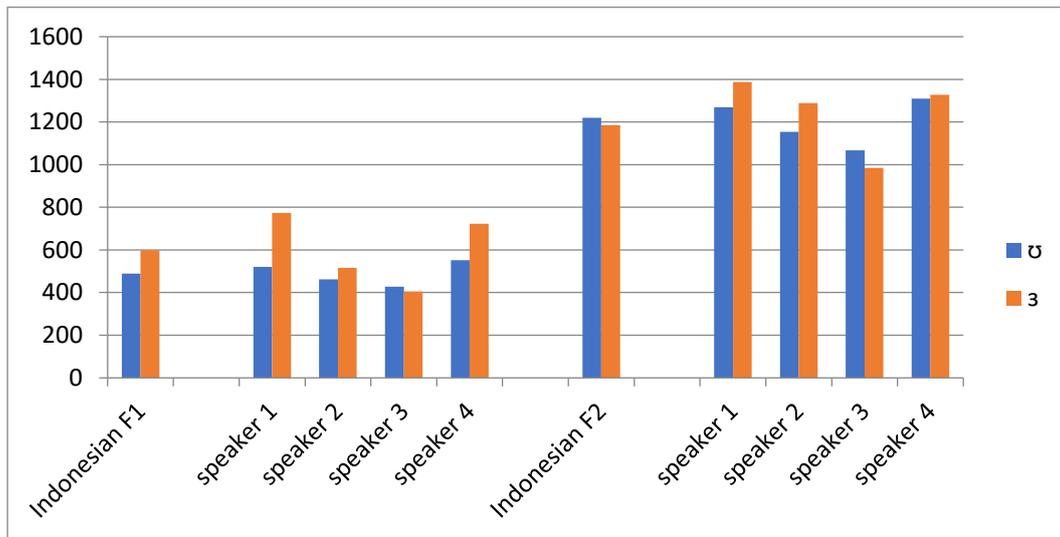


Figure 5. F1 & F2 of /ʊ/ and /ɜ/

Ultimately, the Figure 6 shows comparison between vowels /ɑ/ & /ʌ/. It does not tend to overlap each other. The F1 average of vowels /ɑ/ tends to close 700 Hz, while /ʌ/ is nearly 1000 Hz. The F2 formant of vowels /ɑ/ & /ʌ/ has the same pattern, which does not have a significant difference between 1500 Hz and 1600 Hz.

