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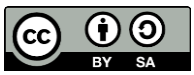

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The Prosody of Arabic Interrogative Speech (An Acoustic Phonetic Study)

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Abstract

Prosody provides essential information regarding intonation, emotion, and the physiological characteristics of speakers. In communication, dialects often influence the intonation patterns used in interrogative utterances. This study aims to analyse the prosody of Arabic spoken by native and non-native speakers, using an acoustic-phonetic approach in a case study involving gender and ethnic variations between Sundanese and Javanese speakers, which have been underexplored in previous research. The prosodic features in this study are limited to pitch frequency, duration, and speech intensity. The data consists of two yes/no interrogative sentences analyzed using Praat software version 6.4.13. The results reveal differences in speech duration between native and non-native speakers, with native speakers exhibiting shorter durations. Regarding pitch contours, Javanese male speakers produce relatively flat frequencies at the end of sentences. Additionally, Sundanese female speakers demonstrate the lowest intensity among the participants. This study contributes to a deeper understanding of Arabic prosody in native and non-native speakers, serves as a reference for developing contextual teaching methods for non-native learners in Indonesia, and enriches the literature on acoustic phonetics in the context of ethnic differences in language speakers.

Keywords: *Arabic speech, Interrogative, Non-native speakers, Prosody*

Introduction

In linguistics, prosody provides information regarding a speaker's intonation, emotions, and physiological characteristics, represented through suprasegmental features. Prosodic or suprasegmental features consistently accompany segmental elements in speech.

These features include pitch (tone), loudness (stress), length (tempo), and pauses (juncture) that accompany utterances (Yustanto et al., 2016; Ningsih, 2020; Kuswantari et al., 2022).Interrogative utterances often reflect how dialects are carried over in communication (Zuiko & Savitri, 2022). According to Kridalaksana (2008), an interrogative speech is an utterance that aims to ask the interlocutor something. In written form, it is usually marked with a question mark (?).

The primary goal of interrogative speech is to elicit a response or an answer from the listener. Arabic interrogative sentences are categorized into four types: yes/no questions, Wh-questions, indirect questions, and rhetorical questions (Badawi et al., 2015).

Effective communication relies on a speaker's ability to convey messages. Proper prosody ensures that the intended message is well understood by the listener, whereas improper prosody may lead to misunderstandings or incorrect interpretations of intent (Gunawan, 2019; Salji et al., 2024). Therefore, speakers and listeners must consider several factors to facilitate smooth communication. As stated by Pike (1972), differences in tone configuration can imply changes in how speakers or sentences relate to their environment. Such differences highlight the unique characteristics of spoken language, which are not the same as written language. Speaking skills involving linguistic elements include accurate pronunciation, proper placement stress, intonation, articulation, appropriate duration, word choice, and precision of the intended message.

Arabic and Indonesian significantly differ, including phonology, morphology, syntax, and semantics (Umroh, 2018; Agustina & Bidari, 2021; Maulani et al., 2022). Furthermore, learners of Arabic in Indonesia study Arabic after becoming proficient in some dominant languages beforehand. Linguistically, the first language or mother tongue can influence speakers when using a second or third language. The resulting influence can be language contact, code-switching, code-mixing, grammar, and linguistic interference (Amatullah & Aziza, 2020; Thohir, 2021; Saou & Hoadjli, 2022).

Jamil and Silvana (2017) previously researched Arabic speech in Indonesia, focusing on a comparative analysis of acoustic duration in declarative and imperative utterances between Arabic learners and native speakers. Their findings indicated that native Arabic speakers exhibited a greater fundamental frequency in declarative and imperative sentences. In the same year, Jamil (2017) examined the frequency structure in Arabic learner and native speaker utterances, revealing that Arabic learners in Medan lacked proper tempo or duration compared to native speakers due to differences in vowel length within Indonesian speech. Subsequently, Utami (2023) analyzed the intonation patterns of interrogative sentences among 10th-grade students in the context of mahārah kalām learning, focusing on the intonation patterns of student utterances involving nominal words.

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Recent research has provided new insights into Arabic prosody. Hellmuth (2022) examined sentence prosody and register variation, revealing how F0, intonation, and linearization adjust across different speech registers. El Zarka (2024) analyzed prosodic patterns in Egyptian Arabic under various information structures, highlighting the role of prosody in signaling focus and thematic elements. Additionally, Abdel-Hamid (2020) explored prosodic features in bilingual Arabic-English speech, demonstrating how pitch, intensity, and speech rate convey emotions such as anger and happiness.

