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Word Stress in *Santri* Utterance: A Comparative Analysis of Acoustic Phonetics

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***Abstract*:** Although word stress in Arabic is not phonemic, proper use can minimize communication ambiguity. This study aims to analyze the production of word stress by students of Arabic as a second language (L2) and compare it with native speakers. This comparative study involved six second-year students of Madrasah Aliyah as research samples. The research data was collected using listening, recording, and note-taking techniques. Then the research data were analyzed using Praat version 6.4.01 to find the stress accurately based on fundamental frequency, duration, and intensity level. The results showed that most L2 learners produced stress correctly on words with light syllables, but incorrectly on heavy and super heavy syllables. On the other hand, the form of word pronunciation also affects stress errors. Words characterized by super heavy syllables and a pause form are typically pronounced with weak stress. In addition, stress errors occur in syllables with double consonants where L2 learners do not apply good enough stress so that they sound like single consonants. These errors occur due to their mother tongue's different word stress systems. The findings are expected to positively impact L2 learners and teachers, by highlighting pronunciation issues, particularly concerning word stress.

INTRODUCTION

Having good and correct pronunciation is essential for effective communication, particularly for foreign language learners. Students who can pronounce words well are more likely to be understood when speaking, even if they make other mistakes. On the other hand, students with poor pronunciation may be difficult to comprehend, even if they excel in grammar[1]. In communication, pronunciation doesn't just refer to the correct pronunciation of individual letters, but also how these letters are combined into words and phrases. The pronunciation aspect, which contains the intent and purpose, is composed of

[1] Maria Ramasari, "Students Pronunciation Error Made in Speaking for General Communication," *Linguistic, English Education and Art (LEEA) Journal* 1, no. 1 (December 30, 2017): 37–48, https://doi.org/10.31539/leea.v1i1.32.

language sounds. These language sounds include segmental phonemes and are conveyed through prosodic units consisting of rhythm, intonation, and stress[2].

Stress, as a prosodic unit, refers to the emphasis placed on elements within a word or sentence through the coordination of speech organs. Physiologically, stress is characterized by increased amplitude due to strong airflow when producing speech sounds. This involves tightening of lung muscles and closer approximation of vocal cords to enhance vibration frequency, resulting in a clearer and stronger sound output[3]. At the lexical level, a stressed syllable generally sounds stronger than others, while in a sentence, stress is evident in words that sound stronger than the rest. According to Irawan & Dinakaramani[4], this emphasis is an accent, indicating the degree of information in an utterance, whether it represents new or old information.

Stress plays an important role in communication, particularly in pronunciation. It is instrumental in making words sound intelligible and comprehensible[5]. Field[6] conducted an experiment demonstrating how word stress affects speech intelligibility. The research focused on how both native and non-native listeners perceived the location of word stress and manipulated vowels. The results showed words become less intelligible when stress is placed on unstressed syllables. Errors in word stress placement can lead to ambiguity, making it difficult for listeners to understand the intended meaning of speech. Furthermore, in English, word stress can differentiate between word classes. For example, the words "present" [ˈprez.ənt] and "present" [priˈzent] have similar pronunciations but different spellings. The difference in emphasis changes the meaning of the word, where the former is a noun and the latter a verb.

The placement of word stress in Arabic can be predicted based on the syllable structure and not phonemic[7]. In simple terms, if the final syllable is super heavy such as CVVC and CVCC, the stress falls on it. If the syllable before the end is heavy such as CVV and CVC, the stress is placed on the second last syllable. If the third syllable before the end is light such as CV, the stress is placed on it[8]. It's important to note that word stress in Arabic is not phonemic, which means that

[2] Lok Raj Sharma, "Significance of Teaching the Pronunciation of Segmental and Suprasegmental Features of English," *Interdisciplinary Research in Education* 6, no. 2 (December 31, 2021): 63–78, https://doi.org/10.3126/ire.v6i2.43539.

[3] Lina Marlina, *Pengantar Ilmu Ashwat* (Bandung: Fajar Media, 2019).

[4] Yusuf Irawan and Arawinda Dinakaramani, *Fonetik Dan Fonologi Melodi Bahasa: Prosodi* (Bandung: Alfabeta, 2019).

[5] Salikhova Nodira Nurullayevna, "The Key of Effective Communication Is Pronunciation," *European Journal of Humanities and Educational Advancements* 1, no. 4 (2020): 5–7.

[6] John Field, "Intelligibility and the Listener: The Role of Lexical Stress," *TESOL Quarterly* 39, no. 3 (September 1, 2005): 399, https://doi.org/10.2307/3588487.

[7] Karin C. Ryding, *Arabic: A Linguistic Introduction* (Cambridge, United Kingdom; New York: Cambridge University Press, 2014).