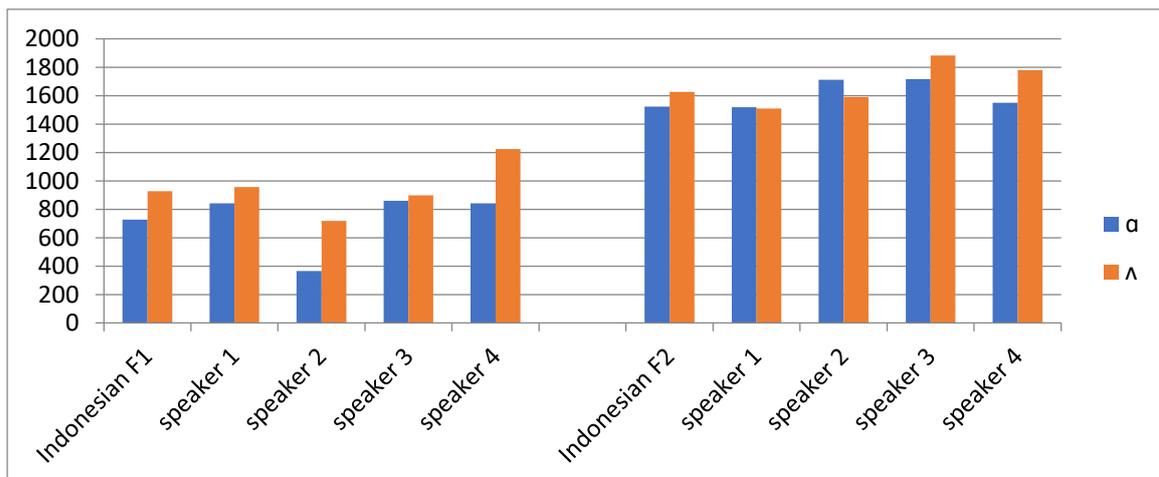


Figure 6. Phoneme /ɑ/ & /ʌ/



Conclusion

Bahasa Indonesia has six vowel inventories /i/, /u/, /e/, /o/, /a/, and /ə/ and tend to be simple language. Besides, Bahasa Indonesia is divided into two different contrasting of front vowels high, higher-mid tongue position, two central mid and low tongue position, and two back vowels contrasting high and higher-mid tongue position. However, the production of vowels of English recorded by the Indonesian students seems to be difficult particularly in pronouncing the minimal word pairs. The Indonesian speakers are difficult to distinguish the phonemes /i/ and /ɪ/, /ε/ and /æ/, which are almost all close to /e/ in Bahasa Indonesia. The formants of phonemes /i/, /ɪ/, /ε/, /æ/ , and /ʌ/ are relatively produced higher than normal English. The production of English vowel /ʌ/ is identical to Indonesian vowel /a/ and phoneme /ɜ/ is pronounced close to /o/ /ɔ /, /ʊ/ to /u/ in Bahasa Indonesia. A further study is suggested to take place in different group study and quantity to be able to provide accuracy and performance. In addition, an effective tool is needed to be applied to receive better sound quality. Hence, the data are examined appropriately and accurately.



References

- Adisasmito-Smith, N. (1999). Influence Of Javanese Vowel Patterning On Indonesian : An Acoustic Investigation. In *14th international Congress of Phonetic Sciences* (pp. 1109–1112). San Fransisco, California: ICPH-14.
- Badan Pusat Statistik. (2010). Penduduk Berumur 5 Tahun Keatas Menurut Kelompok Umur dan Kemampuan Berbahasa Indonesia. Retrieved from <https://sp2010.bps.go.id/index.php/site/tabel?search-tabel=Penduduk+Berumur+5+Tahun+Keatas+Menurut+Kelompok+Umur+dan+Kemampuan+Berbahasa+Indonesia&tid=283&search-wilayah=Indonesia&wid=0000000000&lang=id>
- Ethnologue. (2020). Indonesian. Retrieved January 19, 2020, from <https://www.ethnologue.com/language/ind>
- Fata, I. A., Fitriani, F., Mohammad, T., & Yusuf, Y. Q. (2017). Acoustic Analysis on English Oral Vowels Produced by Acehnese Speakers from Aceh Besar by Using PRAAT Software. *Proceedings of AICS-Social Sciences*, 7, 591-596.
- Hanna, I. T. (1974). *A Spectrographic Analysis of Bahasa Indonesia Vowel Phonemes Under Primary Stress in CVC Words*. Portland State University.
- Hawkins, S., & Midgley, J. (2005). Formant frequencies of RP monophthongs in four age groups of speakers. *Journal of the International Phonetic Association*, 35(2), 183-199. <https://doi.org/10.1017/S0025100305002124>
- Jones, G. W. (2014). *The 2010-2035 Indonesian Population Projection*. Singapore.
- Laila, M., & Adityarini, H. (2009). *Kualitas Pengucapan Bunyi Bahasa Inggris Oleh Pemelajar Bahasa Inggris Yang Berlatar Belakang Bahasa Jawa Di Surakarta* (Doctoral dissertation, LPPM UMS).
- Lestari, R. F., & Tofan Dwi Hardjanto, M. A. (2019). *Akurasi dan Keberterimaan Pelafalan Vokal Belakang Bahasa Inggris oleh Mahasiswa Indonesia: Studi Kasus Mahasiswa Prodi Bahasa Inggris, IKIP Budi Utomo Malang* (Doctoral dissertation, Universitas Gadjah Mada).
- Mcallister, R., Flege, J. E., & Piske, T. (2002). The influence of L1 on the acquisition of Swedish quantity by native speakers of Spanish , English, and Estonian. *Journal of Phonetics*, 30, 229–258. <https://doi.org/10.1006/jpho.2002.0174>
- Mulyanto, J., Kringos, D. S., & Kunst, A. E. (2018). Socioeconomic inequalities in healthcare utilization in Indonesia: a comprehensive survey-based overview. *BMJ Open*, 9(7). <https://doi.org/10.1136/bmjopen-2018-026164>
- Mutiara, R. (2014). *Analisis Kesalahan Pelafalan pada Vokal Murni Bahasa Inggris oleh Petugas Customer Service Center di Bandara Juanda* (Doctoral dissertation, Universitas Brawijaya).
- Nababan, P. W. J. (1985). Bilingualism in Indonesia: Ethnic Language Maintenance and the Spread of the National Language. *Southeast Asian Journal of Social Science*, 13(1), 1–18. <https://doi.org/10.1163/080382485X00020>