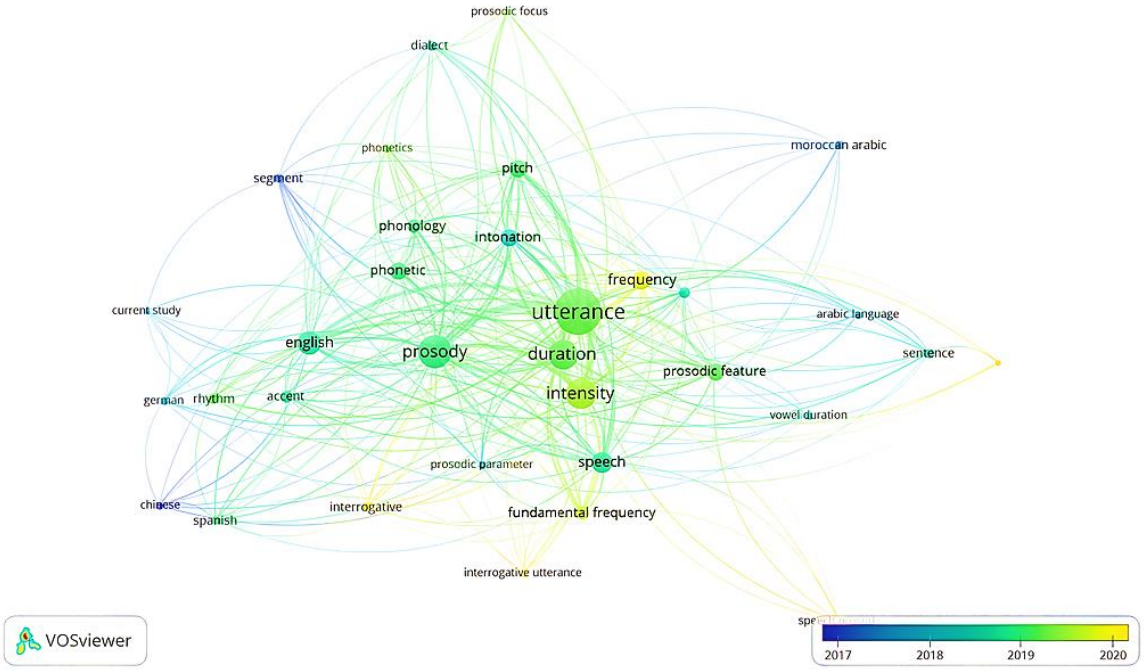

Figure 1.1 Overlay Visualization References

Based on a bibliometric analysis using the VOS Viewer Version 1.6.20 application, as illustrated in Figure 1.1 with keywords such as utterance, prosody, frequency, duration, intensity, and acoustic phonetics from Google Scholar via Harzing's Publish or Perish software (2014-2024) identified 479 publications, indicating extensive research on prosodic, phonetic, and other acoustic characteristics across various languages. However, the keyword Arabic language appears on the network's periphery, indicating that Arabic as a research subject may still need to be deeply explored, particularly in the prosody of interrogative speech. The keyword network also highlighted extensive exploration of other languages, such as English, German, Spanish, and Chinese. It revealed a need for comparative analysis between Arabic and regional languages in Indonesia. It presented an opportunity to analyze prosodic differences between native Arabic speakers and speakers from diverse ethnic backgrounds or other languages.

This study aims to fill the gap by analysing the differences and similarities in the prosody of Arabic interrogative speech in yes/no question types between native Arabic speakers NM and NF and non-native speakers JM, JF, SM, and SF from Sundanese and Javanese tribes, which have not received much attention in previous studies. The Javanese and Sundanese ethnic groups represent two of the largest ethnic groups in Indonesia, each with distinctive phonetic and prosodic characteristics, particularly in terms of intonation, stress, and sound duration. Additionally, the study compares male and female speakers to uncover gender and ethnicity-based prosodic features. The research focuses on three primary aspects: (1) interrogative speech frequency, (2) interrogative speech duration, and (3) speech intensity. These aspects serve as a reference for developing contextual Arabic teaching methods within linguistics by addressing stress, tone, and duration appropriate for Arabic speech. By exploring these aspects, the research aims to provide a reference for developing more contextually appropriate Arabic teaching methods within linguistics, specifically regarding pitch, stress, and duration in spoken Arabic, and to contribute to the literature on acoustic-phonetic studies within the context of ethnic diversity among speakers. The following research questions guide the study:

1. How does gender influence prosodic patterns (pitch frequency, duration, and intensity) in Arabic interrogative speech for native and non-native speakers?
2. How does ethnicity (Sundanese and Javanese) affect non-native speakers' prosodic features (pitch frequency, duration, and intensity) in Arabic interrogative speech?

By addressing these questions, this study seeks to enrich the understanding of Arabic prosody and its interaction with sociolinguistic factors such as gender and ethnicity.

