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# Predictability Effect of Arabic Stress Pattern in English Lexical Stress Production by Arab EFL Undergraduates

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## ABSTRACT

The present study investigates the effect of Arabic lexical stress predictability in producing English lexical stress by Yemeni EFL undergraduates and native Hadhrami Arabic (HA) speakers. The study involved the participation of 69 Yemeni EFL undergraduates with two varying levels of English proficiency. Additionally, 10 American native speakers were included to evaluate the correct production of English stress patterns by the Yemeni EFL undergraduates. The authors adopt the Metrical Theory and the Stress Typology Model to underpin the grounds of this study. Data from the study were collected through a production experiment using individual recording sessions for each participant reading 84 English real and nonce words. The differences between stressed and unstressed syllables were measured using phonetic cues ratios, vowel duration, intensity, and fundamental frequency (F0), analysed through PRAAT software. The findings suggest that the production of English lexical stress by Yemeni EFL undergraduates is influenced by HA. However, the predictability of the Arabic stress pattern does not always trigger errors in producing English lexical stress by Yemeni EFL undergraduates. Findings indicate that Yemeni EFL undergraduates are more attentive to vowel weight, especially when the ultimate syllable incorporates a tense vowel. It stands in contrast to the conventional approach of syllable structure, which places a more pronounced emphasis on instructing English vowels among Arab ELF learners as a result of Arabic dialectal variation.

*Keywords:* English lexical stress, L1 phonological system, PRAAT, stress pattern predictability, Yemeni EFL learners

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## INTRODUCTION

Pronunciation challenges can be attributed to the wrong production of segmental features (consonants and vowels) and suprasegmental

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features (rhythm, stress, intonation) of the English language (Al-Thalab et al., 2018; Ghosh & Levis, 2021; Ladefoged & Johnson, 2015). In EFL settings, the likely identification of English segmental pronunciation errors by EFL learners is a longstanding goal in teaching English pronunciation (Rehman et al., 2022). English suprasegmental features play an essential role in English language pronunciation. While research has demonstrated the impact of English suprasegmental features on speech intelligibility, their teachability in ELF contexts remains uncertain and rather ignored, especially in the EFL context (Lewis & Deterding, 2021; Maghrabi, 2021; Nguyen & Hung, 2021).

Several studies have speculated on the significance of the stress pattern in English speech (Field, 2005; Flege & Bohn, 1989; Fry, 1959; Ghosh & Levis, 2021; Guo, 2022; Jenkins, 2002; Ladefoged & Johnson, 2015; Lai, 2008; Lee et al., 2019; Levis, 2018; Misfer & Busabaa, 2019; Zhang et al., 2008; Zuraiq & Sereno, 2021). According to their findings, mastering the production of English stress patterns improves the intelligibility of English oral communication. Nonetheless, English stress patterns are deemed to be difficult aspects to pronounce correctly by EFL/ESL learners, affecting their speaking competence and comprehension (Ali & Abdalla, 2021; Jung & Rhee, 2018; Saha & Mandal, 2018; Zuraiq & Sereno, 2021). Previous research has thoroughly documented the difficulties in producing English lexical stress by EFL/ESL learners with an emphasis on the impact of the L1 phonological system (Jeong et al., 2020; Modesto & Barbosa, 2019; Tuan, 2018; Zuraiq & Sereno, 2021).

Researchers have identified areas of difficulty by applying linear and non-linear phonological theories. The location of stress patterns influenced by the L1 stress pattern was the main area of debate between linear and non-linear phonological theories. Simply put, linear phonology, as presented in Chomsky and Halle's (1968) work through English Sound Pattern Theory (ESP), implies that differences between English and learners' L1 stress patterns cause a negative interference where learners place the stress pattern based on their mother tongue's stress rules. Meanwhile, non-linear phonology arose to address the gaps left by linear phonology, in which the phenomena of stress pattern are described based on feet and syllables to include a greater scale of languages, as shown in the works of Liberman and Prince (1977) and Hayes (1980), the Metrical Theory (MT). Hayes (1980) suggested that areas of difficulty in producing stress patterns can be predicted based on five parameters: (1) directionality, (2) quantity sensitivity, (3) boundedness, (4) extrametricality, and (5) dominance.

Thus, researchers pointed out that lexical stress manifests itself based on each language-specifics regarding the placement of the lexical stress (Jeong et al., 2020; Modesto & Barbosa, 2019; Saha & Mandal, 2018; Tuan, 2018; Zuraiq & Sereno, 2021). Literature shows that difficulties in producing English lexical stress increase among Arab EFL learners because lexical

stress is relatively predictable in Arabic (Ali & Abdalla, 2021; Helal, 2014; Khazneh, 2015; Koffi, 2021; Zuraiq & Sereno, 2021). The fixed predictability of the stress pattern in Arabic leads to difficulty producing the unpredictable nature of stress patterns in English (Albadar, 2018; Al-Thalab et al., 2018; Zuraiq & Sereno, 2021). Moreover, English has no simple rules or regularities for which syllable receives the primary stress (Levis, 2018). In other words, English words of more than one syllable may be stressed on any syllable. Thus, words with more than one syllable may have the primary stress on the first, second, third, or fourth syllables, such as *ˈphotograph*, *indeˈpendent*, and *mainˈtain*. Free-stress languages (such as English) are typically contrasted with fixed-stress languages (such as Arabic), in which the same syllable is always stressed in most of the Arabic words (Albadar, 2018; Ali & Abdalla, 2021; Al-Thalab et al., 2018; Helal, 2014; Zuraiq & Sereno, 2021).

## Literature Review

The phonological impact of the Arabic phonological system in producing English stress patterns is the focus of research on English lexical stress production (Ali & Abdalla, 2021; Anani, 1989; Ghaith, 1993; Helal, 2014; Khazneh, 2015; Youssef & Mazurkewich, 1998). The main emphasis was on the pattern of the syllable structure, which changes the place of the English-stressed syllable based on Arabic stress rules. As a result, the researchers attempted to investigate the preferred position of the primary stress (antepenultimate, penultimate, and ultimate) in producing English lexical stress as influenced by Arabic syllabic rules. Syllable structure and weight are important determinants that change the primary stress location in English and Arabic (Ali & Abdalla, 2021; Levis, 2018). In English, syllables can be considered heavy if they consist of a tense vowel (referred to as VV in this paper to differentiate between tense and short vowels) or are closed by consonant or consonant clusters (Levis, 2018).

However, this rule is not regular in all English words; for example, *almond* / ˈɑːmənd/ and *attend* / əˈtɛnd / have a final syllable structure CVCC that is heavy in *attend* and light in *almond*. Therefore, Arab EFL learners are assumed to correctly place the English lexical stress on syllable structure patterns that share similar stress rules as in Arabic. However, difficulties are perceived to be increased when English primary stress falls in a syllable that appears heavy but is unstressed. Although this result appears convincing in indicating areas of difficulties that Arab EFL learners face when producing English lexica stress, the results of the prior studies were inconsistent. Based on the findings of prior studies (Ali & Abdalla, 2021; Al-Khulaidi, 2017; Altmann, 2006; Altmann & Kabak, 2015; Anani, 1989; Aziz, 1980; Ghaith, 1993; Maghrabi, 2021; Younes, 1984; Youssef & Mazurkewich, 1998), errors in English lexical stress production by Arab EFL learners were attributed to unpredictable patterns in English, which resulted in fixed challenges of English stress patterns produced by Arab EFL learners. Meanwhile, this assumption

might not be accurate, as studies by Helal (2014), Almbark et al. (2014), and Khazneh (2015) revealed contradictory results.

Several Arab EFL/ESL studies may have implemented the ESP to examine the difficult areas Arab EFL/ESL learners face in producing English lexical stress depicted in the earlier studies by Aziz (1980), Anani (1989), Younes (1984), Ghaith (1993), Youssef and Mazurkewich (1998) and the later years also focused on a similar vein of thought by Altmann (2006), Al-Khulaidi (2017), Ali and Abdalla (2021), and Maghrabi (2021) studies. Therefore, researchers reported that Arab learners encounter most of the difficulties with the penultimate syllable because it is mostly stressed in Arabic unless a closed heavy syllable exists in the ultimate syllable like CVCC (Ali & Abdalla, 2021; Al-Khulaidi, 2017; Al-Thalab et al., 2018; Altmann, 2006; Maghrabi, 2021). On the contrary, Helal (2014) and Khazneh (2015) have partially agreed with the findings of the mentioned studies and contradicted others. Helal (2014) and Khazneh (2015) used MT to explain the errors that Arab EFL/ESL learners face in producing English lexical stress. Their results demonstrated that stress pattern similarities and differences between L1 and English cannot be used merely to predict English lexical stress difficulty areas.

Helal (2014) and Khazneh (2015) found that the presence of extrametrical syllables in English and the quantity-sensitivity (weight of a syllable) that Arabic and English share—which is fixed in Arabic and unpredictable in English—are related to errors in stress patterns made by Arab EFL/ESL learners in English. Thus, in contrast to the findings of Maghrabi (2021), Khazneh (2015) revealed that most Syrian Arab EFL learners could shift the primary stress of English to the second syllable. Yemeni Arab EFL learners, among other EFL learners, struggle to produce clear and accurate English pronunciation (Al-Tamimi et al., 2020). This condition becomes more prevalent when producing the English suprasegmental features, especially when producing English lexical stress. According to Al-Khulaidi (2017), the wrong placement of lexical stress is one of the reasons for the unintelligibility of English speech in Yemeni EFL learners. This issue poses a significant challenge for Yemeni EFL learners, resulting in communication breakdowns with speakers from different language backgrounds (Al-Khulaidi, 2017; Al-Tamimi et al., 2020; Motair & Abdulwahab, 2018).

