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EFFECTS OF AGE ON EMPHASIS PRODUCTION IN JORDANIAN ARABIC: A SOCIO-PHONETIC STUDY

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Abstract

This paper investigates the effect(s) age has on two emphatic sounds, (vis. [sˤ] and [tˤ]) in a sub-dialect of Jordanian Arabic, namely Ajlouni-Jordanian Arabic. This study was for the most part motivated by the neglect of age in studies investigating the socio-phonetics of emphasis in Jordanian Arabic in general and in Ajlouni Jordanian Arabic specifically. The effect of this extra linguistic variable was examined in mono- and bi-syllabic words with the target sounds occurring at both edges of the word. Six vowel qualities were incorporated in the stimuli of this study: the long low-back vowel /a:/, the short low-back vowel /a/, the long high-front vowel /i:/, the short mid-high front vowel /ɪ/, the long high-back vowel /u:/ and the short mid-high back vowel /ʊ/. The data were collected from twelve native speakers of the dialect, with each respondent yielding 96 tokens. As for the acoustic means that were conducted on the gathered data, the following were used: consonant duration (CD), Voice Onset Time (VOT), F1, F2 and F3. The findings show that while age did not show any statistically significant bearings on CD, on the one hand, and on F1, F2, and F3 in both the target and non-target syllables, on the other hand, it has proved to have a significant effect on VOT.

Keywords: Acoustic measurements; Ajlouni-Jordanian Arabic; consonant duration emphasis; vowel quality.

1. Introduction

A feature of all Semitic languages, emphasis is a linguistic phenomenon that is still prevalent in almost all Arabic dialects, including Iraqi Arabic (Salman, 2020), Jordanian Arabic (Almomany, 2018; Omari and Jaber, 2019), Libyan Arabic (Algryani, 2014), and Syrian Arabic (Almbark, 2008), to mention but a few. Emphasis has, generally speaking, been defined as the co-articulation of a primary feature and a secondary feature, with the former being articulate in the alveolar/dental region and the latter being articulated in the posterior region (Davis, 1995; Lehn, 1963; Younes, 1993). However, depending on where the locus of the retraction is assumed to be occurring, emphasis is frequently referred to in the literature as dorsalization, velarization, pharyngealization, and/or backing (Davis, 1995; Herzallah, 1990; Hetzron; 1998; Jakobson, 1957; Kahn, 1975; Lehn, 1963; Watson, 1999, Zawaydeh, 1998, inter alia). Languages distinguishing non-emphatic sounds from emphatic sounds (whether phonemic or allophonic) usually use more common terms such as light vs. dark, clear vs. dark, plain vs.

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dark, soft vs. hard, etc. For consistency and familiarity reasons in the linguistics circles, the term emphasis will be used throughout this study.

By projecting emphatic sounds against their contrasting counterparts, some researchers posit the claim that there are two main types of emphatics: primary emphatics (i.e. [tˤ], [sˤ], [dˤ], and [ðˤ]) and secondary emphatics (i.e. [lˤ]) (for more details, see Jaber, Omari and Al-Jarrah, 2019). However, most researchers are still in disagreement as regards the essence of these two sets of speech sounds except that, unlike secondary emphatics, primary emphatics have plain contrasting counterparts. Consider the following pairs of the primary set and their non-emphatic counterparts:

[tˤi:n] 'mud' vs. [ti:n] 'figs'

[sˤɪn] 'Listen!' vs. [sɪn] 'tooth'

[dˤab] 'a type of lizard' vs. [dab] 'threw'

[ðˤam] 'hugged' vs. [ðam] 'badmouthed'

As for the secondary emphatic sounds, no such phonemic contrast exists at all. Consider the following:

[ba:lˤah] (auction) vs. *[ba:lah] (auction)

However, this claim has been challenged by Al Huneety (2015: 55, 70) for three sounds, namely /l/, /r/ and /j/ as shown in the following minimal pairs:

Waḷḷa 'by God' vs. walla 'to appoint him'

ṃayy 'water' vs. mayy [proper name]

baṛṛa 'outside' vs. barra 'to exonerate'

Notorious for the abundance of emphatic consonants in its phonemic inventory, Arabic is basically the language that is investigated the most as far as emphasis is concerned. As the phonetic realization of emphatic consonants differ from dialect to dialect, the phenomenon of emphasis in Arabic has been investigated thoroughly from phonetic and phonological perspectives (for a review, see Jaber, Omari and Al-Jarrah, 2019), but it has not yet been given its due share of research in terms of the impact of the individual, societal and cultural variables on its production. Particularly, there have been only very few studies addressing the effect(s) of the social variables such as gender (Abudalbuh, 2010; Almomany, 2018), age (Almomany, 2018), social class (Omari and Jaber, 2019), and education on the production of Arabic emphatic sounds. To this end, the present study addresses the possible effect(s) that age as a social variable may have on the production of two emphatic sounds, (namely [tˤ] and [sˤ]) in some social context (namely Ajlouni Jordanian Arabic (henceforth AJA). The dialect under present scrutiny is a rural sub-dialect of Rural Jordanian Arabic that is spoken by the indigenous people of Ajloun City, a city to the north of the capital city (i.e. Amman) of Jordan, and its countrysides like *Ibillin*, *Ibbin*, *Ras Munif*, *Baun*, *Urjan*, *Sakhra*, to mention but a few.

1. Literature Review

Given the sizable body of research that has been done so far on the phenomenon of emphasis in many Arabic dialects (see Section 1. above), it has become evident that emphatic sounds affect the relative values of the first three formant frequencies of the vowels neighboring them. That is, emphaticized vowels are characterized by higher F1 and F3 values and a lower F2 value (Al-Omari, 2021; Salman, 2020; Almomany; 2018; Abudalbuh, 2010; Rababa, 2017; Al-Deaibes, 2016; Jongman, Herd, Al-Masri, Sereno, and Combest, 2011; Jongman, Herd, and Al-Masri, 2007). As for the probable effects other social variables such as

gender, social class, and education may have on the production of emphasis in Arabic dialects, there has been a small body of research accrediting such effects.

Almomany (2023) investigated the bearings of gender on the two emphatic sounds [sˁ] and [tˁ], along with their plain counterparts, in Ajlouni Jordanian Arabic. The researcher confined his study to mono- and bi-syllabic words, with the target (i.e. emphatic) consonants occurring at both edges of the word. Briefly, Almomany (2023) found that consonant duration, F1, F2, and F3 turned out to be unreliable acoustic cues of emphasis in this dialect. However, VOT proved to be a reliable acoustic correlate of emphasis, where males' emphatic VOTs were significantly longer than those of females were (for details, see Almomany, 2023: pp. 67-68).