Method

The research method employed is a comparative qualitative study with a case study approach focusing on acoustic-phonetic analysis to examine the differences and similarities in the prosody of Arabic interrogative speech between native and non-native speakers. The recording was done using a mobile phone recording, and the data was recorded in a controlled environment to minimize background noise. The data used consisted of waveform audio format (wav) recordings containing 12 audio samples of interrogative sentence pronunciations, analyzed using Praat 6.4.13 software to determine values for fundamental frequency (Hz), duration (s), and intensity (dB). Researchers chose Praat software for its ability to quickly generate visualizations of sound waves and spectrograms from audio recordings (Winn, 2020; Ali et al., 2023; Schoenherr et al., 2023)

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The researchers used the purposive sampling technique to select samples, applying criteria that included a Native Male speaker (NM) and a Native Female speaker (NF) from Egypt, aged 22-27 years. This age range was chosen based on language proficiency corresponding to the cognitive development phase of adolescence to early adulthood or the formal operational stage (Parnawi, 2021). The study selected Egyptian native speakers due to the widespread influence of Arabic pronunciation in education, media, and international communication. Furthermore, speakers from Egypt have clarity and stability in intonation, which supports prosodic analysis. Table 1.1 outlines the specific criteria for non-native speakers.

Table 1.1. Non-native Speaker Criteria

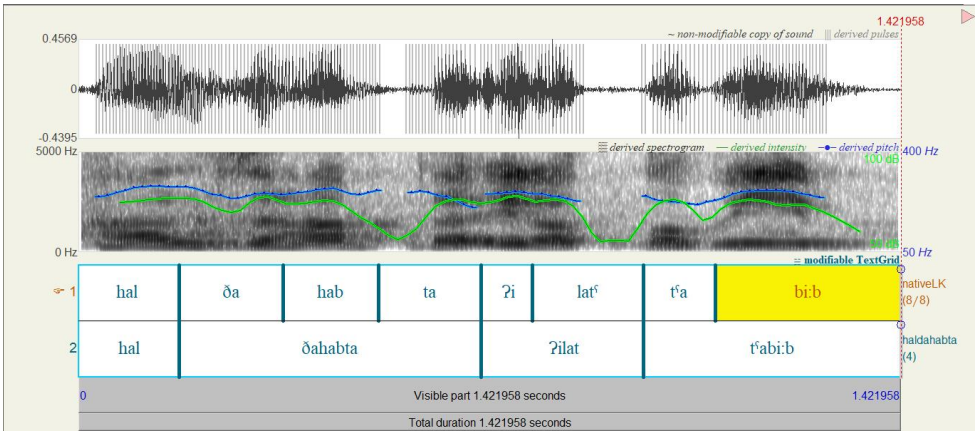
Speaker	Ethnicity	Gender	Age	Highest Educational Level	Arabic learning experience
JM	Javanese	Male	27	High School	3 years
SM	Sundanese	Male	24	High School	6 years
JF	Javanese	Female	22	High School	6 years
SF	Sundanese	Female	24	High School	6 years

The selected age range aligns with the comparative data gathered from native speakers, NM (24 years), and NF (22 years), minimizing the influence of changes associated with older or younger age groups. The inclusion of gender aims to analyze potential differences in prosody between male and female speakers, both among native speakers and non-native speakers. By incorporating gender as a factor, this study seeks to provide a more comprehensive understanding of gender's influence on the prosody of Arabic interrogative speech. The researchers also accounted for educational level and Arabic language learning experience to reduce data variability.

The selected interrogative sentences are two yes/no questions: هَل ذَهَبْتَ إِلَى الطَّبِيب ؟hal ðahabta ʔila:tˤtˤabi:b), meaning 'Have you gone to the doctor?' and أهذِهِ السَيَّارَة جَدِيدَة؟(ʔha:ðihissajja:rah ʒadi:dah), meaning 'Is this car new?'. These sentences represent varied phonetic structures and are commonly used in daily conversations, making them easier for non-native speakers to pronounce. The researchers also based the sentence selection on sound length and stress variation considerations, peessential for analyzing prosody in interrogative speech.

Results and Discussion

A. hal ðahabta ʔilaˤtˤabi:b



Spectrogram 1.1 hal ðahabta ʔilatˤtˤabi:b by NM in Praat program

Spectrogram 1.1 visualizes the yes/no interrogative sentence in Arabic *hal ðahabta ʔilatˤtˤabi:b* produced by a male native speaker NM using the Praat program. The blue line represents the frequency of the utterance, while the yellow line indicates its intensity.

a. Pitch Frequency Analysis

Frequency relates to the high or low pitch of speech and is associated with the vibration of the vocal cords, ultimately referred to as phonation. The frequency represented in Hertz (Hz) reflects the number of cycles occurring per second. Fundamental frequency or base frequency is the lowest frequency of a periodic waveform perceived by the eardrum (Irawan & Arawinda Dinakaramai, 2019). Speech frequency results consist of fundamental frequency and pitch contour. The fundamental frequency value within a waveform can illustrate pitch contour in units of Hertz (Hima et al., 2022).