Regardless of the need to investigate the type of errors Arab EFL learners face in the production of English Lexical stress, researchers from different contextual backgrounds have asserted the importance of studying the dialectal variation of the participants involved in studying lexical stress production (Guo, 2022; Kallio et al., 2022). That is because some regional dialects manifest different phonology systems, which result in various findings. Studying the stress pattern of the dialectal variation may also enhance the grounds of the Metrical theory and Stress Typology Model. The current study examines the production of English lexical stress by

Yemeni EFL undergraduates who speak Hadhrami Arabic (HA).

Similarities and differences exist between English and HA stress and syllabic rules (Bamakhramah, 2010). Words such as *reception* /rɪˈsɛpʃən/ in English and /ṣaːḥíbkum/' *your friend*" in HA display the same syllable patterns as CV.CVC. CVC, where the primary stress falls at the penultimate syllable. This similarity can also be found in other syllables, such as CV.CVV.CVC, CCV.CV.CVVC, CCV. CVC, CVC.CV and CVV.CVC. However, stress patterns can be different between English and HA based on the structure of the syllable—for instance, the Arabic word /taa'wuus/ "*peacock*" CVV.CVVC, and the English word "*carpool*" /ˈkɑːrpuːl/ CVVC. CVVC have different syllable patterns. The primary stress falls on penultimate in *carpool* and on ultimate in *taawuus*. Therefore, it can be anticipated that Yemeni EFL learners (who speak HA) will make errors because primary stress always falls at the ultimate syllable when it consists of a tense vowel. In trisyllabic words that contain CV.CVV.CVC, CVC.CVC.CVC, Arab EFL learners tend to place stress on the antepenultimate syllables. For example, the primary stress horizon /həˈraɪzᵊn/ and consensus /kənˈsensəs/are mostly shifted from the penultimate to the antepenultimate as /ˈhəraɪzən/. Khazneh (2015) reported that most Syrian EFL learners produced the first syllable with a full vowel in trisyllabic words. Despite that, the penultimate syllable is always stressed in trisyllabic words in HA when there is no long vowel in the ultimate syllable. This stress rule needs to be studied to understand the tendency to place the primary stress on Yemeni EFL learners who speak the HA dialect.

Concerning the MT, the HA permits extrametrical syllables, which is opposed to other Arabic dialects that have studied the production of lexical stress by Arab EFL learners, as in Helal (2014) and Khazneh (2015). English extrametrical syllables are assumed to increase difficulties in correctly assigning stressed syllables by Arab EFL learners. In HA, the ultimate syllable with tense vowels is always stressed regardless of the tense vowels in the other syllable at a word level. This fixed rule in HA may lead to further challenges. Therefore, there is a need to highlight this issue to understand the challenges that might be encountered by Hadhami Yemeni EFL learners and other Arab EFL learners who speak similar Arabic dialects that share the same rule as the Meccan Arabic dialect. In addition, results may induce further findings that may support the premises of the MT. Due to differences in stress patterns among Arabic dialects, the producibility of stress patterns in Arabic cannot be generalised. Therefore, there is a need to investigate the effect of dialectal stress patterns when differences exist to ensure more reliable data, as recommended by Koffi (2021) and Guo (2022).

Furthermore, earlier studies have examined the production of English lexical stress by Arab EFL learners using real English words produced by a few participants (Anani, 1989; Ghaith, 1993; Youssef & Mazurkewich, 1998; Younes,

1984). Khazneh (2015) explained that a small sample size might reduce the generalizability of the findings. Al-Thalab et al. (2018) indicated that using a nonce (unreal) and unfamiliar real word as stimuli is necessary to investigate English's prosodic structure underlying stress placement. After Altmann's (2006) study, reliable studies have been conducted to investigate the perceptual ability of Arab learners to experience English lexical stress (Albadar, 2018; Al-Thalab et al., 2018). On the other hand, the recent studies that examined the production of English lexicalisation by Arab speakers replicated the methods that have frequently been criticised for using small sample sizes and real English words.

In addition, previous studies used production tasks to investigate the ability of learners of English to produce English lexical stress. However, most of these studies used acceptability ratings to reach the results at phonetic or phonological levels. That is to say, raters assessed data as they listened to the production of the samples (Ali & Abdalla, 2021; Al-Khulaidi, 2017; Cheng & Zhang, 2015; Jaiprasong & Pongpairoj, 2020; Khazneh, 2015; Liu, 2017; Tuan, 2018). However, recent scholars such as Koffi (2021) emphasised using phonetic software analysis of the acoustic measurement to understand the production of English stress patterns by EFL/ESL learners. That is because relying on human judgement to assess the production of English suprasegmental features does not always provide precise results as technological software, such as PRAAT software (Koffi, 2021; Pennington & Rogerson-Revell, 2019). Therefore, the study aims to investigate the effect of Arabic lexical stress predictability in producing English lexical stress by Yemeni EFL undergraduates, as well as native speakers of Hadhrami Arabic (HA).

## METHODS

The current study follows the causal-comparative designs study where data are collected and analysed statistically. The study employs a stimulus consisting of 84 words (42 were disyllabic real and nonce words +, and 42 were trisyllabic real and nonce words) used in the production task. The stimuli were adapted from the study of Al-Thalab et al. (2018). However, word selection was modified by another evaluation panel to ensure the implementation of the HA stress pattern, as shown in Appendix A. Each test word was inserted in carrier sentences, such as "*I say thunder again*", to control the phonetic measurements as produced by the participants.

A production experiment involved two participants from the experimental group comprising 69 Yemeni EFL undergraduate students who speak the Hadhrami Arabic dialect. Participants were further divided into two subgroups within this group: (1) 38 intermediate and (2) 31 advanced learners, ensuring accurate and normalised data results. The second group (the comparison group) comprises ten male and female English American speakers. Based on the design employed in the current study, the production of English lexical stress

by American speakers was involved in gauging the measurements of the nonce words, which are used to reduce the effect of familiarity. That is to say, the researcher was not concerned with the output of American speakers as the study's independent variables did not influence them. Instead, the researcher aimed to analyse the accurate placement of primary stress in nonce words produced by American speakers.

**Procedures of the Study**

Before the experiment started, each respondent was told that all tested words were nouns. They were also instructed to read at normal speed. Once the respondent sat on the chair and got ready, the researcher asked the respondent to look at the stimuli and ask questions if they had any. Each respondent was recorded individually. Words were then extracted from the sentences in wave files and analysed acoustically with the help of a trained phonetician using a computer program called PRAAT Software.

**Phonetic Measurement**

Three phonetic measurements were taken for each vowel in each syllable for disyllabic and trisyllabic English words: duration, fundamental frequency (F0), and intensity. The phonetic cues were taken to identify the placement of the primary stress produced by the native speakers and the Yemeni EFL undergraduates. Each disyllabic and trisyllabic word was divided according to the syllables to measure vowel duration, vowel intensity, and F0 as produced by each participant. The study conducted the Hypothetical Production Measurements scoring scheme adapted from the study of Lin (2018) to indicate the stressed vowel in each word, which gives each vowel a syllable score with regard to each phonetic cue. For example, the English word *thunder* consists of two syllables/ˈθʌn.də/ and stress falls at the penultimate syllable. Measurements of the first syllable are 0.082 for duration millisecond (ms), 68 decibels (dB) for intensity and 154 hertz (hz) for F0. Measurements of the second syllable are 0.046 for duration, 66 for intensity and 104 for F0. The score ranged from 3 to 1. This process was repeated for all three cues of each syllable. These three scores were added again to become the final score for the stressed syllable. The vowel that received the highest final score was determined to be the stressed syllable.

**RESULTS**

The Yemeni EFL undergraduates scored higher correct responses when English and HA share similar stress patterns. The total number of correct responses by intermediate and advanced Yemeni EFL undergraduates is 97. Meanwhile, the Yemeni EFL undergraduates scored a total of 71 incorrect answers. Only 23 were incorrect responses that displayed similar stress patterns between both variances, as explained in Table 1. It indicates that the predictability of the HA stress pattern actively influences the assignment of stressed syllables in English words. However, findings show that some errors cannot be traced back due to the predictability of the HA stress patterns.

Table 1
*Summary of the results*

| HA Predictability | | Incorrect | Correct | Total |
|---|---|---|---|---|
| Different | Count | **48** | **30** | **78** |
| | % within HA (%) | 61.5 | 38.5 | 100.0 |
| | % within Score (%) | 67.6 | 30.9 | 46.4 |
| | % of Total (%) | 28.6 | 17.9 | 46.4 |
| Similar | Count | **23** | **67** | **90** |
| | % within HA (%) | 25.6 | 74.4 | 100.0 |
| | % within Score (%) | 32.4 | 69.1 | 53.6 |
| | % of Total (%) | 13.7 | 39.9 | 53.6 |

*Source:* Authors' work

The following descriptive results show more detailed findings based on the stress position within a word. Results of American speakers are not provided here because HA influence does not affect their production of English stress. Nevertheless, they are added to Appendices to measure the stressed syllable in nonce words.

## Descriptive Results of HA Stress Pattern Effect

Overall, results from Tables 2 and 3 show that the Yemeni EFL undergraduates mostly placed the stress at the penultimate syllable in words that share similar stress patterns, with stressed syllables getting higher scores than the unstressed syllable. For instance, the word *valley* has the primary stress at the penultimate syllable. Therefore, phonetic measurements of the word *valley* recorded a duration of 0.112 ms, an intensity of 70 dB, and an F0 of 138 Hz in the stressed syllable (Table 2). Nevertheless, the unstressed syllable recorded 104 ms, 60 dB, and 106 Hz by the intermediate group. However, there are four incorrect responses: (1) *captain,* (2) *bamtain,* (3) *defect, and* (4) *degict*, in the production of the intermediate Yemeni EFL undergraduates. For example, stress was cued at the penultimate syllable with 0.084 ms, 66 dB, and 149 Hz in the stressed syllable and 0.111 ms, 66 dB, 154 in the ultimate syllable of the word *captain*.