Almomany (2018), for example, studied the probable effects of age and gender on emphasis in Jordanian Arabic. The researcher made the claim that the effect(s) of the emphatic sounds on the adjacent vowels could be ruled out when other extra linguistic influences (e.g. age) interject. Concisely, Almomany (2018) claimed that neither formant frequencies (F1, F2, and F3) nor consonant duration (henceforth CD) could be reliable cues when other variables are considered simultaneously. Only Voice Onset Time (VOT) was found to be a reliable acoustic correlate of emphasis when interacting with age.

Al-Omari (2021) investigated the effects of gender among the speakers of the four sub-dialects of Jordanian Arabic, namely Rural Jordanian Arabic (RJA), Urban Jordanian Arabic (UJA), Bedouin Jordanian Arabic (BJA), and Ghorani Jordanian Arabic (GJA). His major finding was that emphasis was more evident in males' speech than in females' only in RJA, UJA, and GJA. At greater levels of details, he found that female speakers of BJA and UJA produced shortened VOT's in emphatic environment, but female speakers of RJA and GJA produced lengthened VOT's in emphatic environment (see Al-Omari, 2021: p. 57).

Omari and Jaber (2020) examined the relative bearings of gender and social class on the production of emphasis in UJA. The researchers investigated the plausible effects of these two extra-linguistic variables only by means of the vowel first three formant frequencies in mono-syllabic words at both the onset and midpoint. The researchers employed the overall analysis technique that Almomany (2018) had already suggested to verify the so-called 'most reliable acoustic correlates of emphasis'. In this regard, Omari and Jaber (2020) found that gender (1) had no effect on emphasis at the onset position when interacting with manner (i.e. stop vs. fricative) and emphasis, (2) it had a significant effect on emphasis as males produced higher values of F1 following fricatives than F1 following stops (and vice versa) when interacting with emphasis, manner, and social class (see Omari and Jaber, 2020, p. 10), (3) it had no effect on emphasis at the vowel midpoint irrespective of the variables involved, (4) had an insignificant effect on emphasis by means of F2 value at both the vowel onset and midpoint, a finding first reached by Almomany (2018), and (5) had no salient effect on emphasis by means of F3 neither at the onset nor at the midpoint. As for the effect of the other social variables, Omari and Jaber (2020) reported some significant findings about the interplay of emphasis with manner, gender, and social class. Precisely, they reported a pronounced effect of social class on the production of emphasis in that lower-middle class male speakers produced more emphaticness by means of F1 raised value at the onset of the emphasized vowel (for details, see Omari and Jaber, 2020, p. 10). In addition, they found that there was a significant effect of social class on emphasis evinced by the raised value of F1 in an emphatic environment at the vowel midpoint. Likewise, emphasized vowels showed more lowered F2 value in an emphatic environment only at the midpoint position. As for F3, no significant effect of social class on emphasis production neither at the onset nor at the midpoint of the emphasized vowel was found (Omari and Jaber, 2020).

Omari and Jaber (2019) had already examined the effects of gender and social class on emphasis production in JA. The researchers used more acoustic parameters including VOT, post-release duration, frication duration, vowel duration, and the vowel first three formant frequencies (F1, F2, F3) at both the onset and midpoint of the vowel. Omari and Jaber concluded that: (1) emphasis was more pronounced in males' speech than in females' by virtue of the raised F1 value and the lowered F2 value and (2) lower-middle class speakers showed more emphaticness in their speech (for details. see Omari and Jaber, 2019, pp. 181-189).

Alzoubi (2017) studied the effects of extra-linguistic variables (viz. gender, social class, and origin of the speaker) on the production of the two emphatic sounds [sˤ] and [tˤ], along with their plain counterparts [s] and [t], in the dialect(s) spoken in the capital of Jordan, Amman City. The researcher posited that emphasis was more salient in males' speech than in females' by virtue of raised F1 and F3 values, lowered F2 values, and lengthened VOT. By means of Center of Gravity (COG), the researcher found that speakers in East Amman showed more emphaticness in their speech than those in West Amman. As for the effect of the Original Regional Dialect (ORD) of the speaker, the study yielded that only F2, F3, VOT, and Stop COG were reliable acoustic indicators of emphasis. Particularly, Urban Palestinian speakers were found to carry the least magnitude of change in the direction of emphasis as compared to the other two groups, namely Rural Palestinians and Rural Jordanians (for details, see Alzoubi, 2017, p. 100).

Abudalbuh (2011) examined the effect(s) of age on emphasis production in JA. The researcher reported that gender had, by no means, any significant effect on VOT, vowel duration (VD), and friction duration (FD). The researcher, however, contended that the effect of gender was only manifest by means of F1 raised value and F2 lowered value at both the vowel onset and midpoint (for details, see Abudalbuh, 2011, pp. 31-35).

Al-Masri (2009) studied the acoustic and perceptual effects of emphasis in UJA. The researcher claimed that emphasis was only evinced by means of F1 and F3 raised values and F2 lowered value. The researcher showed that manner proved to affect the relative degree of emphaticness (i.e. only emphatic stops had a significantly lower spectral mean than their plain counterparts). For verification purposes, Al-Masri (2009) conducted a perception study to find out how native speakers of UJA perceive the emphatic sounds vis-à-vis their plain counterparts. The researcher found that it was not the target consonant which contributed to the perception of emphasis but the rest of the word.

Almbark (2008) investigated the effect(s) of gender and region on emphasis production in Syrian Arabic. The researcher conducted two tests: a perceptual test and an acoustic test. In the former test, Almbark (2008) found that there was no significant effect of gender and region on the perception of emphatic (vis-à-vis plain) sounds. The perception study only showed that the type of the consonant had some significant effect on the correct perception of [d, dˤ] and [s, sˤ]. That is, the plain coronals of both sets were more likely to be perceived as semi-emphatics or full emphatics. As for the acoustic measurements, Almbark (2008) found that emphasis was more evident in females' speech than in males' by virtue of VOT and F2 only at the onset of the vowel (for details, see Almbark, 2008, pp. 40-43).

Targeting the effect of gender on emphasis production, Al-Masri and Jongman (2004) investigated the acoustic cues for emphasis in "the northern dialect" of Jordanian Arabic. The researchers found that neither CD nor VD proved to be reliable acoustic correlates of emphasis in that dialect. Only F2 was found to be a reliable acoustic cue for emphasis in that it maintained, irrespective of the locus of the target sound, a lowered value in emphatic neighboring as compared to plain neighboring. As for the effect of gender, it was found that

emphasis was, by means of F2 lowered value, attested more in females' speech than in males' (Al-Masri & Jongman, 2004).