Table 1.1 Fundamental Frequency hal ðahabta ʔilaˤtˤabi:b

Speaker	Hertz (Hz)
NM	165.55 Hz
JM	124.72 Hz
SM	120.27 Hz
NF	239.71 Hz
JF	275.66 Hz
SF	264.58 Hz

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Based on Table 1.1, the fundamental frequency F0 values for male speakers indicate that the native speaker NM exhibits a higher fundamental frequency of 165.55 Hz compared to the non-native speakers from Javanese JM at 124.72 Hz and Sundanese SM at 120.27 Hz. The frequencies of JM and SM fall within the typical range of fundamental frequency for adult males in everyday speech, around 120 Hz (Karenina et al., 2023).

Regarding female speakers, the fundamental frequency produced by the native speaker NF is lower at 239.71 Hz. In comparison, the Javanese speaker JF exhibits a higher frequency at 275.66 Hz, and the Sundanese speaker SF demonstrates a slightly lower frequency at 264.58 Hz. These frequencies align with the average range for women, who generally produce a higher fundamental frequency than men, approximately 210 Hz (Shafhah et al., 2020). The Javanese female speaker JF exhibited the highest frequency at 275.66 Hz. This finding is consistent with Jamil's study (2017), which revealed that female Arabic language learners in Medan tend to have higher frequencies in interrogative speech.

The Praat application can convert frequency into a pitch contour by using its pitch analysis feature to illustrate intonation in speech. This feature is instrumental in illustrating the nuances of intonation in speech. Figures 1.1, 1.2, and 1.3, generated using Praat, depict male speakers' pitch contours.

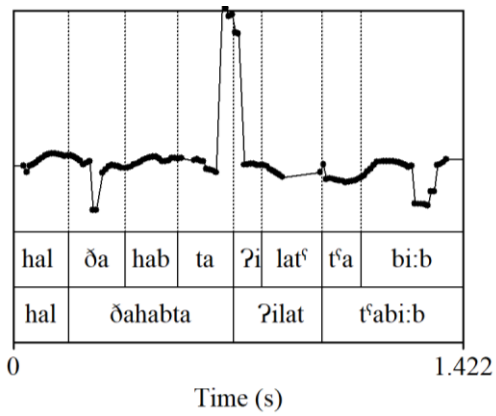

Figure 1.2
The Pitch Contour of NM

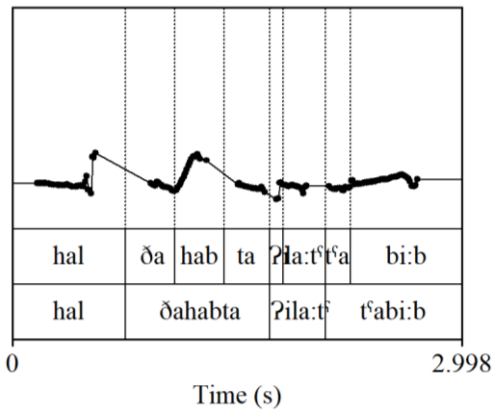

Figure 1.3
The Pitch Contour of JM

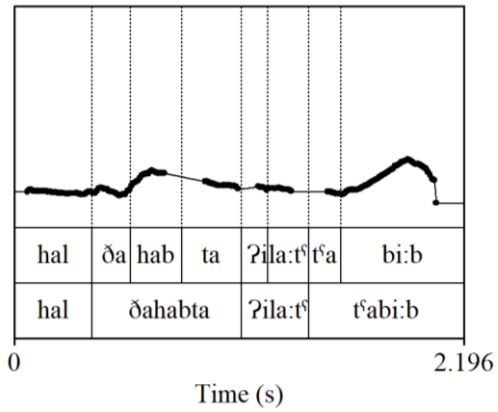

Figure 1.4
The Pitch Contour of SM

The pitch contours in Figure 1.2, Figure 1.3, and Figure 1.4 reveal significant differences between male speakers. In Figure 1.2, native speaker NM demonstrates an increasing pitch pattern at the end of the sentence, indicating the use of more dynamic intonation compared to the two non-native speakers. Figure 1.3 illustrates the pitch flow of non-native speaker JM from the Javanese ethnic group, showing pitch variations that tend to remain flat at the end of the utterance. In Figure 1.4, the pitch flow of non-native speaker SM from the Sundanese ethnic group exhibits more stable tone characteristics, slightly increasing in the middle before dropping at the end.