The advanced group also scored correct responses in most of the words unless for the nonce words *bamtian and degict*, which result from unfamiliarity with words, as seen in Table 3. For instance, the nonce word *degict* scored 0.099 ms, 67 dB, 142 Hz in the stressed syllable and 0.104 ms, 69 dB, 156 Hz in the unstressed syllable. These measurements indicate the wrong placement of the English primary stress. However, all the incorrect responses are related to differences between HA and English stress patterns. This result emphasises the negative transfer from HA to produced stress patterns in English. Nevertheless, the negative transfer is not the only reason for increasing the number of incorrect answers. Some errors can be attributed to the incorrect reduction of the vowels, as in *valance*.

Table 2
*Results of the intermediate group in disyllabic words at the penultimate*

| Word | Transcription | | ST | UN | SC | Word | Transcription | | ST | UN | SC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | EN | HA | R | R | 1/0 | | EN | HA | R | R | 1/0 |
| **Valley** | /ˈvæl.i/ (**CV**C.V) | (**CV**.CV) | 6 | 3 | 1 | Pitrade | /ˈpaɪ.reɪd/ (**CVV**.CVVC) | (CVV.**CVVC**) | 5 | 4 | 0 |
| **Money** | /ˈmʌn.i/ (**CV**C.V) | (**CV**.CV) | 6 | 3 | 1 | Sozet | /'sɒzɪt/ (**CV**.CVC) | (**CV**.CVC) | 6 | 3 | 1 |
| **Rocket** | /ˈrɒk.ɪt/ (**CVC**.VC) | (**CVC**.CV) | 6 | 3 | 1 | Kagiene | ˈkædʒiːn / (**CV**. CVVC) | (CV. **CVVC**) | 6 | 3 | 1 |
| **Nitrate** | /ˈnaɪ.treɪt/ (**CVV**.CVVC) | (CVV.**CVVC**) | 6 | 3 | 1 | Jeelney | /ˈdʒiːl.ni/ (**CVVC**.CVC) | (**CVVC**.CVC) | 5 | 4 | 1 |
| **Data** | /ˈdeɪ.tə/ (**CV**.CV) | (**CV**.CV) | 6 | 3 | 1 | Zomey | /'zɒmi/ (**CV**.CVV) | (CV.**CVV**) | 6 | 3 | 1 |
| **Thunder** | /ˈθʌn.dər/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 | Nerbing | /'nɜːr.bɪŋ/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 |
| **Nursing** | /ˈnɜː.sɪŋ/ (**CV**.CVC) | (**CV**.CVC) | 6 | 3 | 1 | Mabing | /ˈmeɪbɪŋ/ (**CV**.CVC) | (**CV**.CVC) | 6 | 3 | 1 |
| **Racing** | /ˈreɪ.sɪŋ/ (**CVV**.CVC) | (**CVV**.CVC) | 6 | 3 | 1 | Mufting | /ˈmʌf.tɪŋ/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 |
| **Caffeine** | /ˈkæf.iːn/ (**CV**C.VVC) | (CVC.VVC) | 4 | 5 | 0 | Luncer | ˈlʌnsə(r)/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 |
| **Captain** | /ˈkæp.tɪn/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 | Janey | /ˈdʒæ.ni/ (**CV**.CV) | (**CV**.CV) | 6 | 3 | 1 |
| **Melting** | /ˈmel.tɪŋ/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 | keybease | /ˈkiːpiːs/ (**CVV**.CVVC) | (CVV.**CVVC**) | 4 | 5 | 0 |
| **Valance** | /ˈvæl.əns/ (**CVC**.VCC) | (**CVC**.VCC) | 6 | 3 | 1 | Bamtain | /ˈbæmtɪn/ (**CVC**.CVVC) | (CVC.**CVVC**) | 4 | 5 | 0 |
| **Keyboard** | /ˈkiː.bɔːd/ (**CVV**.CVVC) | (CVV.**CVVC**) | 4 | 5 | 0 | Valomes | /ˈvæ.lɒmz/ (**CV**.CVCC) | (CV.**CVCC**) | 3 | 6 | 0 |

Table 2 *(continue)*

| Word | Transcription | | ST | UN | SC | Word | Transcription | | ST | UN | SC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | EN | HA | R | R | 1/0 | | EN | HA | R | R | 1/0 |
| **Vanguard** | /ˈvæn.gɑːrd/ (**CVC**.CVVCC) | (CVC.**CVVCC**) | 4 | 5 | 0 | Vangoid | /ˈvængoɪd (**CVC**.CVVC) | (CVC.**CVVC**) | 3 | 6 | 0 |
| **Journey** | /ˈdʒɜː.ni/ (**CVV**.CV) | (**CVV**.CV) | 6 | 3 | 1 | Degict | /ˈdɪdʒɪkt/ (**CV**. CVCC) | (**CV**. CVCC) | 4 | 5 | 0 |
| **Raba** | ˈreɪbə (**CV**.CV) | (**CV**.CV) | 6 | 3 | 1 | Defect | /ˈdiː.fekt/ (**CV**.CVCC) | (**CV**.CVCC) | 6 | 3 | 1 |

*Source:* Authors' work

Table 3

*Results of the advanced group in disyllabic words at the penultimate*

| Word | Transcription | | ST | UN | SC | Word | Transcription | | ST | UN | SC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | EN | HA | R | R | 1/0 | | EN | HA | R | R | 1/0 |
| **Valley** | /ˈvæl.i/ (**CV**C.V) | (**CV**.CV) | 6 | 3 | 1 | Pitrade | /ˈpaɪ.reɪd/ (**CVV**.CVVC) | (CVV.**CVVC**) | 3 | 6 | 0 |
| **Money** | /ˈmʌn.i/ (**CV**C.V) | (**CV**.CV) | 6 | 3 | 1 | Sozet | /'spzɪt/ (**CV**.CVC) | (**CV**.CVC) | 6 | 3 | 1 |
| **Rocket** | /ˈrɒk.ɪt/ (**CVC**.VC) | (**CVC**.CV) | 6 | 3 | 1 | Kagiene | ˈkædʒiːn / (**CV**. CVVC) | (CV. **CVVC**) | 4 | 5 | 0 |
| **Nitrate** | /ˈnaɪ.treɪt/ (**CVV**.CVVC) | (CVV.**CVVC**) | 3 | 6 | 0 | Jeelney | /ˈdʒiːl.ni/ (**CVVC**.CVC) | (**CVVC**.CVC) | 5 | 4 | 1 |
| **Data** | /ˈdeɪ.tə/ (**CV**.CV) | (**CV**.CV) | 6 | 3 | 1 | Zomey | /'zɒmi/ (**CV**.CVV) | (CV.**CVV**) | 6 | 3 | 1 |
| **Thunder** | /ˈθʌn.dər/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 | Nerbing | /'nɜːr.bɪŋ/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 |
| **Nursing** | /ˈnɜː.sɪŋ/ (**CV**.CVC) | (**CV**.CVC) | 6 | 3 | 1 | Mabing | /ˈmeɪbɪŋ/ (**CV**.CVC) | (**CV**.CVC) | 6 | 3 | 1 |

Table 3 *(continue)*

| Word | Transcription | | ST | UN | SC | Word | Transcription | | ST | UN | SC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | EN | HA | R | R | 1/0 | | EN | HA | R | R | 1/0 |
| **Racing** | /ˈreɪ.sɪŋ/ (**CVV**.CVC) | (**CVV**.CVC) | 6 | 3 | 1 | Mufting | /ˈmʌf.tɪŋ/ (**CVC**.CVC) | (**CVC**.CVC) | 5 | 4 | 1 |
| **Caffeine** | /ˈkæf.iːn/ (**CV**C.VVC) | (CVC.VVC) | 3 | 6 | 0 | Luncer | ˈlʌnsə(r)/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 |
| **Captain** | /ˈkæp.tɪn/ (**CVC**.CVC) | (**CVC**.CVC) | 4 | 5 | 0 | Janey | /ˈdʒæ.ni/ (**CV**.CV) | (**CV**.CV) | 6 | 3 | 1 |
| **Melting** | /ˈmel.tɪŋ/ (**CVC**.CVC) | (**CVC**.CVC) | 6 | 3 | 1 | keybease | /ˈkiːpiːs/ (**CVV**.CVVC) | (CVV.**CVVC**) | 4 | 5 | 0 |
| **Valance** | /ˈvæl.əns/ (**CVC**.VCC) | (**CVC**.VCC) | 3 | 6 | 0 | Bamtain | /ˈbæmtɪn/ (**CVC**.CVVC) | (CVC.**CVVC**) | 4 | 5 | 0 |
| **Keyboard** | /ˈkiː.bɔːd/ (**CVV**.CVVC) | (CVV.**CVVC**) | 4 | 5 | 0 | Valomes | /ˈvæ.lɒmz/ (**CV**.CVCC) | (CV.**CVCC**) | 3 | 6 | 0 |
| **Vanguard** | /ˈvæn.gɑːrd/ (**CVC**.CVVCC) | (CVC.**CVVCC**) | 3 | 6 | 0 | Vangoid | /ˈvængoɪd (**CVC**.CVVC) | (CVC.**CVVC**) | 3 | 6 | 0 |
| **Journey** | /ˈdʒɜː.ni/ (**CVV**.CV) | (**CVV**.CV) | 6 | 3 | 1 | Degict | /ˈdɪdʒɪkt/ (**CV**. CVCC) | (**CV**. CVCC) | 4 | 5 | 0 |
| **Raba** | ˈreɪbə (**CV**.CV) | (**CV**.CV) | 5 | 4 | 1 | Defect | /ˈdiː.fekt/ (**CV**.CVCC) | (**CV**.CVCC) | 3 | 6 | 0 |

*Source:* Authors' work

Tables 4 and 5 illustrate the result of the disyllabic words where stress is located at the ultimate syllable by Yemeni EFL undergraduates. Most tested words share similar stress patterns between both variants, except for the word *success* and its nonce counterpart *diskus*, which share different stress patterns where the ultimate syllable does not include a tense vowel. Measurements of the word *success* were 0.098 ms, 69 dB, 158 Hz in the unstressed syllable and 0.094 ms, 68 dB, 132 Hz in the stressed syllable in the intermediate group.