[8] Nabil Alrajeh, "Digital Processing of Stress in Standard Arabic," *Journal of King Saud University - Languages and Translation* 23, no. 2 (July 2011): 65–68, https://doi.org/10.1016/j.jksult.2011.03.001.

errors in word stress application will not change the meaning of the word but will affect the clarity of speech. For example, in the word /ʔwħaː laha:/, the syllable /la/ in /laha:/ is pronounced with stronger stress to differentiate it from another word[9].

In Indonesian, there are no specific rules regarding word stress because Indonesian is a phrase-stressed language and does not have word stress[10]. According to Zanten & Heuven[11], word stress in Indonesian is free. This means that different stress patterns may be applied to a word, yet Indonesian speakers can still understand the meaning of the spoken words.

Unfortunately, many learners of Arabic tend to ignore the differences in word stress rules[12]. According to Purwandari[13], the variation in phoneme systems between languages can lead to phonological interference. Phonological interference occurs when elements of the learner's native language are mistakenly used in the target language during communication[14]. Widagsa *et al*.,[15] also mentioned that Indonesian learners may not prioritize word stress in communication due to the differences in the prosodic system of Indonesian. This issue has implications for language learning, especially Arabic for Indonesian learners. Indonesian learners often apply Indonesian stress patterns when speaking Arabic, leading to difficulties in comprehension, particularly when communicating with native Arabic speakers. Suciati & Diyanti[16] stated that teaching pronunciation with a focus on rhythm, intonation, and stress aims to enhance students' clarity in communication.

Research on stress by Indonesian speakers has been widely conducted, one of which is Rosyidi[17] who has examined stress and intonation in nine students

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[9] Muhammad Muhammad Daud, *Al-Arabiyyah Wa Ilmu Al-Lughah Al-Hadist* (Kairo: Daar Al-Ghorib, 2001).

[10] Vincent J. Van Heuven and Vera Faust, "Are Indonesians Sensitive to Contrastive Accentuation below the Word Level?," *Wacana, Journal of the Humanities of Indonesia* 11, no. 2 (2009): 226–40.

[11] Ellen Van Zanten and Vincent J. Van Heuven, "Word Stress in Indonesian: Fixed or Free," *NUSA Linguistic Studies of Indonesian and Other Languages in Indonesia* 53 (2004): 1–20.

[12] Maskuri et al., "Analisis Kesalahan Dalam Menggunakan Lahjah Arabiyah Pada Maharah Kalam," *Lahjah Arabiyah: Jurnal Bahasa Arab Dan Pendidikan Bahasa Arab* 4, no. 2 (2023): 159–70.

[13] Esthiningtyas Sheilla Purwandari, "Analisis Interferensi Fonologi Dalam Kegiatan Tasyji'ul Lughah Santri Pondok Pesantren Al-Kamal," *Lisanul Arab: Journal of Arabic Learning and Teaching* 11, no. 1 (June 23, 2022): 50–56, https://doi.org/10.15294/la.v11i1.56913.

[14] Siti Aulia Nazarul Fitria and Mohamad Zaka Al Farisi, "The Comparison of Phoneme Pronunciation Phonological Interference of ق [Q] in Sundanese and Javanese Speakers," *Language Literacy: Journal of Linguistics, Literature, and Language Teaching* 7, no. 1 (June 28, 2023): 218–28, https://doi.org/10.30743/ll.v7i1.7192.

[15] Rudha Widagsa, Sri Wiyanah, and Primasari Wahyuni, "The Influence of Indonesian Prosodic Features on English Word Stress Production," *English Review: Journal of English Education* 7, no. 2 (June 2, 2019): 77, https://doi.org/10.25134/erjee.v7i2.1647.

[16] Suciati Suciati and Yuniar Diyanti, "Suprasegmental Features of Indonesian Students' English Pronunciation and the Pedagogical Implication," *SAGA: Journal of English Language Teaching and Applied Linguistics* 2, no. 1 (January 4, 2021): 9–18, https://doi.org/10.21460/saga.2020.21.62.

[17] Abdul Wahab Rosyidi, "Penerapan Pola Nabr Dan Tanghim Dalam Maharah Al Kalam Mahasiswa Indonesia," *LiNGUA: Jurnal Ilmu Bahasa Dan Sastra* 11, no. 1 (July 1, 2016): 45, https://doi.org/10.18860/ling.v11i1.3438.