Given the body of research available to date, it can be deduced that emphasis is still under-researched from a sociolinguistic perspective. Apart from Abudalbuh's (2011) study, the researcher finds that the bulk of the past research has focused on the effect(s) of other independent variables including dialect, gender, ORD, and social class on emphasis production. This study therefore aims to consider the effects of age on emphasis in a relatively more narrowed regional dialect (i.e. Ajlouni-Jordanian Arabic).

1.1. Research Questions

The present study is an attempt to find some answers to the following research questions:

1. What are the possible effects that age, as an extra-linguistic variable, may have on the production of emphasis in AJA?
2. Is the effect of age on emphasis production in AJA cross-syllabic?

1.2. Hypotheses

Based on some personal observations as a native speaker of the dialect, the researcher posits the claim that age could have some salient effects on emphasis production in the sub-dialect under present scrutiny. The researcher casts doubt on the past researchers' consistent claim that the most reliable acoustic correlate(s) of emphasis is the lowering of F2 value. Hence, emphasis production varies across age groups in AJA.

1.3. Rationale of the Study

Research addressing a specific topic such as this might yield conflicting findings due to logistic flaws related to either the design of the research, the execution of the experiments or the analysis of the findings. Upon reviewing the literature about emphasis production in different Arabic contexts (see Section 1. above), the researcher of the current study dares to claim that cross-comparisons are not always safe to make for at least two main reasons.

First, inconsistencies in research findings could be due to the lack of a unified methodology. For instance, the findings of several studies have been based on very limited number of stimulus materials while simultaneously incorporating a large sample of respondents (Al-Omari, 2021; Omari and Jaber, 2020; Omari and Jaber, 2019; Abudabuh, 2011), the findings of other studies were based on a limited number of respondents while incorporating a large number of stimulus material (Almomany, 2018; Jongman *et al.*, 2011; Al-Masri, 2009).

Second, whereas the bulk of research on emphasis has investigated the phenomenon void of the social context in which it is produced (thus relegating the extra linguistic variables to only a marginal role), very few studies have addressed how the phenomenon is socially constrained. The findings of these studies cannot be pulled together for cross comparisons. For example, although pioneering studies on emphasis production in Arabic dialectology (Card, 1983; Wahba, 1993; Watson, 2002; Al-Masri & Jongman, 2004; Khattab, Al-Tamimi, and Heselwood, 2006, among others) have confirmed that emphasis entails, for the most part, F2 lowering in emphatic contexts, other studies (Lehn, 1963; Khan, 1975; Almomany, 2018) have challenged this claim. A quick look at the literature available to date on the phonetic correlates of emphasis would immediately show that very little has been done about the socio-phonetic aspects of emphasis production, not only in Arabic but also in other languages such as Hebrew.

Being aware of such in-research gaps and inconsistencies, the researcher plans in this research paper to specifically address the influence of one social variable, namely age, on the production of two empathic sounds ([sˤ] and [tˤ])) in some specific linguistic environments as produced in one specific social context – the issues the researcher tries to shed more light on the methodology section below.

1.4.Article Structure

Section (3) projects the methodology of the present study, shedding more light on the research sample, instruments, and data collection and analysis. In section (4), the main findings are displayed. In section (5), the researcher tries to interpret these findings in light of the findings of the literature available to date on the phenomenon under current investigation. In section (6), some conclusions and recommendations are made in light of the present study findings.

2. Methodology

2.1.Participants

The respondents of the present study consisted of 12 native speakers of AJA (i.e. 6 males and 6 females) who were put into three age groups: Young (18-35), Middle-aged (36-50), and Old (above 51). The respondents were chosen based on two main criteria. First, they were only native speakers of AJA (i.e. they do not speak other languages as their parents had been living there since childhood). Second, they did not suffer from any speech impairments.

2.2.Instrument(s)

The stimuli of the present study consisted of 48 minimal pairs with the two primary emphatics [tˤ] and [sˤ], along with their plain counter parts [t] and [s], occurring at both edges of both monosyllablic and bisyllablic words. The minimal pairs were each incubated in the carrier sentence '*ʔɪħki* (target word) *(ɪ)lwalad*' 'Say (target word) the boy'. To distract the respondent's attention from the target word, the carrier sentences were randomized. It is worthy of mention here that as there were many accidental gaps, it was inevitable to use some non-word tokens in the stimuli. As for the conditioning neighbouring linguistic environment, six main vowels were used: [a:], [a], [i:], [ɪ], [u:], and [ʊ]. As for the compatibility of the data, the stimuli of the present study were peer-reviewed by some language experts in the fields of phonetics, phonology, and syntax. In the end, 1152 word-tokens were obtained for analysis. The full list of the stimuli can be found in Appendix I.

2.3.Data Collection and Analysis

Upon seating the respondents in a comfortable sound-proof place, they were cordially asked to read the list of minimal pairs in the given carrier sentence. The recordings were performed using Remax RP1, a digital voice recorder with a noise reduction quality. The recordings were then imported to a Lenovo Corei5- 1135G7 laptop and then to Praat, the speech analysis program the researcher used to get the real figures of the acoustic measurements.

Five acoustic measurements were carried out to investigate the plausible effect(s) of age on emphasis production. These were: CD, VOT, F1, F2, and F3. As for the first three formant frequencies, they were investigated only at the vowel midpoint both in the target syllable and in the non-target syllable. Due to the large number of tokens (i.e. 1152 > 30) and in accordance with the Central Limit Theorem, which posits that large samples have variance close to their populations (i.e. normally distributed), the researcher resorted to use the parametric analysis (i.e. Two-Way Analysis of Variance) to measure the interaction effects of age and emphasis on the acoustic means. In the next section, the researcher reports the findings on those measurements.

3. Results

3.1.Consonant Duration and Voice Onset Time

Based on the conducted Two-Way Analysis of Variance (ANOVA), the following findings were obtained for CD and VOT.

- The interaction of emphasis and age has shown no significant effect of age on emphasis by means of CD as the test value was ((F= 0.273, P= 0.761), where P= 0.761 exceeds the significance level (i.e. 0.05), as shown in Figure (1) below.