Tables 6 and 7 illustrate the result of the trisyllabic words where stress is located at the antepenultimate syllable as produced by Yemeni EFL undergraduates. Results in Table 6 show different types of stress patterns, which cannot all be regarded as HA stress pattern predictability. Some words were given a score of 0, which can be highlighted in this table because of HA transfer, for example, *merchandise, signature, pesticide, galaxy,* and *fortunate*. On the contrary, the intermediate Yemeni EFL undergraduates scored correct responses in words that do not follow HA's structure, such as *leadership*, *scenery, melody, dignity, pharmacy* and *feederchip.* The stress in these words falls at the antepenultimate syllable, which contrasts with the stress patterns of HA. This result reduces the effect of HA

Table 4
*Results of the intermediate group in disyllabic words at the ultimate*

| **(Intermediate)** | | | | | |
|---|---|---|---|---|---|
| **Word** | Transcription | | **Measurement** | | |
| | EN | HA | **ST** | **UN** | **SC** |
| **Sardine** | /sɑːrˈdiːn/ (CVVC.**CVVC**) | (CVVC.**CVVC**) | 3 | 6 | 1 |
| **Darceal** | /dɑːr.ˈsiːl/ (CVC.**CVVC**) | **(**CVC.**CVVC**) | 3 | 6 | 1 |
| **Success** | /səkˈses/ (CVC.**CVC)** | (**CVC**.CVC**)** | 6 | 3 | 0 |
| **Campaign** | /kæmˈpeɪn/ (CVC.**CVVC**) | (CVC.**CVVC**) | 3 | 6 | 1 |
| **Nineteen** | /ˌnaɪmˈtiːn/ (CVC.**CVVC**) | (CVC.**CVVC**) | 4 | 5 | 1 |
| **Machine** | /məˈʃiːn/ (CV.**CVVC**) | CV.**CVVC**) | 3 | 6 | 1 |
| **Campoyed** | /kæmˈpoɪd/ (CVC.**CVVC**) | (CVC.**CVVC**) | 3 | 6 | 1 |
| **Noilteen** | /ˌnoɪlˈtiːn/ (CVVC**.CVVC**) | (CVVC**.CVVC**) | 3 | 6 | 1 |
| **Rarsine** | /ˌrɑːˈsiːn/ (CVV.**CVVC**) | (CVV.**CVVC**) | 3 | 6 | 1 |
| **Diskus** | /dəkˈses/ (CVC.**CVC)** | (**CVC**.CVC**)** | 6 | 3 | 0 |

*Source:* Authors' work

Table 5
*Results of the advanced group in disyllabic words at the ultimate*

| **(Advanced)** | | | | | |
|---|---|---|---|---|---|
| **Word** | **Transcription** | | **Measurement** | | |
| | EN | HA | **ST** | **UN** | **SC** |
| **Sardine** | /sɑːrˈdiːn/ (CVVC.**CVVC**) | (CVVC.**CVVC**) | 3 | 6 | 1 |
| **Darceal** | /dɑːr.ˈsiːl/ (CVC.**CVVC**) | **(**CVC.**CVVC**) | 3 | 6 | 1 |
| **Campaign** | /kæmˈpeɪn/ (CVC.**CVVC**) | (CVC.**CVVC**) | 3 | 6 | 1 |
| **Nineteen** | /ˌnaɪnˈtiːn/ (CVC.**CVVC**) | (CVC.**CVVC**) | 3 | 6 | 1 |
| **Machine** | /məˈʃiːn/ (CV.**CVVC**) | CV.**CVVC**) | 3 | 6 | 1 |
| **Campoyed** | /kæmˈpoɪd/ (CVC.**CVVC**) | (CVC.**CVVC**) | 4 | 5 | 1 |
| **Noilteen** | /ˌnoɪlˈtiːn/ (CVVC**.CVVC**) | (CVVC**.CVVC**) | 3 | 6 | 1 |
| **Rarsine** | /ˌrɑːˈsiːn/ (CVV.**CVVC**) | (CVV.**CVVC**) | 3 | 6 | 1 |
| **Success** | /səkˈses/ (CVC.**CVC)** | (**CVC**.CVC**)** | 4 | 5 | 0 |
| **diskus** | /dəkˈses/ (CVC.**CVC)** | (**CVC**.CVC**)** | 6 | 3 | 0 |

*Source:* Authors' work

Table 6
*Results of the intermediate group in trisyllabic words at the antepenultimate*

| **Antepenultimate Stress (intermediate)** | | | | | | |
|---|---|---|---|---|---|---|
| Word | **Transcription** | | **Measurements** | | | |
| | EN | HA | ST1 | UN2 | UN3 | SC |
| **Leadership** | / ˈliːdəʃɪp / (**CVV**.CV.CVC) | (CVV.**CV**.CVC) | 9 | 5 | 4 | 1 |
| **Scenery** | / ˈsiːnəri/ (**CV**.CV.CV) | CV.**CV**.CV | 7 | 8 | 3 | 0 |
| **Merchandise** | /ˈmɜːtʃəndaɪs / (**CV.**CVC.CVVC) | (CV**.**CVC.**CVVC**) | 6 | 4 | 8 | 0 |
| **Signature** | / ˈsɪgnətʃə(r)/ (**CVC**.CV.CVC) | (CVC.**CVC**.CVC) | 4 | 9 | 5 | 0 |
| **Pesticide** | / ˈpestɪsaɪd / (**CVC**.CV.CVVC) | **(**CVC.CV**.CVVC**) | 4 | 5 | 9 | 0 |
| **Valentine** | / ˈvæləntaɪn / (**CV**.CVC.CVC) | **(**CVC.CV**.CVVC**) | 6 | 3 | 9 | 0 |
| **Pharmacy** | / ˈfɑːrməsi / (**CVC**.CV.CV) | **(**CV.**CV**.CV) | 9 | 6 | 3 | 1 |
| **Fortunate** | / ˈfɔːtʃənət / (**CVV**.CVC.VC) | (CVV.**CVC**.VC) | 5 | 9 | 4 | 0 |

Table 6 *(continue)*

| Antepenultimate Stress (intermediate) | | | | | | |
|---|---|---|---|---|---|---|
| Word | Transcription | | Measurements | | | |
| | EN | HA | ST1 | UN2 | UN3 | SC |
| **Dignity** | / ˈdɪgnəti / (**CVC**.CV.CV) | (CVC.**CV**.CV) | 8 | 7 | 5 | 1 |
| **Melody** | / ˈmelədi / (**CV**.CV.CV) | (CV.**CV**.CV) | 9 | 5 | 4 | 1 |
| **Galaxy** | /ˈgæl.ək.si/ (**CVC**.VC.CV) | (CV.**CVC**.CV) | 6 | 9 | 3 | 0 |
| **Vacapsy** | /ˈvækəpsi/ (**CV**.CVC.CV) | (CV.**CVC**.CV) | 6 | 9 | 3 | 0 |
| **Septiride** | /ˈseptɪraɪd/ (**CVC**.CV.CVVC) | (CVC.CV.**CVVC**) | 7 | 3 | 8 | 0 |
| **Sobsature** | /ˈsɒbsətʃə(r)/ (**CVC**.CV.CVC) | **(**CVC.**CVC**.CVC) | 6 | 9 | 3 | 0 |
| **Bargary** | /ˈbɑːgəri/ **(CV**.CV.CV) | **(**CV.**CV**.CV) | 9 | 6 | 3 | 1 |
| **Detsity** | /ˈdetsəti/ (**CV**.CV.CV) | (CV.**CV**.CV) | 9 | 5 | 4 | 1 |
| **Benefit** | /ˈbenɪfɪt/ (**CV**.CV.CVC) | (CV.**CV**.CVC) | 9 | 5 | 4 | 1 |
| **Perefy** | /ˈpiːrəfi/ (**CV**.CV.CV) | (CV.**CV**.CV) | 9 | 6 | 3 | 1 |
| **Ferculate** | /ˈfɜːrkələt/ (**CVC**.CV.CVC) | (CVC.**CV**.CVC) | 5 | 9 | 4 | 0 |
| **Feederchip** | /ˈfiːdətʃɪp/ (**CVV**.CV.CVC) | (CVV.**CV**.CVC) | 9 | 6 | 3 | 1 |
| **Rarchandise** | /ˈrɑːtʃəndaɪs/ **(CV.**CVC.CVC) | (CV**.**CVC.**CVVC**) | 6 | 3 | 9 | 0 |
| **Nolentide** | /ˈnɒləntaɪd/ (**CV**.CVC.CVVC) | (CV.CVC.**CVVC**) | 6 | 3 | 9 | 0 |
| **Semofy** | /ˈseməfi/ (**CV**.CV.CV) | (CV.**CV**.CV) | 8 | 7 | 3 | 1 |
| **Bameset** | /ˈbemɪset/ (**CV**.CV.CVC) | (CV.**CV**.CVC) | 9 | 5 | 4 | 1 |

*Source:* Authors' work

Table 7
*Results of the advanced group in trisyllabic words at the antepenultimate*

| Antepenultimate Stress (advanced) | | | | | | |
|---|---|---|---|---|---|---|
| **Word** | Transcription | | Stressed Vowel | | | |
| | EN | HA | ST | UN2 | UN3 | SC |
| **Leadership** | / ˈliːdəʃɪp / (**CVV**.CV.CVC) | (CVV.**CV**.CVC) | 9 | 5 | 4 | 1 |
| **Scenery** | / ˈsiːnəri/ (**CV**.CV.CV) | CV.**CV**.CV | 7 | 8 | 3 | 0 |