majoring in Arabic Language Education. The results showed that they had difficulty in applying Arabic stress and intonation patterns. The result shows that stress and intonation are closer to the pattern of the mother tongue. Based on the results of his study, Widagsa et al.[18] stated that Indonesian speakers pay less attention to word stress when communicating. Apart from the difference in the prosodic system, word stress in Indonesian is not distinctive. Similar research was conducted by Nurpahmi[19] who stated that Indonesian speakers are inaccurate when pronouncing nouns compared to verbs. The inaccuracy of word stress production is influenced by differences in suprasegmental phoneme characteristics. Indonesian does not have specific regulations regarding the production of word stress. However, according to Karjo[20], word stress errors by Indonesian learners are not only affected by the mother tongue but also phonological factors. Krisdianata & Bram's study[21] also states that word stress errors are caused by several factors including age, mother tongue, target language exposure, personality, motivation, and phonetic ability. However, the factors of age, personality, and target language exposure did not show a significant effect, while other factors such as mother tongue, motivation, and phonetic ability greatly influenced the accuracy of word stress. Meanwhile, according to Yanuar[22], proficiency plays an important role in producing word stress accuracy regardless of age and different mother tongue backgrounds.

In previous studies, pressure was examined using many college students as research subjects. One of them tested the pressure on different research subjects because the researcher specialized in his study on the age factor. Therefore, this study aims to observe the stress of Arabic words by Indonesian Santri with a focus on boarding school students as a departure from previous research. This is because Arabic is used more often in oral communication in boarding schools than in general schools. Additionally, the study included acoustic phonetic analysis to evaluate word stress. The researcher utilized Praat version 6.4.01 for the analysis and measurement of word stress accuracy in L2 students' utterances.

Pronunciation is one of the important skills to improve, but also something difficult to learn and teach. For foreign language learners, the main problem in

[18] Widagsa, Wiyanah, and Wahyuni, "The Influence of Indonesian Prosodic Features on English Word Stress Production."

[19] Sitti Nurpahmi et al., "An Acoustic Analysis of Word Stress Production by Indonesian Learners of English," *Indonesian TESOL Journal* 5, no. 2 (November 22, 2023): 302–20, https://doi.org/10.24256/itj.v5i2.4167.

[20] CH Karjo, "Accounting for L2 Learners' Errors in Word Stress Placement," *Indonesian Journal of Applied Linguistics* 5, no. 2 (2016): 199–208, https://doi.org/10.17509/ijal.v5i2.1344.

[21] Yoannes Yuka Krisdianata and Barli Bram, "Word Stress Errors Made by English Education Master's Program Students," *Academic Journal Perspective: Education, Language, and Literature* 10, no. 1 (May 31, 2022): 1, https://doi.org/10.33603/perspective.v10i1.6763.

[22] Ivo Dinasta Yanuar, "Exploring the Impact of Age and Proficiency: English Word Stress Placement in Indonesian EFL Learners," *English Education: Jurnal Tadris Bahasa Inggris* 16, no. 2 (December 1, 2023): 1, https://doi.org/10.24042/ee-jtbi.v16i2.15886.

pronunciation is to change the conceptual model acquired in childhood to fit their native language[23]. In this case, the different word stress characteristics between Arabic and Indonesian make phonological interference possible. Therefore, the results of this study are expected to contribute to the teaching and learning of Arabic pronunciation, especially regarding word stress.

METHOD

The study uses a comparative qualitative method with a content analysis design to observe, compare, and describe the stress patterns of Arabic words among students learning Arabic as a second language (L2) with native speakers. This analysis aimed to depict the word stress patterns among L2 students compared with native speakers' utterances[24]. The research sampling was conducted using a purposive sampling technique, samples were selected based on specific criteria relevant to the research objectives[25]. The research sample in this study included six Indonesian speakers, three males and three females (*M* age = 17.16). All participants were second-year students at Madrasah Aliyah, originating from the same *Pondok pesantren* in Bandung City. The selection of this sample was predicated on the research objective of examining word stress production among Indonesian santri. The study involved word stress testing on seven Arabic words, each containing two to three syllables of different types and locations. These words were extracted from a news text titled "النشاط يجدد شباب الدماغ" from the Al Jazeera Learning Arabic website. The news text included an audio feature of a native Arabic speaker, which was used as a basis for comparison with the utterances of L2 learners. However, in some circumstances, the native speaker's utterance in the video could not represent the research data so another native speaker was presented and was asked to pronounce the word in the appropriate format. Subsequently, the seven words were categorized based on the word stress rules in Arabic[26], as detailed in Table 1 below.

Table 1. List of words

Words to Pronounce	Phonetic Transcription	Gloss
ضَعُفَ	/ˈdˤaʕufa/	Weaken
يَجِبُ	/ˈyadʒibu/	He should
سَعِيْدٌ	/saʕiːˈdun/	Happy
دِمَاغٌ	/dimaːˈɣun/	Brain
تَنْظِيْم	/tanˈðˤiːm/	Regulation
تَسْتَمِرّ	/tastaˈmirr/	Continue
تَدْرِيْبَات	/tadriːˈbaːt/	Trainings

[23] Abbas Gilakjani, Seyedeh Ahmadi, and Mohammad Ahmadi, "Why Is Pronunciation So Difficult to Learn?," *English Language Teaching* 4, no. 3 (August 23, 2011): p74, https://doi.org/10.5539/elt.v4n3p74.