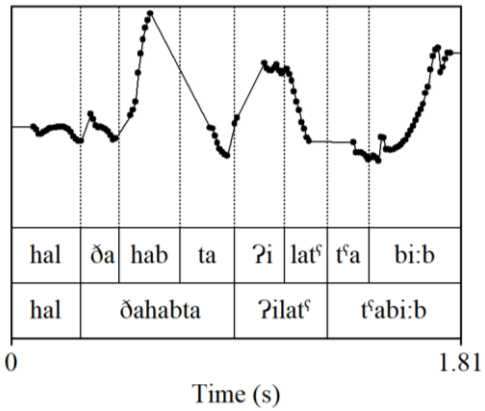

Figure 1.5
The Pitch Contour of NF

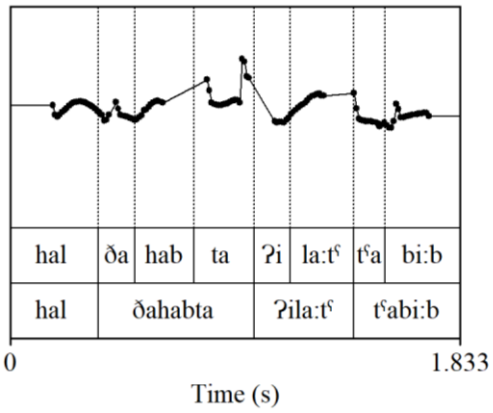

Figure 1.6
The Pitch Contour of JF

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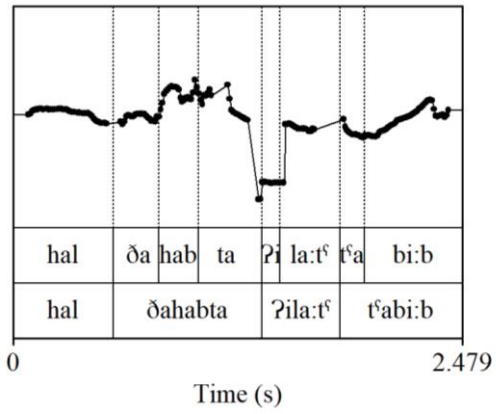

Figure 1.7
The Pitch Contour of SF

Figures 1.5, 1.6, and 1.7 illustrate the pitch contours produced by female speakers. Figure 1.5 illustrates that the native speaker NF exhibits a significant pitch rise in the middle of the sentence, particularly on the word *ðahabta*, culminating in a higher pitch peak on the final word *taˤbiːb*. In Figure 1.6, the Javanese speaker JF demonstrates a more dynamic pitch increase as Javanese intonation typically features a more varied up-and-down pattern. Meanwhile, in Figure 1.7, the Sundanese speaker SF exhibits a sharp intonation shift, with a significant pitch drop in the middle of the sentence before rising again.

In Figure 1.3, the interrogative utterance by Javanese speaker JM has a flat ending. Figure 1.6, Javanese speaker JF shows a slight rise in the final syllable. This pitch pattern differs from Ardini & Sunarya's research (2024), which noted that Javanese speakers use a high pitch at the end of sentences when speaking English, even when the sentence is not a question. These results suggest that, despite not being interrogative sentences, the influence of the Javanese mother tongue can still affect the intonation patterns used in English speech.

a. Duration Analysis

Duration refers to the length or quantity of time a sound is pronounced. Sound duration is an essential acoustic aspect in phonetic analysis because it provides information about pronunciation, rhythm, and linguistic structure (Narhan et al., 2023).

Table 1.3 Duration hal ðahabta ʔilatˤtˤabiːb

Speaker	**Millisecond (ms)**
NM	1.42 ms
JM	2.99 ms
SM	2.20 ms

NF	1.81 ms
JF	1.83 ms
SF	2.48 ms

The duration produced by male speakers, as shown in Table 1.3, reveals a significant difference between native and non-native speakers. The Arabic native speaker NM has the shortest duration of 1.42 ms, while the Javanese male speaker JM has the most prolonged duration at 2.99 ms. Among female speakers, the speech duration also shows variations within a closer range. The native female speaker NF exhibits the shortest duration of 1.81 ms, whereas the Sundanese female speaker SF has a longer duration of 2.48 ms compared to others.

The duration variations in Table 1.3 indicate that Javanese male speakers take more time to produce utterances than native Arabic and Sundanese speakers. The speaker's mother tongue may influence this phenomenon. Previous studies by Yustanto (2016) and Pranoto (2018) noted that the everyday speech duration of Javanese male speakers tends to be longer than that of female speakers, which may reflect broader language patterns.

b. Intensity Analysis

Intensity is associated with the loudness or volume of a person's voice when speaking. Its acoustic characteristic is measured in decibels or dB (Sitanggang, 2022).