Table 7 *(continue)*

| Antepenultimate Stress (advanced) | | | | | | |
|---|---|---|---|---|---|---|
| **Word** | Transcription | | Stressed Vowel | | | |
| | EN | HA | ST | UN2 | UN3 | SC |
| **Merchandise** | /ˈmɜːtʃəndaɪs / (**CV.**CVC.CVVC) | (CV.CVC.**CVVC**) | 6 | 3 | 9 | 0 |
| **Signature** | / ˈsɪgnətʃə(r)/ (**CVC**.CV.CVC) | (CVC.**CVC**.CVC) | 4 | 9 | 5 | 1 |
| **Pesticide** | / ˈpestɪsaɪd / (**CVC**.CV.CVVC) | **(**CVC.CV.**CVVC**) | 6 | 3 | 9 | 0 |
| **Valentine** | / ˈvæləntaɪn / (**CV**.CVC.CVC) | **(**CVC.CV.**CVVC**) | 8 | 3 | 7 | 1 |
| **Pharmacy** | / ˈfɑːrməsi / (**CVC**.CV.CV) | **(**CV.**CV**.CV) | 9 | 6 | 3 | 1 |
| **Fortunate** | / ˈfɔːtʃənət / (**CVV**.CVC.VC) | (CVV.**CVC**.VC) | 9 | 5 | 4 | 1 |
| **Dignity** | / ˈdɪgnəti / (**CVC**.CV.CV) | (CVC.**CV**.CV) | 9 | 7 | 5 | 1 |
| **Melody** | / ˈmelədi / (**CV**.CV.CV) | (CV.**CV**.CV) | 9 | 5 | 4 | 1 |
| **Galaxy** | /ˈgæl.ək.si/ (**CVC**.VC.CV) | (CV.**CVC.**CV) | 9 | 3 | 6 | 1 |
| **Vacapsy** | /ˈvækəpsi/ (**CV**.CVC.CV) | (CV.**CVC.**CV) | 6 | 9 | 3 | 0 |
| **Septiride** | /ˈseptɪraɪd/ (**CVC**.CV.CVVC) | (CVC.CV.**CVVC**) | 7 | 3 | 8 | 0 |
| **Sobsature** | /ˈsɒbsətʃə(r)/ (**CVC**.CV.CVC) | **(**CVC.**CVC**.CVC) | 6 | 9 | 3 | 0 |
| **Bargary** | /ˈbɑːgəri/ **(CV**.CV.CV) | **(**CV.**CV**.CV) | 9 | 6 | 3 | 1 |
| **Detsity** | /ˈdetsəti/ (**CV**.CV.CV) | (CV.**CV**.CV) | 9 | 6 | 3 | 1 |
| **Benefit** | /ˈbenɪfɪt/ (**CV**.CV.CVC) | (CV.**CV**.CVC) | 9 | 5 | 4 | 1 |
| **Perefy** | /ˈpiːrəfi/ (**CV**.CV.CV) | (CV.**CV**.CV) | 9 | 6 | 3 | 1 |
| **Ferculate** | /ˈfɜːrkələt/ (**CVC**.CV.CVC) | (CVC.**CV**.CVC) | 5 | 9 | 4 | 0 |
| **Feederchip** | /ˈfiːdətʃɪp/ (**CVV**.CV.CVC) | (CVV.**CV**.CVC) | 9 | 6 | 3 | 1 |
| **Rarchandise** | /ˈrɑːtʃəndaɪs/ **(CV.**CVC.CVC) | (CV.CVC.**CVVC**) | 6 | 3 | 9 | 0 |
| **Nolentide** | /ˈnɒləntaɪd/ (**CV**.CVC.CVVC) | (CV.CVC.**CVVC**) | 9 | 3 | 6 | 1 |
| **Semofy** | /ˈseməfi/ (**CV**.CV.CV) | (CV.**CV**.CV) | 9 | 6 | 3 | 1 |
| **Bameset** | /ˈbemɪset/ (**CV**.CV.CVC) | (CV.**CV**.CVC) | 9 | 5 | 4 | 1 |

*Source:* Authors' work

stress pattern predictability, which does not allow stress at the antepenultimate syllable.

Table 7 shows similar results compared to the previous table, except that the advanced group produced the stress correctly at the antepenultimate in words like *signature, fortunate, pacific, nolentide,* and *pacific*. *Fortunate*, for example, scored 0.097 ms, 69 dB, 143Hz, 0.094 ms, 66 dB, 138 hz, 0.114 ms, 67 dB and 124 Hz in each syllable, respectively. Some errors are related to the HA effect, such as changing the place of stress to the ultimate where the tense vowel is located. However, the primary stress was incorrectly placed in another syllable, which does not include the pattern of HA. For example, the word *Vacapsy* recorded 0.070 ms, 67 dB, 131 Hz in the stressed syllable, 0.114 ms, 71 dB, 138 Hz in the unstressed syllable, and 0.064 ms, 57 dB, 117 Hz in the unstressed syllable.

Results in Table 8 show several incorrect primary stress placements that cannot be related to the predictability of HA stress patterns, such as in *pacific, synopses,* and *magnetic*. *Synopses*, for instance, scored 0.099 ms, 72 dB, 202 Hz, 0.098 ms, 70 dB, 170 Hz, 0.082 ms, 67 dB and 143 Hz for each syllable separately. This result indicates that Yemeni EFL undergraduates wrongly stress the antepenultimate syllable, although the stress pattern is similar to HA in the word *synopses* (CV.**CVC**.CVC). Other incorrect responses, however, can be traced to the effect of HA stress patterns such as *byhontide* and *pelogonide*. Moreover, the intermediate Yemeni EFL undergraduates scored correct responses in *vanilla, nosila, recording,* and *defender*.

Table 9 shows the responses by the advanced group, where the primary stress is located at the penultimate. Fewer incorrect responses are shown in this table compared to the antepenultimate stress. The HA stress pattern mainly influences correct and incorrect placement of English lexical stress. Yet, the Yemeni EFL undergraduates stress the vowel incorrectly to the antepenultimate in *synopsis* and *synoksuf*, which cannot be related to the effect of HA.

Table 8
*Results of the intermediate group in trisyllabic words at the penultimate*

| Word | Penultimate Stress (intermediate) | | | | | |
|---|---|---|---|---|---|---|
| | Transcription | | Measurement | | | |
| | EN | HA | UN1 | ST2 | UN3 | SC |
| **Vanilla** | / vəˈnɪlə / (CV.**CV**.CV) | (CV.**CV**.CV) | 6 | 9 | 3 | 1 |
| **Pacific** | / pəˈsɪfɪk / (CV.**CV**.CVC) | (CV.**CV**.CVC) | 9 | 6 | 3 | 0 |
| **Peroxide** | / pəˈrɒksaɪd / (CV.**CVC**.CVVC) | (CV.CVC.**CVVC**) | 6 | 3 | 9 | 0 |
| **Defender** | /dɪˈfendə(r)/ (CV.**CVC**.CVC) | (CV.**CVC**.CVC) | 6 | 9 | 3 | 1 |
| **Recording** | / rɪˈkɔːdɪŋ / (CV.**CVV**.CVC) | (CV.**CVV**.CVC) | 6 | 9 | 3 | 1 |

Table 8 *(continue)*

| Word | Penultimate Stress (intermediate) | | | | | |
|---|---|---|---|---|---|---|
| | Transcription | | Measurement | | | |
| | EN | HA | UN1 | ST2 | UN3 | SC |
| **Byzantine** | / baɪˈzæntaɪn / (CVV.**CV**C.CVVC) | (CVV.CVC.**CVVC**) | 9 | 5 | 4 | 0 |
| **Magnetic** | /mægˈnet.ɪk/ (CVC.**CV**C.VC) | (CVC.**CV**C.VC) | 9 | 6 | 3 | 0 |
| **Nosila** | /nəˈsɪlə/ (CV.**CV**.CV) | /nəˈsɪlə/ (CV.**CV**.CV) | 9 | 6 | 3 | 0 |
| **Subnetic** | /sʌbˈnetɪk/ (CVC.**CV**.CVC) | (CVC.**CV**.CVC) | 9 | 6 | 3 | 0 |
| **Rerarging** | /rɪˈrɑːrgɪŋ/ (CV.**CVV**.CVC) | (CV.**CVV**.CVC) | 3 | 9 | 6 | 1 |
| **Mamigic** | /məˈmɪdʒɪk/ (CV.**CV**.CVC) | (CV.**CV**.CVC) | 9 | 6 | 3 | 0 |
| **Byhontide** | /baɪˈhɒntaɪd/ (CVV.**CV**C.CVVC) | (**CVV**.CVC.CVVC) | 9 | 5 | 4 | 0 |
| **Pelognide** | /pəˈlɒgnaɪd/ (CV.**CV**C.CVVC) | (CV.CVC.**CVVC**) | 9 | 3 | 6 | 0 |
| **dedanfer** | /dɪˈdænfə(r)/ (CV.**CV**C.CVC) | (CV.**CV**C.CVC) | 6 | 9 | 3 | 0 |
| **Consensus** | /kənˈsen.səs/ (CVC.**CV**C.CVC) | (CVC.**CV**C.CVC) | 9 | 6 | 3 | 0 |
| **Synopsis** | /sɪˈnɑːp.sɪs/ (CV.**CV**C.CVC) | (CV.**CV**C.CVC) | 9 | 6 | 3 | 0 |
| **Komsensus** | /kəmˈsen.səs/ (CVC.**CV**C.CVC) | (CVC.**CV**C.CVC) | 9 | 6 | 3 | 0 |
| **Synoksuf** | /sɪˈnɑːk.sɪf/ (CV.**CV**C.CVC) | (CV.**CV**C.CVC) | 9 | 6 | 3 | 0 |