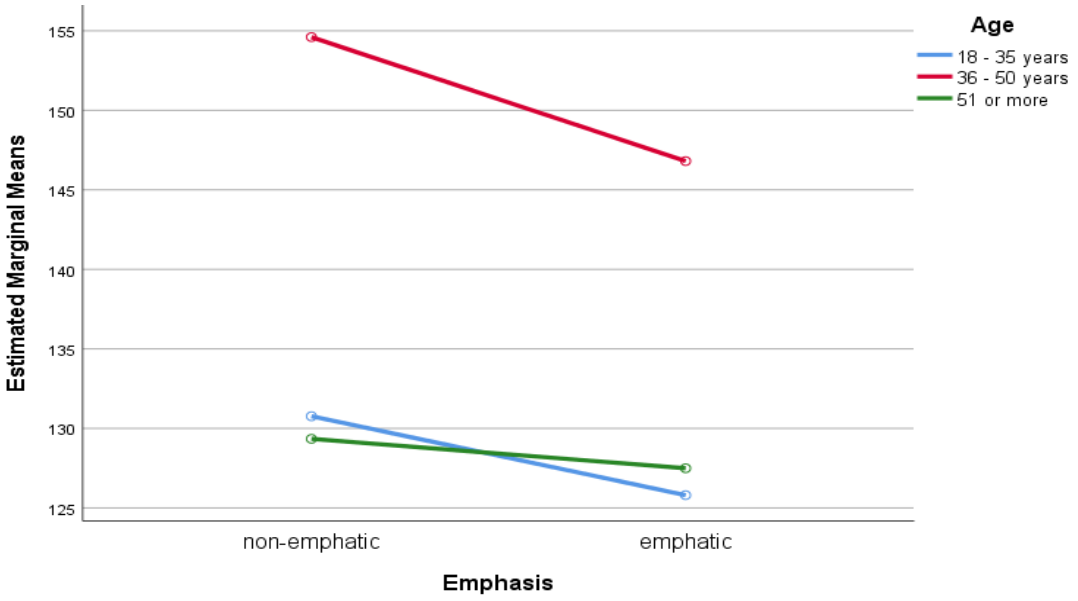


***Figure 1*:** Emphasis and Age Interaction on CD

- The interaction of emphasis and age on VOT has, nonetheless, turned to be significant (F= 4.729, P= 0.010) only for the non-emphatic VOT, where the VOT of the *middle-aged* group was longer (Mean= 22.854) than those of the *Old* group (Mean= 19.250) or the *Young* group (Mean= 14.729). Figure (2) and Chart (1) below show this interaction.

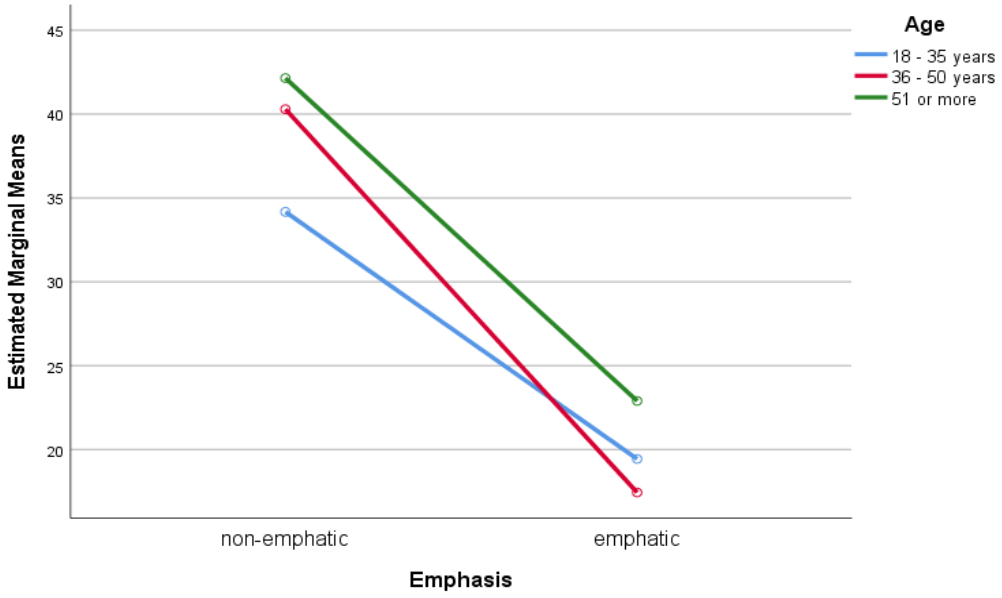


***Figure 2*:** Emphasis and Age Interaction on VOT

3.2.1. F1, F2, and F3 in the Target Syllable

- The interaction of emphasis and age has shown no significant effect of age on emphasis by means of F1 in the target syllable as the test value was (F= 0.540, P= 0.583), where P= 0.583 exceeds the significance level (i.e. 0.05), as shown in Figure (3) below.

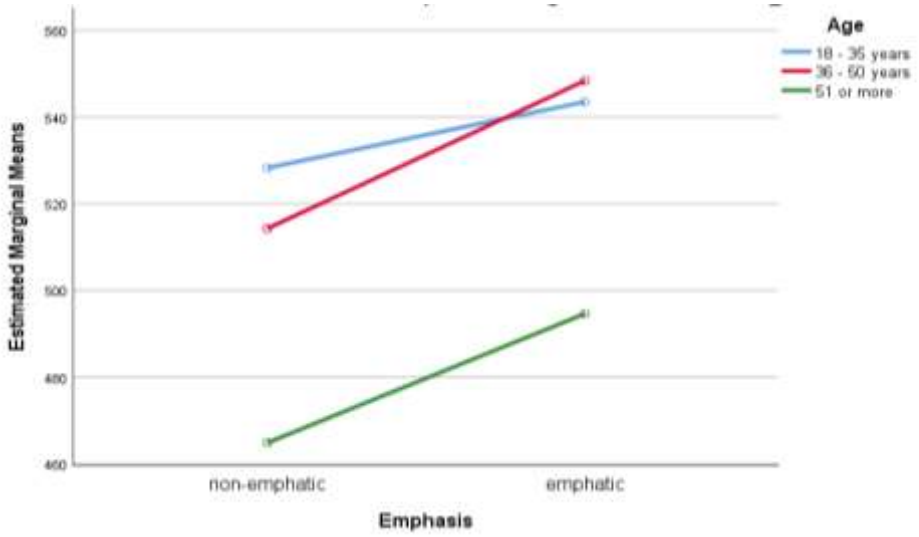


***Figure 3*:** Emphasis and Age Interaction on F1 in the Target Syllable

- The interaction of emphasis and age has shown no significant effect of age on emphasis by means of F2 in the target syllable as the test value was (F= 0.255, P= 0.775), where P= 0.775 exceeds the significance level (i.e. 0.05), as shown in Figure (4) below.