[24] Mad Ali et al., "Investigating the Arabic /f/ Pronunciation: A Comparative Analysis of Acoustic Phonetics," *Al-Ta'rib : Jurnal Ilmiah Program Studi Pendidikan Bahasa Arab IAIN Palangka Raya* 11, no. 2 (December 8, 2023): 181–96, https://doi.org/10.23971/altarib.v11i2.7234.

[25] Beatrice Farrugia, "WASP (Write a Scientific Paper): Sampling in Qualitative Research," *Early Human Development* 133 (June 2019): 69–71, https://doi.org/10.1016/j.earlhumdev.2019.03.016.

[26] Ryding, *Arabic*.

The study employed listening, recording, and note-taking techniques for data collection. The researcher asked six L2 learners to randomly pronounce seven Arabic words to avoid influencing the resulting pronunciation pattern. The researcher observed the participants while pronouncing the words. Additionally, research data was collected by recording the utterances of the seven Arabic words using a specialized voice recorder. The recorded data was then analyzed and compared with native speakers, utilizing Praat version 6.4.01 for data processing. Furthermore, the recording results were transformed into waveforms to highlight stressed and unstressed syllables by determining the acoustic parameters of word stress.

RESULT AND DISCUSSION

Word stress is a prosodic unit characterized by the prominence of certain syllables. In an utterance, this prominence results from loudness, length, pitch, and vocal quality. All these elements are realized through acoustic features characterized by fundamental frequency, duration, and intensity[27]. In general, stress analysis encompasses all three acoustic components. Therefore, this investigation will focus on the analysis of word stress by L2 learners using three speech parameters.

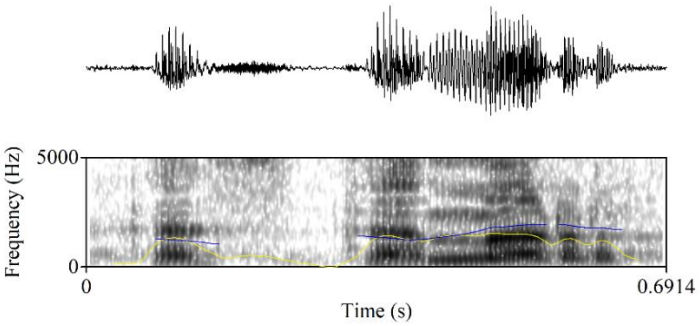

Figure 1. The pitch contour and intensity of the word *tastamirr* on spectrogram by native speakers

Based on Figure 1, stressed syllables are characterized by a rise in pitch contour, greater energy, and longer duration. These features represent the auditory manifestation of frequency, which is connected to vocal cord movements. Intensity reflects the loudness and softness of the sound, while duration indicates the presence of stronger prominence[28]. However, it is important to note that these parameters may sometimes be inconsistent. In Arabic, the primary parameters for determining word stress in Arabic are intensity and duration, as stress in Arabic is influenced by syllables.

[27] Peter Roach, *English Phonetics and Phonology: A Practical Course*, 4th ed (Cambridge; New York: Cambridge University Press, 2009).

[28] Yusuf Irawan, *Fonetik Akustik* (CV. Angkasa, 2017).

The syllable structure in Arabic comprises light such as CV, heavy such as CVV and CVC, and super heavy such as CVVC and CVCC syllables[29]. On the other hand, intensity is an acoustic parameter inconsistent in determining stressed syllables. Therefore, the assessment of word stress will be done based on the fundamental frequency, duration, and then intensity[30]. Results from the acoustic analysis show a proportional relationship between fundamental frequency and duration in stressed syllables.

In this section, we present the results of the word stress analyses of seven Arabic words by L2 learners by measuring the acoustic parameters of the utterances through the Praat software. Acoustically, the speech data is then compared with native speakers. The results of the analysis contain acoustic data that is tabulated based on the value of the fundamental frequency (Hz), duration (S), and intensity (dB) of the syllable. (**bold** shows maximum value).