*Source:* Authors' work

Table 9
*Results of the advanced group in trisyllabic words at the penultimate*

| Word | Penultimate Stress (Advanced) | | | | | |
|---|---|---|---|---|---|---|
| | Transcription | | Measurement | | | |
| | EN | HA | UN1 | ST2 | UN3 | SC |
| **Vanilla** | / vəˈnɪlə / (CV.**CV**.CV) | (CV.**CV**.CV) | 6 | 9 | 3 | 1 |
| **Pacific** | / pəˈsɪfɪk / (CV.**CV**.CVC) | (CV.**CV**.CVC) | 9 | 6 | 3 | 1 |
| **Peroxide** | / pəˈrɒksaɪd / (CV.**CVC**.CVVC) | (CV.CVC.**CVVC**) | 6 | 3 | 9 | 0 |
| **Defender** | /dɪˈfendə(r)/ (CV.**CVC**.CVC) | (CV.**CVC**.CVC) | 6 | 9 | 3 | 1 |
| **Recording** | / rɪˈkɔːdɪŋ / (CV.**CVV**.CVC) | (CV.**CVV**.CVC) | 6 | 9 | 3 | 1 |

Table 9 *(continue)*

| Penultimate Stress (Advanced) | | | | | | |
|---|---|---|---|---|---|---|
| **Word** | Transcription | | Measurement | | | |
| | EN | HA | UN1 | ST2 | UN3 | SC |
| **Byzantine** | / baɪˈzæntaɪn / (CVV.**CVC**.CVVC) | (CVV.CVC.**CVVC**) | 9 | 5 | 4 | 0 |
| **Magnetic** | /mægˈnet.ɪk/ (CVC.**CVC**.VC) | (CVC.**CVC**.VC) | 9 | 6 | 3 | 0 |
| **Nosila** | /nəˈsɪlə/ (CV.**CV**.CV) | /nəˈsɪlə/ (CV.**CV**.CV) | 9 | 6 | 3 | 1 |
| **Subnetic** | /sʌbˈnetɪk/ (CVC.**CV**.CVC) | (CVC.**CV**.CVC) | 7 | 8 | 3 | 1 |
| **Rerarging** | /rɪˈrɑːrgɪŋ/ (CV.**CVV**.CVC) | (CV.**CVV**.CVC) | 3 | 9 | 6 | 1 |
| **Mamigic** | /məˈmɪdʒɪk/ (CV.**CV**.CVC) | (CV.**CV**.CVC) | 9 | 6 | 3 | 0 |
| **Byhontide** | /baɪˈhɒntaɪd/ (CVV.**CVC**.CVVC) | (**CVV**.CVC.CVVC) | 9 | 5 | 4 | 0 |
| **Pelognide** | /pəˈlɒgnaɪd/ (CV.**CVC**.CVVC) | (CV.CVC.**CVVC**) | 4 | 9 | 5 | 1 |
| **dedanfer** | /dɪˈdænfə(r)/ (CV.**CVC**.CVC) | (CV.**CVC**.CVC) | 6 | 9 | 3 | 1 |
| **Consensus** | /kənˈsen.səs/ (CVC.**CVC**.CVC) | (CVC.**CVC**.CVC) | 9 | 6 | 3 | 0 |
| **Synopsis** | /sɪˈnɑːp.sɪs/ (CV.**CVC**.CVC) | (CV.**CVC**.CVC) | 9 | 6 | 3 | 0 |
| **Komsensus** | /kəmˈsen.səs/ (CVC.**CVC**.CVC) | (CVC.**CVC**.CVC) | 6 | 9 | 3 | 0 |
| **Synoksuf** | /sɪˈnɑːk.sɪf/ (CV.**CVC**.CVC) | (CV.**CVC**.CVC) | 9 | 6 | 3 | 0 |

*Source:* Authors' work

### Result of Pearson Chi-Square and Cramer's V

A Pearson Chi-Square test was conducted to determine if there is a relationship between the HA stress pattern and the assignment of stressed syllables when producing English lexical stress by Yemeni EFL undergraduates. Table 10 displays the results of the Pearson Chi-Square test, showing whether there is any significant association between the HA stress pattern and the production of English lexical stress.

Results of the Chi-Square test show strong evidence of a relationship between the HA stress pattern and the production of English lexical stress (Chi-Square = 22.172, df = 1, $P<0.005$).

## DISCUSSION

### Disyllabic Words

Overall, the results found evidence supporting the view that HA stress pattern predictability affects assigning the location of the primary stress in the production of

Table 10
*Results of the Pearson Chi-Square test*

| ***Pearson Chi-Square Test*** | | | | | |
|---|---|---|---|---|---|
| | Value | df | Asymptotic Significance (2—sided) | Exact Sig (2-sided) | Exact Sig (1-sided) |
| **Pearson Chi-Square** | 22.172[a] | 1 | 0.001 | | |
| **Continuity Correction[b]** | 20.722 | 1 | 0.001 | | |
| **Likelihood Ratio** | 22.614 | 1 | 0.001 | | |
| **Fisher's Exact Test** | | | | 0.000 | 0.000 |
| **N of Valid Cases** | 168 | | | | |

*Notes.* [a] = 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 32.96; [b] = computed only for the 2×2 table.
*Source:* Authors' work

English lexical stress patterns. That is to say, HA's stress pattern strongly affects placing English primary stress in English words, as produced by the Yemeni EFL undergraduates. More precisely, the Yemeni EFL undergraduates have mostly assigned the primary stress correctly in the stressed syllable when HA share the same stress patterns in English. This result supports the positive transfer from HA to English production of stress patterns.

With regard to literature, the method of collecting the tested instruments focused on the areas of the predicated difficulties, which contradicts the assumption of the Stress Typology Model by Altmann (2006). Thus, findings reported in most previous studies showed that Arab EFL learners encounter difficulties in placing the English lexical stress without attaining to areas that may not be challengeable for Arab EFL learners. The results of the two Yemeni participant groups in this study show that they were more likely to stress the vowel at the penultimate syllable in disyllabic and trisyllabic words. This result goes in line with the past studies of Ali and Abdalla (2021), Khazneh (2015), Altmann (2006) and Anani (1989). On the contrary, other critical results appeared to contradict these findings. Both groups of the Yemeni EFL undergraduate reported errors in stressing the correct vowel at the penultimate syllables.

Regarding the placement of English lexical stress as affected by HA stress patterns, the Yemeni EFL undergraduates tend to correctly place the primary stress in vowels at the penultimate syllable in disyllabic words more than in the trisyllabic words. For example, words like *valley, money data, thunder, nursing, racing, melting, janey, raba, sozet, jeelney, zomey, nurbing, mabing, muffting and luncer,* were all stressed at the penultimate syllable correctly. It can be interpreted as a transfer of the HA stress rule, which emphasises the stressed vowel at the penultimate as soon as there is no diphthong or a tense vowel in the ultimate syllable. Inversely, two words violated this rule, as in *captain* and *bamtain*. The Yemeni EFL undergraduate placed the primary stress at the ultimate syllable of

*captain* and *bamtain* because they contain two vowels at the autographic level /ai/; however, the English transcription of the word *captain* manifests the two vowels as schwa /ˈkæp.tən/. It can be concluded that Yemeni EFL undergraduates got confused with the constitute /ai/, except for the advanced group who correctly placed the stress at the penultimate in the word *captain*.

In contradiction to the stress rule of Classical Arabic, the Yemeni EFL undergraduates preferred to locate the primary correctly at the penultimate when it has an open syllable, as in *sozet*, *racing* and *mabin* (**CV**.CVC). Classical Arabic manifests stress at the final syllable if the penultimate contains an open syllable and the ultimate has a closed syllable (CV.**CVC**). Khazneh (2015) reported that Arab EFL learners stress the final syllable if it contains a closed syllable (CV.**CVC**). The same result was also evident in the study of Ali and Abdalla (2021), who found that Arab Iraqi learners of English place stress on closed syllables more than on open syllables. This result emphasises the notion of investigating the dialectal effect of a learner more than their standard language to come up with more accurate results, as Jung and Rhee (2018) suggested. It is adequate evidence that can be related to the effect of the HA, which does not manifest closed syllables with consonant clusters as heavy syllables. Another study may test these results in verbs to show the cruciality of this finding.

By contrast to the similarity of stress patterns, the Yemeni EFL undergraduates place the penultimate stress incorrectly to the ultimate syllable in disyllabic words, as in *keyboard, keybease, vangoid, nitrate, caffeine, kagien* and *paritade*. This result is associated with differences in stress rules between English and HA, as the rest of the stimuli contain tense vowels at the final syllable. As a result, the study shows that the Yemeni EFL undergraduates tended to emphasise the penultimate syllable and were drawn to stressing the location of the tense vowel at the final syllable. Nevertheless, the incorrect placement of stress in the word *nitrate* /ˈnaɪ.treɪt/ contrasted the result of the word *rotate* /rəʊ'teɪt/ in the study of Maghrabi (2021), as both words consist of two tense vowels in each syllable. Maghrabi reported frequent errors in words that contain two tense vowels in disyllabic words. Saudi EFL learners change the vowel to the penultimate, where the primary stress is at the ultimate; this is a contrary interpretation of the Metrical Theory. Nonetheless, the result of word *nitrate* supports the findings of Khazneh (2015), stating that when a word contains two tense vowels, the Syrian EFL learners' stress pattern showed a tendency toward changing the quality of the vowel in the second syllable.

Moreover, words such as *Degict* and *Defect* as nouns (**CV**.CVCC) have stress at penultimate syllables. This stress pattern has been regarded as one of the most challenging patterns where EFL/ESL learners scored a high rate of errors in the production and perception of English lexical stress studies (Albadar, 2018; Al-Thalab et al., 2018; Khazneh, 2015; Zuraiq & Sereno,

2021). This error was reported to occur due to the Arabic stress pattern that considers (CV. **CVCC**) as a superheavy syllable which attracts stress at the word level (Al-Thalab et al., 2018; Khazneh, 2015). The trochaic (**CV**.CVCC) foot does not exist in the HA system; thus, the Yemeni EFL undergraduates commit the same errors, except the advanced group who successfully produced the primary stress, the penultimate syllable. The Yemeni EFL undergraduates produced *Degict* and *Defect* with an extra vowel after as /ˈdiː feket/ to break the cluster of the consonant /kt/, yet the stress was placed at the ultimate after explaining to the participants that this word contains only two syllables.