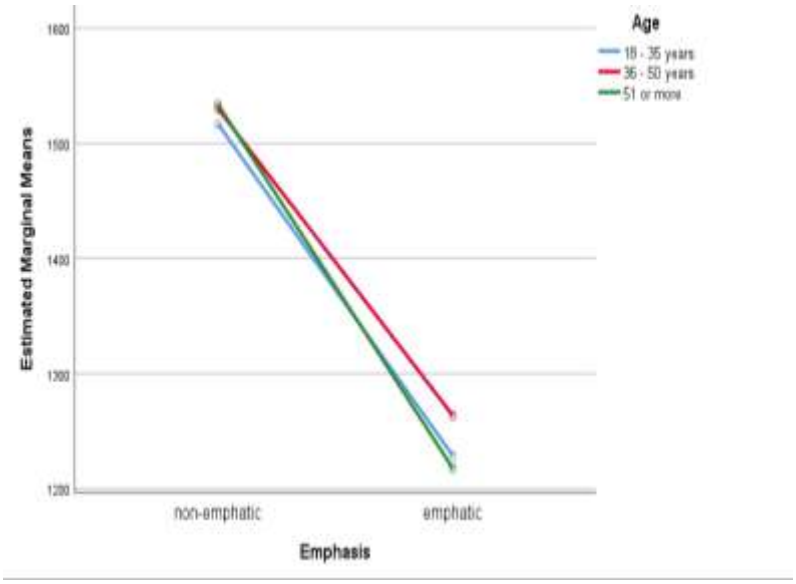


***Figure 4*:** Emphasis and Age Interaction on F2 in the Target Syllable

- The interaction of emphasis and age has shown no significant effect of age on emphasis by means of F3 in the target syllable as the test value was (F= 0.029, P= 0.971), where P= 0.971 exceeds the significance level (i.e. 0.05), as shown in Figure (5) below.

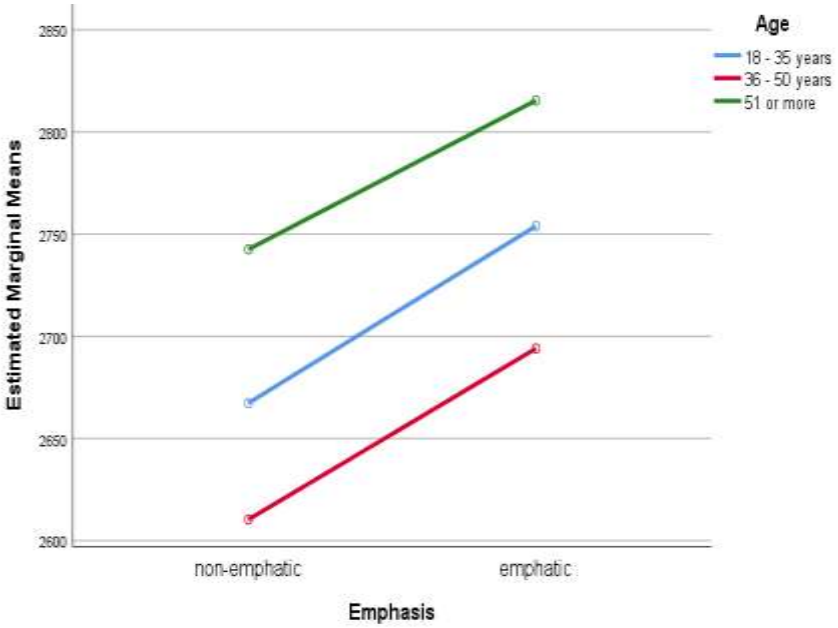


***Figure 5*:** Emphasis and Age Interaction on F3 in the Target Syllable

3.2.2. F1, F2, and F3 in the Non-target Syllable

The Two-Way ANOVA was therefore conducted to pinpoint the possible effects age may have on emphasis by means of the first three formant frequencies in the non-target syllable. The following findings were obtained.

- The interaction of emphasis and age has shown no significant effect of age on emphasis by means F1 in the non-target syllable as the test value was (F= 0.191, P= 0.826), where P= 0.826 exceeds the significance level (i.e. 0.05), as shown in Figure (6) below.

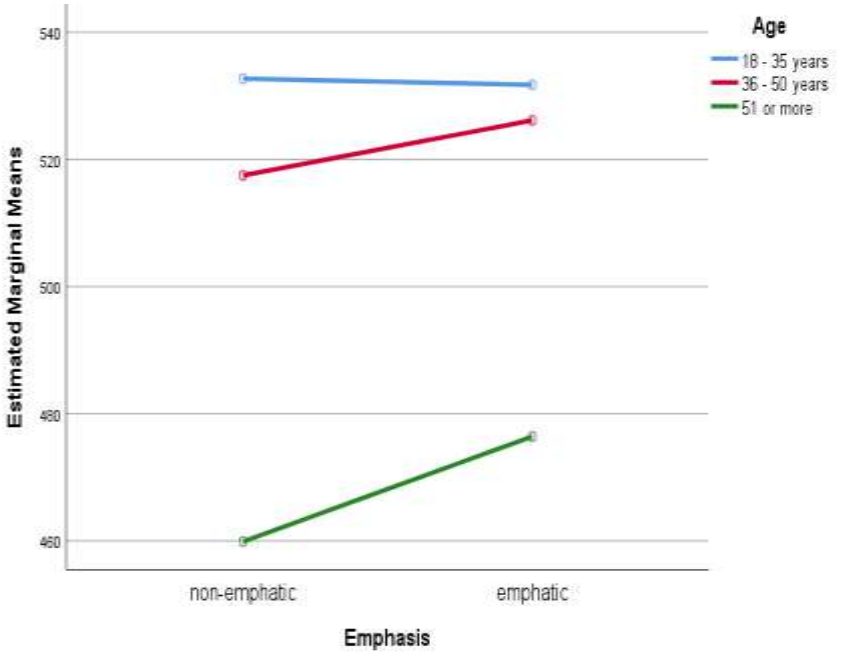


Figure 6: Emphasis and Age Interaction on F1 in the Non-target Syllable

- The interaction of emphasis and age has shown no significant effect of age on emphasis by means of F2 in the non-target syllable as the test value was (F = 0.082, P= 0.922), where P= 0.922 exceeds the significance level (i.e. 0.05), as shown in Figure (7) below.