Table 2. Acoustic data for the word *ḍa'ufa*

Respondent	CV			CV			CV		
	F0	T	I	F0	T	I	F0	T	I
NS	**280.71**	**0.52**	**80.20**	249.84	0.37	73.02	243.18	0.50	74.25
R-1	128.42	0.27	86.12	136.94	0.36	83.03	148.96	0.31	84.87
R-2	233.57	0.19	85.46	233.86	0.24	83.42	238.19	0.26	82.92
R-3	213.51	0.27	85.51	104.51	0.23	80.60	103.73	0.31	81.23
R-4	247.82	0.23	84.68	250.05	0.30	86.15	259.01	0.34	84.89
R-5	252.06	0.17	84.60	282.55	0.41	83.93	292.35	0.31	83.67
R-6	126.79	0.29	84.71	134.75	0.41	80.98	125.37	0.31	81.14

Table 2 presents the acoustic data for the word *ḍa'ufa* by native speakers and six L2 learners. The word *ḍa'ufa* consists of three syllables in which the stress is located in the antepenultimate[31]. This stress placement is supported by the native speakers' pronunciation, which is characterized by higher fundamental frequency, duration, and intensity values in the first syllable. According to the data, only R-3 accurately produced the stress, showing higher fundamental frequency and intensity values in the first syllable. The other respondents demonstrated differences in acoustic values compared to native speakers, particularly in intensity and frequency values. Furthermore, all participants made errors in vowel production, as indicated by the longer duration values of the second and third syllables compared to the first syllable.

[29] Alrajeh, "Digital Processing of Stress in Standard Arabic."
[30] Roach, *English Phonetics and Phonology*.
[31] Ryding, *Arabic*.

Table 3. Acoustic data for the word *yajibu*

Respondent	CV			CV			CV		
	F0	T	I	F0	T	I	F0	T	I
NS	**265.86**	**0.46**	**78.67**	241.76	0.42	72.18	252.52	0.44	75.95
R-1	122.23	0.23	83.08	134.10	0.41	75.13	135.83	0.27	75.52
R-2	227.24	0.26	85.27	221.71	0.26	79.92	214.36	0.27	80.25
R-3	124.98	0.23	79.74	124.24	0.23	78.37	86.56	0.23	74.21
R-4	251.45	0.25	85.57	247.29	0.32	79.98	254.51	0.36	83.46
R-5	292.70	0.22	84.85	274.14	0.36	79.24	262.27	0.27	80.73
R-6	147.86	0.31	82.26	127.45	0.23	79.92	115.27	0.25	71.71

The research data illustrates the stress placement of the word *yajibu* by native speakers and six L2 learners. Structurally, the word *yajibu* follows the same pattern as the word *ḍa'ufa*, therefore the stress falls on the antepenultimate syllable[32]. Acoustically, this stress is supported by the native speakers exhibiting the highest fundamental frequency, intensity, and duration values on the first syllable. Based on the presented data, correct stress placement was observed in R-2, R-3, R5, and R-6. All respondents demonstrated higher fundamental frequency and intensity values in the first syllable. However, R-1 and R-4 displayed fundamental frequency and intensity values that did not align with those of native speakers. Similar to the word *ḍa'ufa*, almost all respondents produced accurate vowels. The error observed was an elevation of vowel level in short syllables.

Table 4. Acoustic data for the word *sa'īdun*

Respondent	CV			CVV			CVC		
	F0	T	I	F0	T	I	F0	T	I
NS	221.81	0.37	66.89	230.90	**0.72**	69.04	**304.57**	0.57	**76.96**
R-1	145.96	0.70	85.06	158.44	0.26	83.57	145.91	0.31	83.98
R-2	267.71	0.33	83.87	274.08	0.52	84.60	268.19	0.38	85.37
R-3	109.17	0.40	83.15	124.80	0.53	83.44	211.71	0.42	76.25
R-4	268.95	0.40	84.06	247.63	0.69	82.72	276.96	0.35	84.73
R-5	303.57	0.37	83.47	294.06	0.56	85.33	287.51	0.24	87.19
R-6	143.90	0.36	84.63	139.68	0.55	80.06	131.96	0.29	76.28

The data in Table 4 presents the acoustic analysis of the word *sa'īdun* as pronounced by native speakers and six L2 learners. The word *sa'īdun* comprises one light syllable and two heavy syllables. Analysis of the native speakers' acoustic data reveals that the third syllable has the highest fundamental frequency and intensity value, while the longest duration is observed in the second syllable. This contrast suggests that the second syllable contains a long vowel sound, resulting in its prolonged pronunciation compared to the third syllable. The findings highlight that correct stress placement is exhibited by R-3 and R-4,

[32] Ryding.

evident from their higher fundamental frequency values in the third syllable. Conversely, R-1, R-5, and R-6 placed stress on the first syllable (SĀ-ˈi-dun), while R3 stressed the second syllable (sa-ˈĪ-dun). Furthermore, all participants, except the first respondent, accurately produced the long vowel sound in the second syllable.