This result does not support the previous study by Al-Khulaidi (2017), who reported that Yemeni EFL learners correctly stressed the penultimate syllable in noun words containing (**CV**.CVCC). These results violated the effect of the Arabic stress rule, which the author investigated in her study, and contradicted the previous studies of Helal (2014), Khazneh (2015), and Ali and Abdalla (2021). It might occur due to the differences in the data analyses between the current study and the study of Al-Khulaidi (2017), as they depend on the authors' impressions. Otherwise, the participants were highly competent in English. Furthermore, stress was mostly placed successfully at the ultimate syllable by the Yemeni EFL undergraduates in disyllabic words such as sardine, *darceel*, *campaign, campoyed, nineteen, machine and rarsine.* These findings support the effect of the HA stress pattern because of the exigence of tense vowels at the ultimate syllable. On the contrary, errors were recorded in *success and deskus* because the ultimate syllable does not consist of a tense vowel as in the previous examples.

With regard to syllabic patterns, Yemeni EFL undergraduates face fewer difficulties in English stress patterns that exist in the binary feet, such as **CVC**.V and **CV**.CV, **CV**.CVC, **CVC**.CVC, C**VV**.CV, CVC. **CVVC,** and CVVC.**CVVC**. By contrast, errors increased in feet as CVV.CVVC, CV. CVVC, and CVC.CVC as produced by Yemeni EFL undergraduates.

The findings of the current study support the assumption of the Metrical Theory. This model assumes that English and HA are quantity sensitive, where stress is attracted based on the weight of a syllable. Nevertheless, English allows the extrametricality parameter, which is not present in HA or standard Arabic. The errors that the Stress Typology Model could not explain based on similarity and differences can be explained through the extrametricality parameter in Metrical Theory.

**Trisyllabic Words**

Although HA is a variation of Classical Arabic, the location of the lexical stress may differ due to the differences in the syllable structure patterns of both CA and HA. Like Classical Arabic, the lexical stress in HA is generally attracted by the weight of the syllables and is mostly right-headed. However, the primary key feature of differences is that stress becomes assigned

to the leftmost mora (weight) when the foot word consists of two stressed syllables (Bamakhramah, 2010). From this point, it can be said that errors may arise due to dialectal variation, and it is not accurate to say right-headed problems where the study shows that it is not problematic. More research has to be taken into consideration.

In relation to the effect of the stress patterns between the English and HA stress patterns in trisyllabic words, some errors in the production of the Yemeni EFL undergraduates can be traced to the negative transfer from HA. The first 24 tested words have the primary stress placed the primary stress at the antepenultimate syllable as *leaderships, feedership, scenery, signature, pesticide, pharmacy, fortunate, dignity, melody, galaxy, vacapcy, bargary, and benefit*. It was assumed that the Yemeni EFL undergraduates would be unable to locate the stress at the antepenultimate syllable because HA does not manifest stress at the antepenultimate in trisyllabic and polysyllabic words. Nevertheless, the Yemeni EFL undergraduates correctly assigned stress at the antepenultimate syllable in *leadership, pharmacy, melody, benefit, destiny*, and their nonce words counterparts. This result supports Levis (2018), who argued, based on previous studies, that EFL learners encounter fewer difficulties when stress is located at the first syllable in English nouns. Despite this finding, Yemeni EFL undergraduates tend to stress the ultimate syllable when it consists of a tense vowel, as in *merchandise, valentine, pesticide, nolentide and rarchandise*. This result explained that Yemeni EFL undergraduates are not sensitive to the structure of the syllable rather than the existence of tense vowels.

Errors were also observed in trisyllabic words where stress is located at the penultimate syllable. Yemeni EFL undergraduates fail to place the correct primary stress on a certain vowel, as seen in words like *synopses*, and they are attracted to tense vowels in the final syllables, as in *byzantine* and *pelognide.* However, the placement of English primary stress in words like *vanilla*, *nosila, defender, recoding, and rerarging* was correct. The words *synopses, consensus, komsensus, and synoksuf* were stressed at the antepenultimate syllable, violating the stress pattern of HA.

In simpler terms, Yemeni EFL undergraduates tended to make the first syllable longer and louder in duration and F0. Yemeni EFL undergraduates became confused when 'y' and 'o' existed in words or were unaware that these sounds could be changed into schwa in some English words because reducing vowels or changing them into schwa is not manifested in the Arabic language (Zuraiq & Sereno, 2021).

## CONCLUSION

The study's findings indicated that the predictability of the Arabic stress pattern was not the only factor contributing to Yemeni EFL undergraduates' errors while producing English stress patterns. Results indicate that Yemeni EFL undergraduates are more drawn to vowel weight than stress patterns, mainly when the last syllable consists of a tense

vowel rather than the pattern of syllable structure. Based on the study's findings, there is a dire need to teach pronunciation to students who wish to pursue higher studies in English and other departments. The present study findings suggest that phonetics and phonics training are needed for students from the early years of their basic education in the EFL context. Teachers have to demonstrate the significance of changing vowel quality to achieve intelligible and comprehensive speech. Furthermore, when introducing words to learners for the first time, the stressed syllable has to be clearly shown to the students. RAAT software can be a helpful tool in teaching English suprasegmental features pronunciation to visualise errors in pronunciation.

### Implication for Theory and Practice

The study provides clear support for applying the Metrical Framework, which effectively anticipates the challenging areas in producing the English lexical stress by considering various parameters, notably quality-sensitivity and extrametricality parameters. The Metrical Theory posits that both English and HA exhibit quantity-sensitivity, where stress placement hinges on the syllable's weight. Furthermore, the Metrical Theory's ability to predict difficulties extends to the extrametricality parameter, a feature present in English but absent in HA. This parameter refers to stress patterns where certain syllables fall outside the metrical grid, influencing stress assignment.

It affirms the predictive capacity of the Metrical framework in understanding stress assignment difficulties encountered by Yemeni EFL undergraduates. Therefore, the theory's consideration of quality-sensitivity and extrametricality parameters provides valuable insights into the complexities of stress placement in the acquisition of English as a foreign language by speakers of HA. Meanwhile, the ESP provides more predictability for disyllabic words compared to trisyllabic words. There is a need to cater for a more comprehensive predictability effect for languages that have multisyllables, such as the HA dialects.

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## REFERENCES

Albadar, A. (2018). *The role of quantity sensitivity in the perception of English lexical stress by predictable stress language speakers: Arabic L2 learners of English.* Academia. https://www.academia.edu/66943914/The_Role_of_Quantity_Sensitivity_in_the_Perception_of_English_Lexical_Stress_by_Predictable_stress_Language_Speakers_Arabic_L_2_Learners_of_English?uc-sb-sw=100650972

Ali, H. S., & Abdalla, J. K. (2021). Pronunciation of English stress by Iraqi Arabic and Kurdish EFL learners. *Journal of Tikrit University for Humanities*, *28*(12.1), 19-37. https://doi.org/10.25130/jtuh.28.12.1.2021.24

Al-Khulaidi, M. (2017). Word stress in Yemeni English: A phonetic study. *International*

*Multidisciplinary Journal*, *3,* 14-24. https://doi.org/10.54392/ijll2145

Almbark, R., Bouchhioua, N., & Hellmuth, S. (2014). Acquiring the phonetics and phonology of English word stress: Comparing learners from different L1 backgrounds. *Proceedings of the International Symposium on the Acquisition of Second Language Speech, Concordia Working Papers in Applied Linguistics* (Vol. 5, pp. 19-35). Department of Education, Concordia University.

Al-Tamimi, N. O. M., Abudllah, N. K. M., & Bin-Hady, W. R. A. (2020). Teaching speaking skill to EFL college students through task-based approach: Problems and improvement. *British Journal of English Linguistics*, *8*(2), 113-130. https://doi.org/10.37745/bjel.2013

Al-Thalab, H. S. A., Yap, N. T., Nimehchisalem, V., & Rafik-Galea, S. (2018). Perception of English lexical stress: Some insights for English pronunciation lessons for Iraqi ESL learners. *Pertanika Journal of Social Sciences & Humanities*, *8*(2), 209-224.

Altmann, H. (2006). *The perception and production of second language stress: A cross-linguistic experimental study* [Doctoral dissertation, University of Delaware]. https://www.ling.uni-stuttgart.de/institut/ifla/PDF_Upload/Heidi_Altmann/altmann-dissertation.pdf

Altmann, H., & Kabak, B. (2015). English word stress in L2 and postcolonial varieties: Systematicity and variation. In U. Gut, R. Fuchs, & E. Wunder (Eds.), *Universal or diverse paths to English phonology* (pp. 185-208). De Gruyter Mouton. https://doi.org/10.1515/9783110346084-010

Anani, M. (1989). Incorrect stress placement in the case of Arab learners of English. *International Review of Applied Linguistics in Language Teaching*, *27*(1), 15-22. https://doi.org/10.1515/iral.1989.27.1.15

Aziz, Y. Y. (1980). Some problems of English word-stress for the Iraqi learner. *English Language Teaching Journal*, *34*(2), 104-109. https://doi.org/10.1093/elt/34.2.104

Bamakhramah, M. A. (2010). *Syllable structure in Arabic varieties with a focus on superheavy syllables* (Publication No. 3390256) [Doctoral dissertation, Indiana University]. ProQuest Dissertations & Theses Global. https://www.proquest.com/dissertations-theses/syllable-structure-arabic-varieties-with-focus-on/docview/305212489/se-2

Cheng, B., & Zhang, Y. (2015). Syllable structure universals and native language interference in second language perception and production: Positional asymmetry and perceptual links to accentedness. *Frontiers in Psychology*, *6*, Article 1801. https://doi.org/10.3389/fpsyg.2015.01801

Chomsky, N., & Halle, M. (1968). *The sound pattern of English*. Harper & Row Publishers.