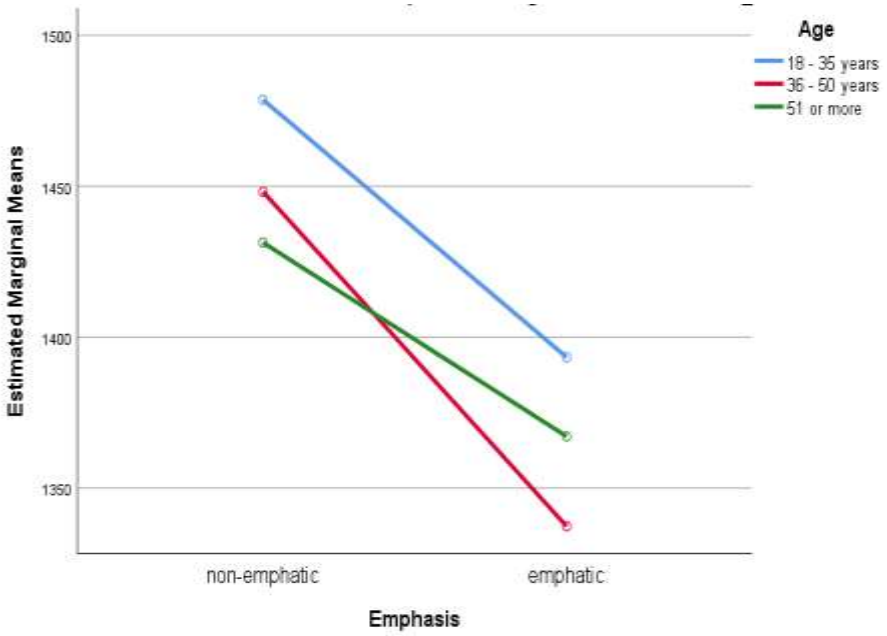


Figure 7: Emphasis and Age Interaction on F2 in the Non-target Syllable

- The interaction of emphasis and age has shown no significant effect of age on emphasis by means of F3 in the non-target syllable as the test value was (F= 0.084, P=0.920), where P= 0.920 exceeds the significance level (i.e. 0.05), as shown in Figure (8) below.

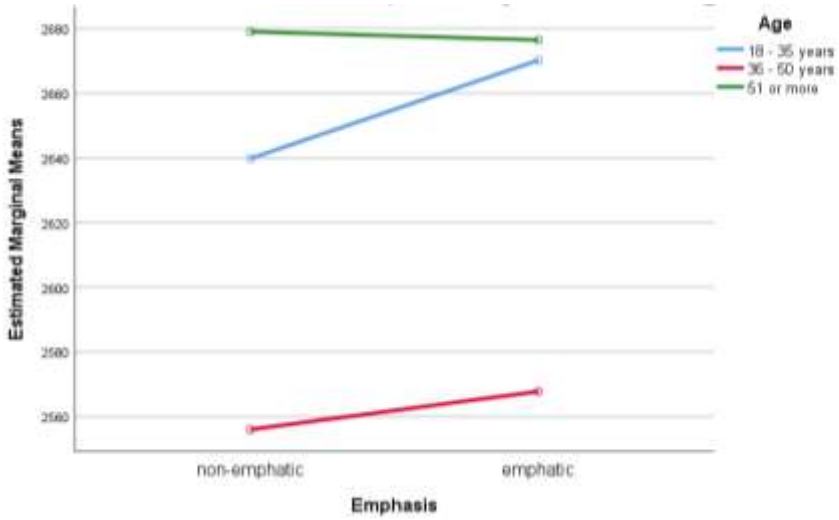


Figure 8: Emphasis and Age Interaction on F3 in the Non-target Syllable

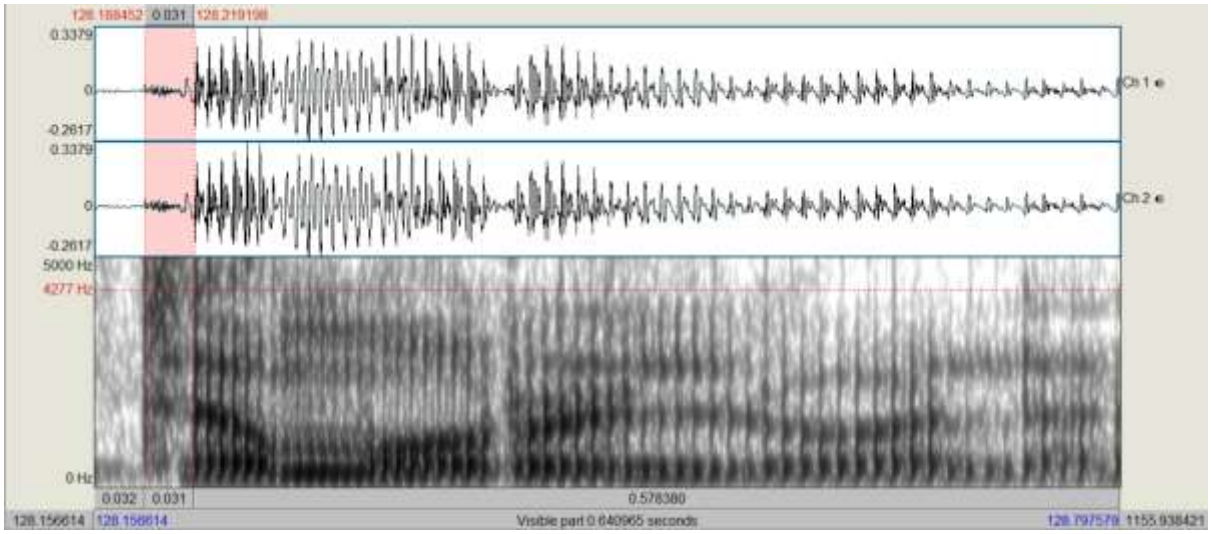
4. Discussion

The present study has been by and large an investigation into the effects of age on the production of two emphatic sounds in AJA, a sub-dialect of Jordanian Arabic. Given the figures above, the researcher dares to claim that although these findings confirmed few previous research findings, they mostly run counter to many that have been confirmed by seminal works on emphasis production.