Table 5. Acoustic data for the word *dimāgun*

Respondent	CV			CVV			CVC		
	F0	T	I	F0	T	I	F0	T	I
NS	223.83	0.42	74.50	240.62	**0.82**	72.40	**323.13**	0.53	**76.21**
R-1	131.74	0.11	79.24	137.36	0.57	82.95	147.30	0.37	83.70
R-2	223.59	0.19	80.03	238.79	0.47	83.84	236.23	0.27	81.70
R-3	188.44	0.27	78.78	119.77	0.45	81.87	103.44	0.41	79.15
R-4	242.49	0.27	83.22	240.57	0.64	82.90	283.65	0.40	84.90
R-5	263.24	0.20	81.05	282.92	0.46	82.86	277.80	0.39	87.11
R-6	123.43	0.23	78.37	125.18	0.54	82.75	121.40	0.34	76.92

The data in Table 5 presents the acoustic data for the word *dimāgun* produced by native speakers and six L2 learners. Structurally, *dimāgun* follows the same pattern as the word *saˈīdun*, with the stress falling on the third syllable. According to the acoustic data from native speakers, the highest fundamental frequency and intensity values occur on the third syllable, while the longest duration is on the second syllable. Among the native speakers, respondents R-1, R-4, and R-5 exhibited fundamental frequency and intensity values corresponding to the stress pattern, while R-2, R-3, and R-6 placed stress on the second syllable (di-MĀ-gun). Notably, all respondents accurately produced the long vowel in the second syllable, mirroring the word's pronunciation.

Table 6. Acoustic data for the word *tanẓīm*

Respondent	CVC			CVVC		
	F0	T	I	F0	T	I
NS	136.73	0.21	72.46	**229.40**	**0.25**	**75.36**
R-1	135.86	0.34	84.89	147.72	0.49	80.03
R-2	215.71	0.39	84.44	214.87	0.72	84.04
R-3	107.82	0.34	84.66	199.91	0.56	76.43
R-4	246.16	0.55	83.31	244.64	1.02	81.10
R-5	298.44	0.35	83.50	284.30	0.42	83.78
R-6	132.15	0.50	82.48	123.21	0.62	77.25

Table 6 shows the acoustic data for the word *tanẓīm* as spoken by native speakers and six L2 learners. The word *tanẓīm* is made up of two syllables, one heavy, and the other super heavy. According to theory, a word with a super heavy syllable should have increased stress on that syllable when read with a pause form[33]. The acoustic data from the native speakers supports this, showing higher

[33] Ryding.

fundamental frequency, intensity, and duration values in CVVC syllables compared to CVC syllables. However, correct stress placement is exhibited by R-1 and R-3. While R-1, R-2, R-3, R-4, and R-6 place stress on the first syllable (TAN-ẓīm) despite the second syllable having a longer duration.

Table 7. Acoustic data for the word *tastamirr*

Respondent	CVC			CV			CVCC		
	F0	T	I	F0	T	I	F0	T	I
NS	127.16	0.20	70.03	140.81	0.15	73	**192.86**	**0.25**	**74.54**
R-1	135.05	0.41	82.61	124.53	0.29	79.20	134.63	0.50	75.96
R-2	221.64	0.46	82.40	312.14	0.17	83.26	223.07	0.71	83.74
R-3	116.94	0.44	83.77	111.90	0.25	78.73	191.72	0.53	82.90
R-4	260.49	0.36	82.26	212.06	0.33	81.31	229.59	0.53	79.46
R-5	278.95	0.37	82.75	269.80	0.13	79.62	278.47	0.32	81.14
R-6	124.79	0.48	83.54	117.56	0.16	83.04	125.37	0.29	77.55

According to the data, the stress in the word *tastamirr* is located differently for native speakers and six L2 learners. The acoustic data from native speakers indicates that the highest fundamental frequency, duration, and intensity values occur in the super heavy syllable, suggesting that the stress falls on that particular syllable[34]. Among the L2 learners, just R-2 and R-6 accurately produced stress, as evidenced by fundamental frequency and duration values similar to those of native speakers. On the other hand, R-1, R-3, R-4, and R-5 placed the stress on the first syllable (TAS-ta-mirr), as indicated by higher fundamental frequency and duration values compared to the other syllables.

Table 8. Acoustic data for the word *tadrībāt*

Responden	CVC			CVV			CVVC		
	F0	T	I	F0	T	I	F0	T	I
NS	165.27	0.17	74.20	141.88	0.20	**74.49**	**212.41**	**0.36**	72.48
R-1	138.69	0.26	83.89	132.82	0.50	80.11	139.01	0.49	84.35
R-2	513.03	0.41	85.18	233.58	0.40	79.87	232.52	0.51	85.83
R-3	250.64	0.37	84.61	106.23	0.18	75.38	115.72	0.71	84.73
R-4	243.90	0.36	83.79	235	0.65	84.48	252.40	0.94	81.98
R-5	312.62	0.32	84.46	264.14	0.21	77.14	279.20	0.42	83.53
R-6	127.14	0.65	84.42	118.80	0.20	69.53	119.48	1.45	79.02

In Table 8, the acoustic data for the word *tadrībāt* by native speakers and six L2 learners is presented. The word *tadrībāt* comprises three syllables of heavy and super-heavy types. According to Ryding[35], words containing super-heavy syllables are stressed more strongly when spoken in a pause form. This is supported by the acoustic data from native speakers, which indicates that

[34] Nurpahmi et al., "An Acoustic Analysis of Word Stress Production by Indonesian Learners of English."