Table 1.4 Intensity hal ðahabta ʔilaˤtˤabi:b

Speaker	**decibel (dB)**
NM	73.72 dB
JM	75.07 dB
SM	71.87 dB
NF	71.75 dB
JF	68.03 dB
SF	62,69 dB

The vocal intensity of the male group, as presented in Table 1.4, shows distinct variations between the Arabic native speaker NM and the non-native speakers from Javanese JM and Sundanese SM backgrounds. The Sundanese speaker SM exhibits the lowest intensity at 71.87 dB, slightly lower than the Javanese speaker JM at 75.07 dB and the native speaker NM at 73.72 dB. These differences suggest that Javanese male speakers tend to produce more intense speech than Arabic native speakers and Sundanese speakers. The average intensities fall within the speech level range of 66–75 Db (Koffi, 2020), typically used in verbal communication to

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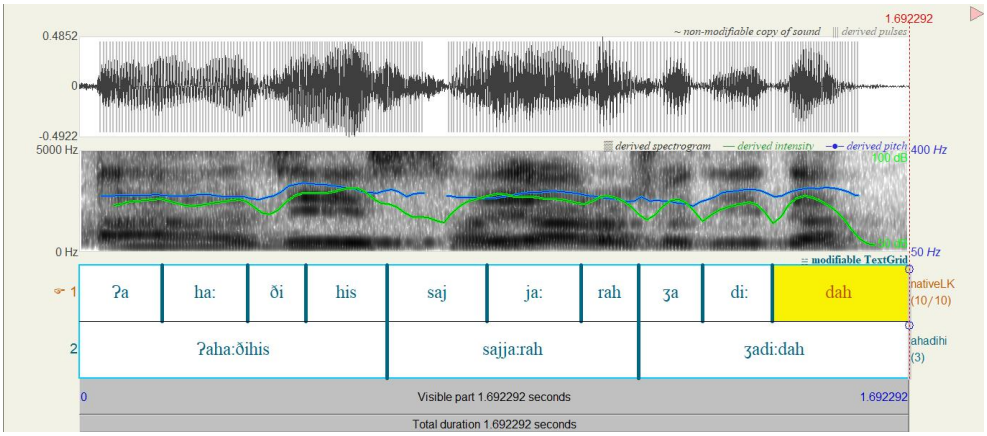
ensure messages are conveyed to listeners while remaining within the normal range for everyday conversations. The observed variation suggests that male speakers use sufficient vocal intensity to produce clear and compelling interrogative utterances.

For the female group, variations in intensity are also observed but follow a different pattern. The native female speaker NF demonstrates the highest intensity at 71.75 dB. The Javanese female speaker JF produces a moderate intensity at 68.03 dB, while the Sundanese female speaker SF exhibits the lowest intensity at 62.69 dB. The comparison indicates that native female speakers of NF tend to produce more intense speech than non-native speakers from Javanese and Sundanese backgrounds.

B. ʔaha:ðihissajja:rah ʒadi:dah



Spectrogram 1.2 ʔaha: ðihissajja:rah ʒadi:dah by NM in Praat program

Spectrogram 1.2 shows the analysis results of yes/no interrogative sentence in Arabic ʔaha:ðihissajja:rah ʒadi:dah speech in the Praat program by NM speakers, which includes spectrogram, pitch, intensity, duration, and word segmentation.

b. Pitch Frequency Analysis

Table 1.5 illustrates the fundamental frequency male and female speakers produce when pronouncing the phrase ʔaha:ðihissajja:rah ʒadi:dah. Among the male speakers, there is a notable variation in frequency between the Arabic native speaker NM and the non-native speakers from Javanese JM and Sundanese SM backgrounds. The male native speaker NM produces a frequency of 162.88 Hz. The Javanese male speaker JM produces a slightly lower frequency of 129.67 Hz, which falls within the typical adult male fundamental frequency range. Meanwhile, the Sundanese male speaker SM exhibits the lowest frequency at 97.79 Hz.

Table 1.5 Fundamental Frequency ʔaha:ðihissajja:rah ʒadi:dah

Speaker	Hertz (Hz)
NM	162.88 Hz
JM	129.67 Hz
SM	97.79 Hz
NF	223.85Hz
JF	265.85 Hz
SF	271.93 Hz

Female speakers had higher frequencies than male speakers because adult men tend to have a lower pitch range than adult women (Abdel-Hamid, 2020). The frequency difference in the female group is still within the general range for adult female voices. Sundanese female speaker SF recorded the highest frequency at 271.93 Hz, while Javanese female speaker JF had a slightly smaller frequency at 265.85 Hz, and the lowest frequency by Native speaker NF was 223.85 Hz. The much higher frequencies in non-native speakers indicate that they tend to produce louder sounds. The higher frequencies observed in non-native speakers might result from how non-native speakers adopt and adapt Arabic intonation to the vowel characteristics influenced by their home language. The variation indicates the influence of phonological and socio-linguistic factors in producing the fundamental frequency of Arabic speech in non-native speakers.