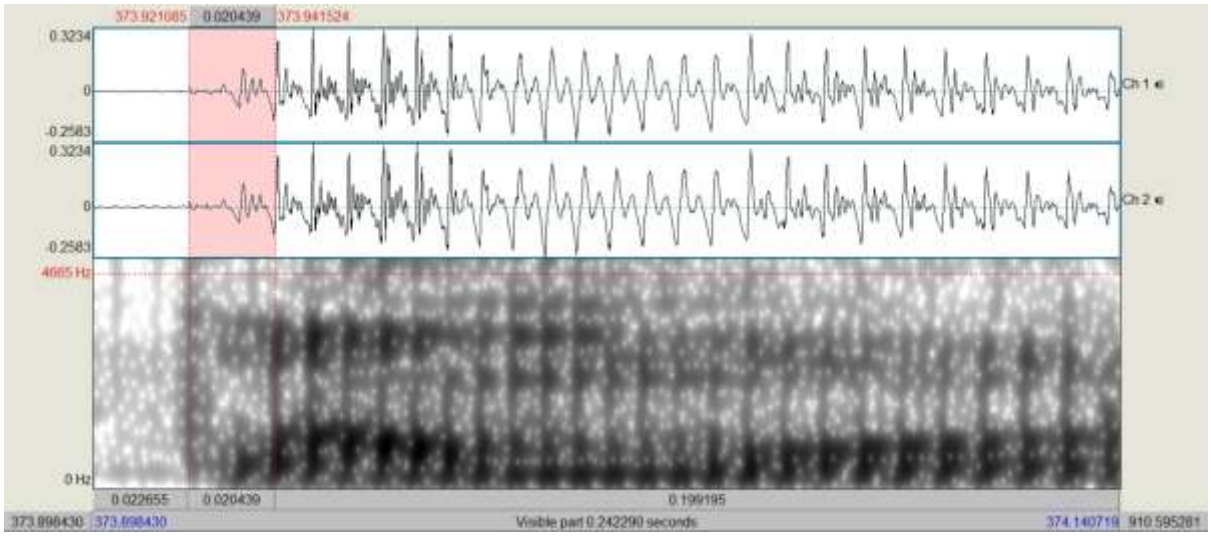
In this respect, the researcher can answer the two main questions of the present study. Relative to the first question (i.e. what are the possible effects that age, as an extra-linguistic variable, may have on the production of emphasis in AJA?), there were no effects of age on the investigated acoustic cues in the direction of emphasis. Following this and relative to the second question (i.e. Is the effect of age on emphasis production in AJA cross-syllabic?), there was no effect of age either on the target syllable or on the adjacent syllable.

Following this, the hypotheses in Section 2.2. were partially refuted. The first main hypothesis was refuted in that speakers in the three age groups did not show any statistically significant differences when producing emphasis. However, the second main hypothesis was confirmed, as F2 lowered value proved to be an insignificant acoustic correlate of emphasis across the three age groups, hence emphasis production did not show any variation across the three age groups. Lending support to some previous research findings (e.g. Almomany, 2018; Al-Omari, 2021; Rababa, 2017; Al-Masri & Jongman, 2004), this study has shown that CD is an insignificant acoustic correlate of emphasis. The only factorization of the influence of this correlate was reported by Al-Masri (2009) who suggested that CD turned out to be insignificant word-initially, but significant when the target consonant (i.e. emphatic vs. plain) occurs word-finally (for details, see Al-Masri, 2009, p. 31).

Another finding confirming those of previous research (e.g. Almomany, 2023; Al-Omari, 2021; Almomany, 2018; Al Malwi, 2017; Rababa, 2017; Khattab *et al.*, 2006) is that VOT has turned out to be a reliable acoustic correlate of emphasis. To clarify, the voiceless stop [t] has, acoustically speaking, turned to be produced with relatively longer VOT than its emphatic counterpart [tˤ]. Spectrograms (1) and (2) below display the difference.



***Spectrogram 1*:** VOT for plain [t] being almost 31 ms



Spectrogram 2: **V**OT for emphatic [tˤ] being 20 ms

Despite this acoustically significant difference, the Two-Way ANOVA has shown that the effect was in the direction of non-emphasis. That is, the *Middle-aged* group have produced longer plain VOTs than the *Old* group and *Young* group, respectively. Chart (1) below displays the difference.

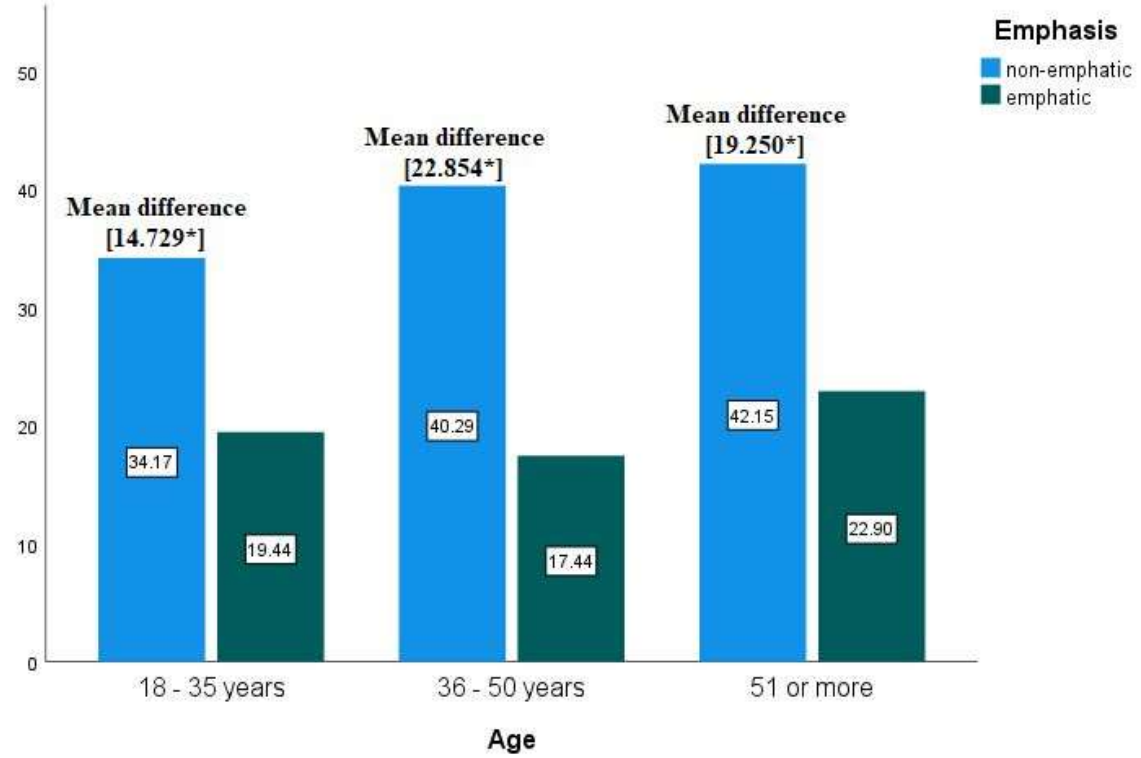


Chart 1: Mean Differences for Emphasis*Age Interaction

What this means is that the present study has shown that the effect of age is only manifested by the lengthened value of the consonantal cue, namely Voice Onset Time (VOT). While most of the previous studies have confirmed the reliability of VOT as an acoustic cue

for emphasis, only Omari and Jaber (2019) have challenged the consensus, arguing that VOT is not a reliable acoustic correlate of emphasis in UJA when intersecting with other social variables such as gender and/or social class (for details, see Omari and Jaber, 2019, p. 181).