[35] Ryding, *Arabic*.

fundamental frequency and duration values are higher in CVVC syllables compared to other syllables. Based on the data presented, R-1 and R-4 produced the stress correctly on the word. While R-2, R-3, R-5, and R-6 produced stress on the first syllable (TAD-rī-bāt) characterized by higher fundamental frequency values on the syllable.

Results of acoustic analysis of word stress

In this research, we examined the word stress patterns produced by L2 learners on two to three-syllable Arabic words. The findings from the acoustic analysis indicate that most L2 learners accurately place word stress on light syllables (*ḍa'ufa* and *yajibu*), but struggle with correct placement on heavy (*sa'īdun* and *dimāgun*) and super heavy (*tanẓīm*, *tastamirr*, and *tadrībāt*) syllables. These results are summarized in Figure 1 below.

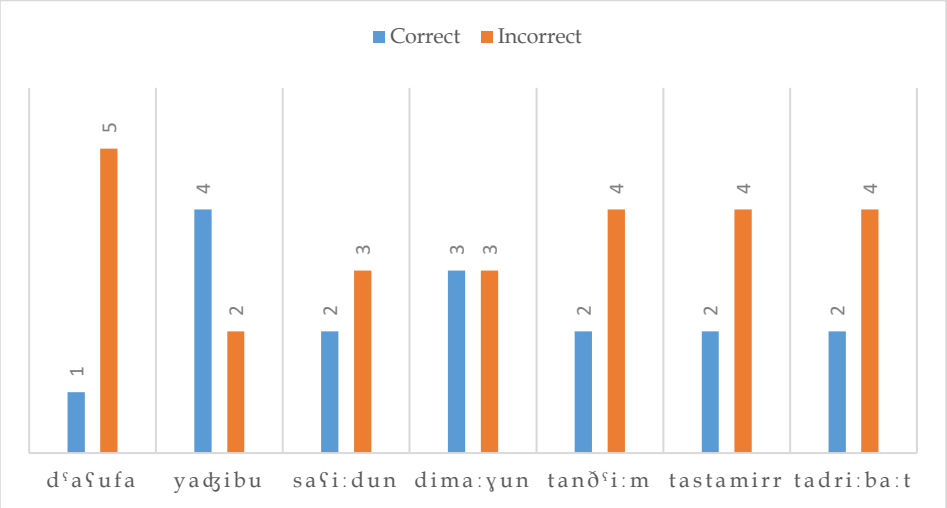

Figure 2. Diagram of the result of word stress analysis by L2 learners

Acoustically, the results of word stress production by L2 learners show inconsistency in giving prominence to stressed syllables. This is indicated by the acoustic analysis results where fundamental frequency, duration, and intensity do not correlate. For instance, in words like *ḍa'ufa* and *yajibu* with three light syllables where the stress rule places it on the antepenultimate[36], the calculation results show that the highest intensity value is at the first syllable, but the last syllable has a higher F0.

Furthermore, the measurement results show that L2 learners make mistakes in producing vowels. For example, adding vowels in short syllables (CV) and reducing vowels in long syllables (CVV, CVVC). In the words *ḍa'ufa* and *yajibu*, it was found that all respondents tended to add long vowels to unstressed syllables so that the word structure was changed. Originally the word *yajibu* but

[36] Ryding.

pronounced with the addition of vowels in the second syllable becomes *yajibu*. In addition, based on the data presented in Table 4, shows that pronunciation errors when pronouncing the word *sa'īdun* cause a shift in meaning. This occurs due to the addition of a long vowel to the first syllable and reducing the vowel in the second syllable so that the word structure changes to *sā'idun*. This shift in meaning occurred because the length of Arabic vowels can affect word meaning[37]. This mistake is marked by the longer duration of the vowel in the first syllable compared to the second syllable. The word *sa'īdun* means "happy" so if stress and length are placed on the first syllable, it becomes *sā'idun*, meaning "forearm." This error is found in Lepage and Busà's study[38] that stress and vowel production are related to intelligibility. However, vowel placement errors are considered to have a greater negative effect.