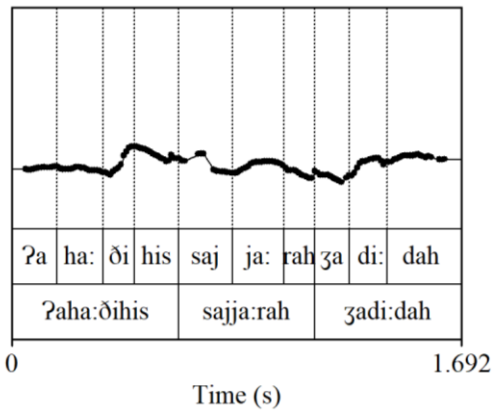


Figure 1.8
The Pitch Contour of NM

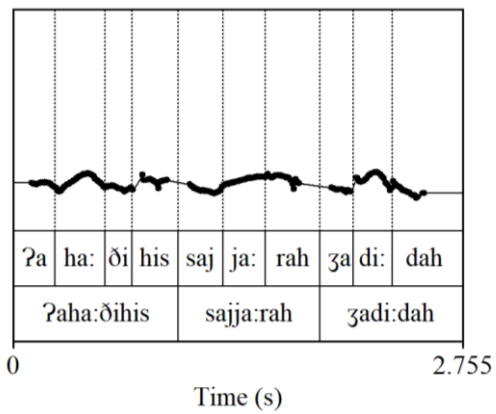


Figure 1.9
The Pitch Contour of JM

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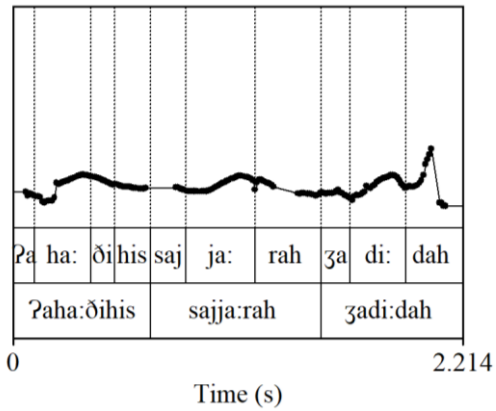

Figure 1.10
The Pitch Contour of SM

Figure 1.8 shows that speaker NM demonstrates an intonation pattern with a slight rise at the end of the sentence. In Figure 1.9, the pitch contour of speaker JM appears flatter, with tone variations that reflect a stable intonation. Meanwhile, as depicted in Figure 1.10, the Sundanese male speaker SM exhibits a relatively flat pattern with minor rises and falls toward the end of the sentence.

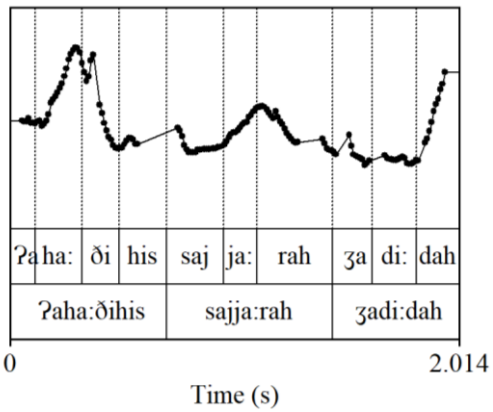

Figure 1.11
The Pitch Contour of NF

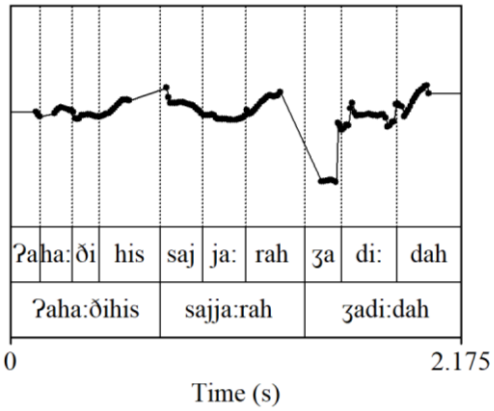

Figure 1.12
The Pitch Contour of JF

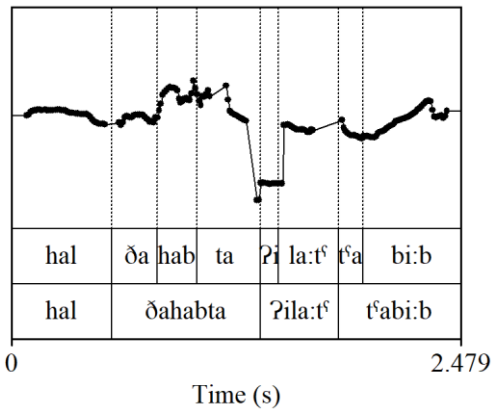

Figure 1.13
The Pitch Contour of SF

The intonation patterns of female speakers NF, JF, and SF show notable differences compared to their male counterparts. In Figure 1.11, the intonation pattern of the native female speaker exhibits an apparent rise at the end of the sentence, more pronounced than that of the native male speaker, indicating a question form. The Javanese female speaker JF, as shown in Figure 1.12, demonstrates a more dynamic pitch contour than JM, with more noticeable rises and falls. The more dynamic pitch contour likely reflects how Javanese female speakers expressly adopt Javanese intonation. In Figure 1.13, the pitch contour of the Sundanese female speaker SF shows a sharp decline in the middle of the sentence, followed by a rise at the end.

c. Duration Analysis

Table 3.5 highlights variations in speech duration between male and female speakers. Among male speakers, more significant differences are observed, with the native speaker NM and the Sundanese speaker SM exhibiting shorter durations at 1.69 ms and 2.21 ms, respectively. The Javanese speaker JM displays the most extended duration at 2.76 ms. In contrast, the female group shows more consistent durations, with the native speaker NF recording 2.01 ms, the Javanese speaker JF at a similar 2.17 ms, and the Sundanese speaker SF slightly longer at 2.75 ms. These differences suggest that language and local accents influence speech duration, with non-native speakers, particularly those from a Sundanese background, tending to produce longer utterance durations than native Arabic speakers.