Field, J. (2005). Intelligibility and the listener: The role of lexical stress. *TESOL Quarterly, 39*(3)*,* 399-423. https://doi.org/10.2307/3588487

Flege, J. E., & Bohn, O.-S. (1989). An instrumental study of vowel reduction and stress placement in Spanish-accented English. *Studies in Second Language Acquisition, 11*(1), 35-62. https://doi.org/10.1017/S0272263100007828

Fry, D. B. (1959). Theoretical aspects of mechanical speech recognition. *Journal of the British Institution of Radio Engineers, 19*(4), 211-218. https://doi.org/10.1049/jbire.1959.0026

Ghaith, S. (1993). The assignment of primary stress to words by some Arab speakers. *System*, *21*(3), 381-390. https://doi.org/10.1016/0346-251X(93)90028-F

Ghosh, M., & Levis, J. M. (2021). Vowel quality and direction of stress shift in a predictive model explaining the varying impact of misplaced word stress: Evidence from English. *Frontiers in Communication, 6*, Article 628780. https://doi.org/10.3389/fcomm.2021.628780

Guo, X. (2022). Acoustic correlates of English lexical stress produced by Chinese dialect speakers compared to native English speakers. *Frontiers in Psychology*, *13*, Article 796252. https://doi.org/10.3389/fpsyg.2022.796252

Hayes, B. P. (1980). *A metrical theory of stress rules* [Doctoral dissertation, Massachusetts Institute of Technology]. DSpace@MIT–MIT Libraries. http://hdl.handle.net/1721.1/16066

Helal, S. (2014). Stress in English: Prosodic and rhythmic complexity for Arab learners. *Proceedings of the International Symposium on the Acquisition of Second Language Speech: Concordia Working Papers in Applied Linguistics, 5*, 261-294.

Jaiprasong, S., & Pongpairoj, N. (2020). L2 Production of English word stress by L1 Thai learners. *LEARN Journal: Language Education and Acquisition Research Network, 13*(2), 142-157.

Jenkins, J. (2002). A sociolinguistically based, empirically researched pronunciation syllabus for English as in international language. *Applied linguistics, 23*(1), 83-103. https://doi.org/10.1093/applin/23.1.83

Jeong, H., Thorén, B., & Othman, J. (2020). Effect of altering three phonetic features on intelligibility of English as a lingua franca: A Malaysian speaker and Swedish listeners. *Asian Englishes, 22*(1), 2-19. https://doi.org/10.1080/13488678.2018.1536817

Jung, Y. J., & Rhee, S. C. (2018). Acoustic analysis of English lexical stress produced by Korean, Japanese and Taiwanese-Chinese speakers. *Phonetics and Speech Sciences, 10*(1), 15-22. https://doi.org/10.13064/KSSS.2018.10.1.015

Kallio, H., Suni, A., & Šimko, J. (2022). Fluency-related temporal features and syllable prominence as prosodic proficiency predictors for learners of English with different language backgrounds. *Language and Speech, 65*(3), 571-597. https://doi.org/10.1177/00238309211040175

Khazneh, I. (2015). *Factors affecting the assignment of English word stress by Syrian EFL learners* [Unpublished master's thesis]. University of Aleppo.

Koffi, E. (2021). *Relevant acoustic phonetics of L2 English: Focus on intelligibility.* CRC Press. https://doi.org/10.1201/9781003106418

Ladefoged, P., & Johnson, K. (2015). *A course in phonetics* (6th ed.). Cengage Learning.

Lai, Y. (2008). *Acoustic realization and perception of English lexical stress by Mandarin learners* (Publication No. 3316252) [Doctoral dissertation, University of Kansas]. ProQuest Dissertations & Theses Global. https://www.proquest.com/dissertations-theses/acoustic-realization-perception-english-lexical/docview/250346459/se-2

Lee, G., Shin, D. J., & Garcia, M. T. M. (2019). Perception of lexical stress and sentence focus by Korean-speaking and Spanish-speaking L2 learners of English. *Language Sciences*, *72*, 36-49. https://doi.org/10.1016/j.langsci.2019.01.002

Levis, J. (2018). Word stress and intelligibility. In *Intelligibility, Oral Communication, and the Teaching of Pronunciation* (Series of Cambridge Applied Linguistics, pp. 100-124). Cambridge University Press. https://doi.org/10.1017/9781108241564.010

Lewis, C., & Deterding, D. (2021). Teaching suprasegmentals in English as a lingua franca contexts. In H. Mohebbi & C. Coombe (Eds.), *Research questions in language education and applied linguistics* (Series of Springer texts in education, pp. 167-169). Springer, Cham. https://doi.org/10.1007/978-3-030-79143-8_31

Liberman, M., & Prince, A. (1977). On stress and linguistic rhythm. *Linguistic Inquiry, 8*(2), 249-336.

Lin, C. W. (2018). *The perception and production of Arabic lexical stress by learners of Arabic: A usage-based account* [Doctoral dissertation,

University of Michigan]. Deep Blue Repositories. https://hdl.handle.net/2027.42/143979

Liu, D. (2017). The acquisition of English word stress by Mandarin EFL learners. *English Language Teaching*, *10*(12), 196-201. https://doi.org/10.5539/elt.v10n12p196

Maghrabi, R. (2021). A phonological study of the influence of Arabic stress on the pronunciation of English words by Saudi ESL learners. *Journal of Arts, Literature, Humanities and Social Sciences*, (73), 350.-365 https://doi.org/10.33193/JALHSS.73.2021.600

Misfer, Z. A., & Busabaa, N. A. (2019). Stress placement and the difficulties encountered by female EFL students in Saudi Arabian context. *Arab World English Journal*, (Special Issue), 32-43. https://doi.org/10.24093/awej/efl1.3

Modesto, F., & Barbosa, P. A. (2019). Unravelling foreign accent prosody: Production and perception of lexical stress in English by Brazilian Portuguese speakers. *Revista de Estudos da Linguagem, 27*(1), 165-189. https://doi.org/10.17851/2237-2083.27.1.165-189

Motair, A., & Abdulwahab, T. (2018). Communicative language teaching in Yemeni EFL Classroom from the teachers' perspective. *IASET, 7*(5), 2319-3948.

Nguyen, L. T., & Hung, B. P. (2021). Communicative pronunciation teaching: Insights from the Vietnamese tertiary EFL classroom. *System, 101,* Article 102573. https://doi.org/10.1016/j.system.2021.102573

Pennington, M. C., & Rogerson-Revell, P. (2019). *English pronunciation teaching and research: Contemporary perspectives.* Palgrave Macmillan. https://doi.org/10.1057/978-1-137-47677-7

Rehman, I., Silpachai, A., Levis, J., Zhao, G., & Gutierrez-Osuna, R. (2022). The English pronunciation of Arabic speakers: A data-driven approach to segmental error identification. *Language Teaching Research, 26*(6), 1055-1081. https://doi.org/10.1177/1362168820931888

Saha, S. N., & Mandal, S. K. D. (2018). Phonetic realization of English lexical stress by native (L1) Bengali speakers compared to native (L1) English speakers. *Computer Speech & Language*, *47*, 1-15. https://doi.org/10.1016/j.csl. 2017.06.006

Tuan, D. M. (2018). English lexical stress assignment by EFL learners: Insights from a Vietnamese context. *European Journal of Education Studies, 4*(11), 59-74.

Younes, M. A. (1984). *The stressing of final superheavy syllables by Saudi learners of English: Implications for the contrastive analysis hypothesis* (ED271009). ERIC. https://eric.ed.gov/?id=ED271009

Youssef, A., & Mazurkewich, I. (1998). The acquisition of English metrical parameters and syllable structure by adult native speakers of Egyptian Arabic (Cairene dialect). In S. Flynn, G. Martohardjono, & W. O'Neil (Eds.), *The generative study of second language acquisition* (pp. 303-332). Lawrence Erlbaum. https://doi.org/10.4324/9781315806471

Zhang, Y., Nissen, S. L., & Francis, A. L. (2008). Acoustic characteristics of English lexical stress produced by native Mandarin speakers. *The Journal of the Acoustical Society of America*, *123*(6), 4498-4513. https://doi.org/10.1121/1.2902165

Zuraiq, W., & Sereno, J. A. (2021). Production of English lexical stress by Arabic speakers. In R. Wayland (Ed.), *Second language speech learning: Theoretical and empirical progress* (pp. 290-311). Cambridge University Press. https://doi.org/10.1017/9781108886901.012

## Appendix A

Supplementary Table 1
*The stimuli of the production task*

| Carrier Phrases | | | |
|---|---|---|---|
| I say valley again | I say bamtain again | I say leadership again | I say synopsis again |
| I say money again | I say valomes again | I say scenery again | I say komsensus again |
| I say rocket again | I say danfuard again | I say merchandise again | I say dedanfer again |
| I say nitrate again | I say degict again | I say signature again | I say keybease again |
| I say data again | I say defect again | I say pesticide again | I say vacapsy |
| I say thunder again | I say sardine again | I say valentine again | I say synoksuf again |
| I say nursing again | I say darceal again | I say pharmacy again | |
| I say racing again | I say success again | I say fortunate again | |
| I say caffeine again | I say campaign again | I say dignity again | |
| I say captain again | I say nineteen again | I say melody again | |
| I say melting again | I say machine again | I say galaxy again | |
| I say valance again | I say campoyed again | I say septiride gain | |
| I say keyboard again | I say noilteen again | I say Sobsature again | |
| I say vanguard again | I say rarsine again | I say bargary again | |
| I say Journey again | I say deskus again | I say detsity again | |
| I say Raba again | I say peroxide again | I say benefit again | |
| I say Pitrade again | I say defender again | I say perefy again | |
| I say sozet again | I say recording again | I say ferculate again | |
| I say Kagiene again | I say byzantine again | I say feederchip again | |
| I say Jeelney again | I say magnetic again | I say rarchandise again | |
| I say zomey again | I say nosila again | I say nolentide again | |
| I say nerbing again | I say subnetic again | I say semofy again | |
| I say mabing again | I say rerarging again | I say bameset again | |
| I say mufting again | I say mamigic again | I say vanilla again | |
| I say luncer again | I say byhontide again | I say pacific again | |
| I say Janey again | I say pelognide again | I say consensus again | |