Moving on to the vocalic cues, the researcher has found that there is no significant effect(s) of age on emphasis in AJA by means of the first three formant frequencies, neither in the target syllable nor in the non-target syllable. This finding runs counter to most of what has been reported in the previous literature which has confirmed that vowels in emphatic environment show more raised F1 and F3 values, and a more lowered F2 value (Alzoubi, 2017; Rababa, 2017; Al-Deaibes, 2016; Al-Masri and Jongman, 2014; Jongman *et al.*, 2011; Abudalbuh, 2011; Al-Masri, 2009, among others). Only minimal support for this finding is reported by Omari and Jaber (2019) who have found that F2 was significant only at the onset of the vowel (but not at the midpoint) when emphasis is constrained by social class. Omari and Jaber (2019) have also pinpointed that there is no potential significant effect of the interplay between emphasis and gender or social class in terms of F3 at both the onset and midpoint.

Another piece of evidence that would lend furtherance to the findings on the vocalic cues comes from Al-Omari's and Jaber's (2020) research in which they maintain that: (1) there is no significant effect of the interaction of emphasis, manner, and gender/ social class on F1 neither at the onset nor at the midpoint of the vowel. They have also claimed that the overall interaction of emphasis, manner, gender, and social class yielded no significant effect on F1 only at the midpoint of the vowel. In addition, the researchers (*ibid.*) have found that neither F2 nor F3 at either position (i.e. onset and midpoint) of the vowel was significantly affected by the interactions of (emphasis*manner*gender/social class) and (emphasis*manner*gender*social class).

5. Conclusion

This study has, given the abundance of the previous literature, not yielded findings which are far from being true. Hence, there have been clear-cut conflicting results since the emergence of the relatively new scope of research on the plausible effects of social variables on emphasis production in Arabic.

This study was an attempt to study the plausible effect(s) some social variables, such as age, may have on emphasis production in a variety of JA. This study fosters the importance to carry further future research, incorporating more extra-linguistic variables such as education, gender, inter-marriage, and social class with more precision on regional basis.

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Appendix I

Stimulus material for monosyllables (*Please note that the asterisk after each word indicates that it is a non-word).

Consonant	Mono-syllabic Words								
	Vowel	Word-Initial				Word-Final			
		Plain	Gloss	Emphatic	Gloss	Plain	Gloss	Emphatic	Gloss
s/sˤ	a:	sa:b	Dissipated	sˤa:b	Touched	ba:s	Kissed	ba:sˤ	Bus
	a	sab	Badmouthed	sˤab	Poured	bas	Enough	basˤ*	__
	i:	si:b	Leave!	sˤi:b	Touch!	ni:s*	__	ni:sˤ	Porcupine
	ɪ	sɪn	A tooth	sˤɪn	Shut up!	bɪs	A cat	bɪsˤ*	
	u:	su:g	Drive!/Market	sˤu:g*	__	bu:s	Kiss!	bu:sˤ*	__
	ʊ	sʊm	Poison!	sˤʊm	Tie tightly!	nʊs*	__	nʊsˤ	Half
t/tˤ	a:	ta:b	Repented	tˤa:b	Recovered	ba:t	Stayed overnight	ba:tˤ*	__
	a	tam	Done!	tˤam	Covered	mat	Did (something) lazily	matˤ	Stretched
	i:	ti:n	Figs	tˤi:n	Mud	bi:t*	__	bi:tˤ*	__
	ɪ	tɪf	Spit!	tˤɪf*	__	zɪt	Throw!	zɪtˤ*	__
	u:	tu:b	Repent!	tˤu:b	Bricks	fu:t	Enter!	fu:tˤ	__
	ʊ	tʊn*	__	tˤʊn*	Tuna fish	bʊt	Decide!	bʊtˤ	Stab!

Stimulus material for bi-syllabic words (*Please note that the asterisk after each word indicates that it is a non-word).

Consonant	Vowel	Bi-syllabic Words							
		Word-Initial				Word-Final			
		Plain	Gloss	Emphatic	Gloss	Plain	Gloss	Emphatic	Gloss
s/sˤ	a:	sabba:r*	__	sˤabba:r	Cactus	ha:ʤɪs	Obsession	ha:ʤɪsˤ*	__
	a	samar	Female name	sˤamar*	__	ʔabus	Shall I kiss!	ʔabusˤ*	__
	i:	safi:*	__	sˤafi:	Pure	mi:das	A furniture shop name	mi:dasˤ*	__
	ɪ	samɪr	Male name	sˤamɪr*	__	bɪmʊs*	Related to	bɪmʊsˤ	Is sucking
	u:	su:mu:	Estimate!	sˤu:mu:	Fast!	mu:bɪs*	__	mu:bɪsˤ*	A village name
	ʊ	sabʊr*	__	sˤabʊr	Cactus fruit	fʊsfʊs	Flies	fʊsfʊsˤ*	__
t/tˤ	a:	tu:ba:s*	__	tˤu:ba:s	Name of a city in Palestine	ʃa:mɪt	Humiliating	ʃa:mɪtˤ	High
	a	tabar*	__	tˤabar	An axe	bafʊt	Slicing	bafʊtˤ	Stand up abruptly
	i:	tami:s	A type of bread	tˤami:s*	__	ʃi:mat	Characteristics	ʃi:matˤ*	__
	ɪ	tɪbɪr	Gold nuggets	tˤɪbɪr*	__	ɵa:bɪt	Fixed	ɵa:bɪtˤ*	__
	u:	tʊmu:r	Dates	tˤʊmu:r*	__	du:da:t	Worms	du:da:tˤ*	__
	ʊ	tamʊr	Dates	tˤamʊr	Heap	bʊket	Bouquet	bʊketˤ*	__