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Table 1.6 Duration ʔaha:ðihissajja:rah ʒadi:dah

Speaker	Millisecond (ms)
NM	1.69 ms
JM	2.76 ms
SM	2.21 ms
NF	2.01 ms
JF	2.17 ms
SF	2.75 ms

Native Arabic speakers consistently produced shorter utterance durations compared to non-native speakers. This difference is likely due to Arabic's phonological efficiency, which places significant emphasis on vowel length and timing as distinguishing features of meaning. On the other hand, non-native speakers often elongated their utterances, particularly in vowels, as they adapted to unfamiliar Arabic phonemes. For Javanese speakers, the slower rhythm of their native language contributed to these extended durations, while Sundanese speakers may have faced challenges in mastering Arabic's temporal constraints.

d. Intensity Analysis

Table 1.7 illustrates the difference in intensity between male and female speakers between native and non-native speakers. In the male group, native Arabic speaker NM recorded an intensity of 75.06 dB. In comparison, non-native Javanese speaker JM showed a higher intensity of 77.39 dB, and Sundanese speaker SM showed a lower intensity of 69.81 dB. The data indicates that male speakers tend to produce speech with an intensity higher than the usual speech intensity, which is around 47-65 dB.

Table 1.7 Intensity ʔaha:ðihissajja:rah ʒadi:dah

Speaker	decibel (dB)
NM	75.06 dB
JM	77.39 dB
SM	69.81 dB
NF	69.94 dB
JF	68.44 dB
SF	64.85 dB

The differences in intensity between native and non-native speakers are less pronounced in the female group than in the male group. The native female speaker NF recorded an intensity of 69.94 dB, while the non-native female speakers from Javanese JF and Sundanese SF backgrounds recorded 68.44 dB and 64.85 dB,

respectively. Although the intensity of non-native female speakers is also lower than that of the native speaker, the disparity is less significant than observed in the male group. Overall, the intensity of female speakers tends to be lower than their male counterparts.

Intensity variations highlight another key difference between native and non-native speakers. Native speakers produced higher intensity levels, reflecting their ability to articulate and emphasize interrogative utterances. In contrast, Sundanese speakers produced lower intensity, which reflects their native speech habits of softer articulation. The Sundanese community is known for its gentle communication style, often using low vocal power to convey sensitivity and softness in their culture (Kartini, 2016; Hidayat & Hafiar, 2019; Nurjaman, 2021). This cultural norm emphasizes subtlety and politeness, which may explain the reduced intensity observed in their Arabic speech production.

Conclusion

The findings of this study conclude that there are differences in frequency, pitch contour, intensity, and duration in Arabic interrogative utterances between native speakers and non-native speakers from Javanese and Sundanese backgrounds. Among the two types of interrogative utterances analyzed, the fundamental frequency (pitch) of the native male speaker was higher than that of all other male and female speakers. Regarding pitch contour, the Javanese male speaker displayed a relatively flat frequency pattern at the end of sentences. Native speakers, both male and female, demonstrated shorter durations compared to non-native speakers. The native male speaker recorded the shortest duration, while the Javanese non-native male speaker exhibited the longest. Sundanese female speakers exhibited the lowest intensity among all groups, both native and non-native. These differences highlight the strong influence of gender and native language in shaping the prosodic patterns of Arabic, with non-native speakers and males tending to show more extreme variations compared to native speakers and females.

The results of this study emphasize that linguistic and cultural factors play a significant role in shaping prosodic patterns. Therefore, teaching Arabic to non-native speakers should consider appropriate prosodic characteristics. A better understanding of the differences in prosody between native and non-native speakers can help reduce pronunciation errors and improve learners' communication skills. The findings highlight the need for teachers to integrate knowledge of linguistic and cultural influences on prosody into their teaching. Understanding that Javanese speakers exhibit flatter pitch contours compared to native Arabic speakers and that Sundanese speakers produce lower intensity relative to other groups can help educators design targeted exercises. Raising

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students' awareness of differences between their native language and Arabic can enhance their understanding of prosodic challenges and improve their ability to adapt to native Arabic norms. This research also opens avenues for further studies on Arabic prosody, particularly in the context of the influence of native language and the role of gender in the pronunciation of interrogative utterances.

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