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Acoustic Analysis of English Lexical Stress in The Disyllabic Nouns and Verbs of Pashto-Speaking EFL Learners

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Abstract

Research literature of acoustic studies indicates that non-native speakers of English face difficulty in producing and perceiving English lexical stress contrasts due to certain factors. This study investigates how Pashto-speaking English as a Foreign Language (EFL) learners produce lexical stress in English disyllabic nouns and verbs. It focuses on two key acoustic features of stress: duration and intensity. Ten pairs of disyllabic words, presented in context sentences, served as stimuli for data collection. A total of 720 tokens were created from 120 sound samples of the six Pashto-speaking EFL learners, and interactive labeling through FormantPro.praat, descriptive statistics, and One-Sample t-Test were used to analyze data. Results reveal that Pashto-speaking EFL learners tend to lengthen the second syllable and increase the intensity of the first syllable in both nouns and verbs. This pattern deviates from native English stress patterns, suggesting difficulty in acquiring and producing the correct acoustic features. Specifically, the findings indicate that these learners struggle with marking stress shifts that differentiate stressed syllables from unstressed ones in noun-verb pairs. This highlights the need for language teaching and curriculum development tailored to address the specific challenges faced by Pashto-speaking EFL learners and other multilingual communities in Pakistan.

Keywords: Acoustics, lexical stress, English, Pashto, EFL learners

Introduction

Pakistan's linguistic landscape is characterized by remarkable diversity, reflecting centuries of historical and cultural influences. With more than

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72 indigenous languages spoken across the country, Pakistan stands as a testament to the richness of human linguistic expression (Hussain, Hussain, & Dar, 2023). This multilingualism is not only a reflection of Pakistan's cultural heritage but also a significant factor in shaping language learning and acquisition processes, particularly concerning English as an L2. The influence of learners' mother tongues on the acquisition of English as an L2 is a well-established phenomenon in language acquisition research. When individuals learn a second language, they often transfer linguistic features from their native languages to the target language. In the case of Pashto-speaking EFL learners in Pakistan, the influence of Pashto on English acquisition is particularly noteworthy due to the divergent stress patterns between the two languages (Khan, Ahmad, & Khuwaja, 2016).

Pashto, like many other languages, has its own stress patterns, which differ from those found in English. In Pashto, stress typically falls on the final syllable of a word. In contrast, English lexical stress placement can vary based on factors such as word category (nouns, verbs) and morphological structure (Fleming, 2021). This fundamental difference in stress patterns poses a significant challenge for Pashto-speaking EFL learners as they navigate the intricacies of English pronunciation and prosody.

The errors in stress placement on pairs of words in English with the same spellings but different meanings, such as "present" (n) versus "present" (v), and "record" (n) versus "record" (v), are common challenges for English language learners, including Pashto-speaking EFL learners in Pakistan. These errors often stem from the learners' native language influence, particularly when the stress patterns in their mother tongue, like Pashto, differ from those in English. In Pashto, stress typically falls on the final syllable of a word, whereas in English, stress placement can vary based on word category (noun versus verb) and morphological structure. Therefore, Pashto-speaking EFL learners may struggle to accurately determine the stress placement in English words that have multiple meanings and functions. For example, in "present" (n), the stress is on the first syllable: PRES-ent (noun meaning a gift or a time period) and in "present" (v), the stress is on the second syllable: pre-SENT (verb meaning to show or to offer).

To understand the challenges of acquiring English lexical stress, an acoustic analysis provides valuable insights. Examining fundamental frequency (F0), duration, and intensity helps identify stress placement patterns in disyllabic nouns and verbs. By analyzing Pashto-speaking EFL

learners' speech production, researchers gain insight into how Pashto's stress patterns influence English lexical stress pronunciation.

Language learning is a very complex phenomenon, and it is a unique human capacity. Language is learned in childhood effortlessly, but when it comes to second language (L2) or foreign language (FL) learning, it gets much more complicated and effortful, especially for adults. Adult learners usually do not learn L2 in the same manner as children. Adult speech differs significantly from child speech. Adults who learn a foreign or L2 are rarely able to speak that language without an accent. The degree of accent varies with respect to different speakers. Different researchers propose different factors for accent, i.e., age, language environment, and the nature of L1, etc. According to Fledge (1995), age makes it challenging for L2 learners to recognize some specific auditorily noticeable differences in the sounds of L1 and L2. This challenge creates a hurdle for them to form new phonemic categories, which may result in the development of a foreign accent. A number of studies have also indicated that perceiving and categorizing foreign sounds inaccurately correlate with foreign accent.