- Paauw, S. (2009). One land, one nation, one language: An analysis of Indonesia's national language policy. *University of Rochester Working Papers in the Language Sciences*, 5(1), 2-16.
- Perwitasari, A. (2013). Slips of the ears: Study on vowel perception in Indonesian learners of English. *Jurnal Humaniora*, 25(1), 103-110.
- Perwitasari, A., Klamer, M., & Schiller, N. O. (2016). Formant Frequencies and Vowel Space Area in Javanese and Sundanese English Language Learners. *The Southeast Asian Journal of English Language Studies*, 22(3), 141–152. <https://doi.org/10.17576/3L-2016-2203-10>
- Peterson, G. E., & Barney, H. L. (1952). Control Methods Used in a Study of the Vowels. *The Journal of the Acoustical Society of America*, 24(2), 175–184. <https://doi.org/10.1121/1.1906875>
- Sakti, S., Kelana, E., Riza, H., Sakai, S., Markov, K., & Nakamura, S. (2008). Development of Indonesian large vocabulary continuous speech recognition system within A-STAR project. In *Proceedings of the Workshop on Technologies and Corpora for Asia-Pacific Speech Translation (TCAST)*.
- Sakti, S., Markov, K., & Nakamura, S. (2005). Rapid Development of Initial Indonesian Phoneme-based Speech Recognition Using The Cross-Language Approach. In *Proc. Oriental COCODA*, 38–43.
- Suyudi, I., & Saptono, D. (2016). Indonesian Formants In Acoustic Analysis. *Asian Journal of Basic and Applied Sciences*, 3(2).
- Tilman, R. D. C., & Nurhayani, I. (2015). Kesalahan Pengucapan Vokal Depan Bahasa Inggris Oleh Mahasiswa Semester I Universitas Nasionaltimor Lorosa'e. *LITE: Jurnal Bahasa, Sastra, dan Budaya*, 11(2).
- Wardana, I. K. (2014). Kesalahan Artikulasi Phonemes Bahasa Inggris Mahasiswa Prodi Bahasa Inggris Unmas Denpasar; Sebuah Kajian Fonologi Generatif. *Jurnal Bakti Saraswati (JBS)*, 3(02).
- Wibowo, A. H. (2015). Permasalahan Pengucapan Bunyi Vokal Bahasa Inggris.
- Widagsa, R. (2015). Acoustic Analysis of English Vowel Formant Frequencies Produced by Indonesian Native Speakers. In C. Kristiyani, C. Tutyandari, B. Barm, Y. A. Iswandari, L. Sumarni, & T. A. Pasaribu (Eds.), *The 2nd International Language and Language Teaching Conference*. Yogyakarta: Sanata Dharma University.
- Widagsa, R., & Putro, A. A. Y. (2017). Acoustic Measurement On Vowel Production Of English As A Second Language By Indonesian EFL Learners. *English Review: Journal of English Education*, 6(1), 71-80. <https://doi.org/10.25134/erjee.v6i1.772>.
- Widagsa, R., Perwitasari, A., & Sari, M. K. (2018). Vowel Space Area of Minangkabau Learners of English. *Language Circle: Journal of Language and Literature*, 12(2), 153-164. <https://doi.org/10.15294/lc.v12i2.14174>
- Wijana, I. D. P. (2003). Indonesian Vowels and Their Allophones. *Jurnal Humaniora*, 15(1),



39-42.

- Zanten, E. V. A. N., & Heuven, V. J. V. A. N. (1983). A Phonetic Analysis of the Indonesian Vowel System: A Preliminary Acoustic Study. *NUSA, Linguistic Studies of Indonesian and Other Languages in indone-sia*, 15, 70–80.
- Zanten, E. V. A. N., & Heuven, V. J. V. A. N. (1984). The Indonesian vowels as pronounced and perceived by Toba Batak, Sundanese and Javanese speakers. *Bijdragen tot de Taal-, Land-en Volkenkunde*, (4de Afl), 497-521.
- Zein, S. (2019). English, Multilingualism and Globalisation In Indonesia A Love Triangle: Why Indonesia should move towards multilingual education. *English Today*, 35(1), 48–53. <https://doi.org/10.1017/S026607841800010X>