One common mistake made by L2 students is pronouncing words with a pause form, such as *tanẓīm*, *tastamirr*, and *tadrībāt*. Acoustic analysis shows inconsistent values, especially in the word *tastamirr*, which contains super heavy syllables and is pronounced with a pause form. However, unlike other words with super heavy syllables, this word consists of syllables with double consonants. Acoustically, the presence of double consonants is marked by a longer duration. This is because double consonants are interpreted as strengthening the articulation of the phoneme, resulting in the lengthening of its duration[39]. In Figure 1, can be seen that the word *tastamirr* is pronounced with a longer duration of the super heavy syllables by native speakers. This is also supported by the highest fundamental frequency and intensity values on the super heavy syllable. Additionally, the presence of double consonants is visualized in the waveform. Based on the data in Table 7, it shown that L2 students tend to lengthen the vowel in the first syllable rather than the third syllable, indicating a reduction of the double consonants, making them sound like single consonants.

The errors that L2 learners make when pronouncing Arabic words are influenced by their everyday language system. As stated by Widagsa et al.[40], Indonesian speakers lack awareness of word stress due to the differences in word stress systems between the language they are learning and their native language. Although the function of stress in both languages does not have a significant

[37] Muhammad Afif Amrulloh, "Fonologi Bahasa Arab (Tinjauan Deskriptif Fonem Bahasa Arab)," *Jurnal Al Bayan: Jurnal Jurusan Pendidikan Bahasa Arab* 8, no. 1 (February 24, 2017), https://doi.org/10.24042/albayan.v8i1.353.

[38] Andrée Lepage and Maria Grazia Busà, "Intelligibility of English L2: The Effects of Incorrect Word Stress Placement and Incorrect Vowel Reduction in the Speech of French and Italian Learners of English," *International Symposium on the Acquisition of Second Language Speech Concordia, Working Papers in Applied Linguistics* 5 (2014): 387–400.

[39] Kamel Ferrat and Mhania Guerti, "An Experimental Study of the Gemination in Arabic Language," *Archives of Acoustics* 42, no. 4 (December 20, 2017): 571–78, https://doi.org/10.1515/aoa-2017-0061.

[40] Widagsa, Wiyanah, and Wahyuni, "The Influence of Indonesian Prosodic Features on English Word Stress Production."

impact on changes in meaning, errors in stress production will have an impact on word clarity. Especially in Arabic, there are special rules related to word stress as a characteristic of the Arabic language itself. Neglecting the word stress means losing the characteristics of the Arabic language[41]. Ultimately, L2 learners tend to have difficulty producing Arabic word stress properly and transferring the Indonesian language system into Arabic. Externally, this error signifies language interference where the system in the mother tongue is transferred into Arabic[42] this shows the identity of the L2 learners as an Indonesian speaker.

Despite L2 learners producing word stress incorrectly, their pronunciation remains understandable. Acoustic measurements indicate that L2 learners do not consistently stress syllables, reflecting their identity. In addition, this study focuses on isolated stress production at the word level. Therefore, errors in word stress pronunciation by L2 learners do not alter the meaning or word class.

CONCLUSION

Based on the analysis, the production of word stress by L2 learners is influenced by syllable structure and reading format. Notable errors were found in words with heavy and super heavy syllables, particularly in the placement of long vowels and the pronunciation of double consonants, leading to potential ambiguity in word meaning. Despite word stress not being phonemic in Arabic, errors in vowel production can result in changes in word meaning. Acoustic measurements revealed that the addition of vowels causes a shift in stress. L2 learners' errors in word stress production are attributed to the lack of a similar stress system in their native language. However, although acoustic measurements show deviations from native speakers, the pronunciation of Arabic words by L2 learners remains understandable. This variation is considered a reflection of their identity as Indonesian speakers.

The results of this study are expected to have positive implications for both L2 learners and teachers, prompting them to prioritize Arabic sound grammar, particularly word stress. A well-designed pre-program can be implemented during learning activities to decrease word stress production errors. This is essential, as L2 learners must acquire a comprehensive understanding of Arabic word rules, especially of vowel levels, which can lead to ambiguity in the meaning of utterances.

[41] Rosyidi, "Penerapan Pola Nabr Dan Tanghim Dalam Maharah Al Kalam Mahasiswa Indonesia."

[42] Hikmah Maulani and Muhammad Dhiya Alwan, "Bilabial Articulation Pronunciation 'B' (L1) and Syafatain Letters 'Ba' (L2): Analysis of the Pronunciation of the Letter Ba in Surah Al-Fatihah," *ALSUNIYAT: Jurnal Penelitian Bahasa, Sastra, Dan Budaya Arab* 6, no. 1 (April 30, 2023): 16–28, https://doi.org/10.17509/alsuniyat.v6i1.54685.

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