Adult learners encounter more difficulties and more challenges in learning L2 or a foreign language because they already well-developed lexical, phonological, and semantic representations of their L1, which hinder and interfere with the new representation for L2. Although success in foreign or L2 learning is associated with both grammatical and phonological accuracy, it is the inappropriate manipulation of the sound system and stress placement rules of a foreign or L2 language that more often results in communication breakdown. Word stress production is one area of difficulty for EFL learners. Research shows that appropriate word stress placement is more vital for comprehending non-native speech than grammatical correctness (Munro & Derwing, 1995; Munro & Derwing, 1999; Trofimovich & Issacs, 2012). This means that inappropriate placement of stress results in misperception of L2 speech. Zhang, Nissen, and Francis (2008) expressed a similar view, stating that non-native speakers of English often struggle to produce English lexical stress contrasts like native speakers do, which most often results in communication breakdown. This difficulty often stems from L1 interference from one's first language, lack of knowledge about which syllables require stress, and difficulty in phonetically manipulating specific stress correlates. According to Lord (2001), English L2 or EFL learners lack awareness of L2 stress placement rules because teaching rules related to the placement of L2 lexical stress are still neglected in EFL/L2 classrooms. Different researchers indicate that L1 transfer is one of the

main reasons of incorrect L2 stress patterns (Altmann, 2006; Erdmann, 1973; Peperkamp, Vendelin, & Dupoux, 2010; Wang, 2008).

Different researchers have explored the acoustic correlates of English lexical stress, produced by speakers of different languages other than English. Most of these studies have focused on disyllabic English words in which the stress location identifies the word as a noun or verb. Results of these studies consistently indicate that the acoustic correlates of average fundamental frequency F0, intensity, syllable duration, and vowel quality are associated with the perception and production of English lexical stress: stressed syllables have higher F0, greater intensity, and longer duration than unstressed syllables (Zhang, Nissen, & Francis, 2008). No published study was found related to the pattern with which Pashto-speaking learners of English in Pakistan produce and mark lexical stress on disyllabic English words, especially nouns and verbs. The present study is an attempt to explore and analyze the acoustic characteristics of English lexical stress, especially of the two important lexical stress correlates of duration and intensity in the production of lexical stress on the selected disyllabic English nouns and verbs produced by Pashto-speaking EFL learners in Pakistan.

Research Questions

This study had the following research questions:

1. With what pattern do Pashto-speaking Pakistani EFL learners use the stress correlates of duration and intensity to produce and mark lexical stress on the selected disyllabic English pair words (nouns and verbs)?

2. Do Pashto-speaking learners of English use and vary the two stress correlates to mark stress shift and distinguish stressed syllables from unstressed syllables in disyllabic English pair words in the same way as native speakers do?

3. Do statistically significant differences exist in the mean duration and mean intensity of all the first and second syllables across all ten pairs (nouns and verbs) of disyllabic words?

Literature Review

Anderson, Johnson & Koehler (1992) analyzed the correlation between deviance in pronunciation of nonnative students at the levels of syllable

structure, segmental structure, and prosody. They found that pronunciation deviance at all three levels correlated with the experts' ratings of the participants' pronunciation, but prosody had the strongest influence. Archibald's work from 1991 to 2000 on the acquisition of L2 stress by learners of different languages suggested that L2 learners' use of principles of Universal Grammar (UG), correct L2 parameter settings from resetting, and incorrect L1 parameter settings from transfer make up their interlanguages (Archibald, 2000, p. 152). Archibald's (1993) study of learners of Spanish (a variable fixed-stress language), Polish, and Hungarian (fixed-stress languages) provided evidence of transfer of L1 metrical parameters to the acquisition of stress in L2. He also pointed out that if non-native students cannot perceive correct stress placement the way native speakers do, then the input will not 'act as triggering data' for correct L2 parameter setting. This suggests that there is a need to investigate EFL learners' perception and production of stress.

Altmann (2006) studied the effects of the stress properties of native language on the acquisition of primary word stress in L2 in the light of two recent typological hierarchical models of stress: the Stress Deafness Model and the Stress Typology Model. The participants were speakers of Chinese, Japanese, Arabic, French, Turkish, Korean, and Spanish. They were learning English at the advanced level. Results indicated that Arabic, Turkish, French speaking students faced problems in perceiving the location of stress, but their performance was most like native speakers of English in production. Learners with Chinese, Japanese, Korean, and Spanish perceived stress. However, their stress production differed from that of the control groups.

Chen (2001) studied the ways Mandarin speakers of English produced sentence stress compared to American English speakers. Results indicated that Mandarin speakers were able to differentiate stressed and unstressed words in terms of F0, duration, and intensity. Results also indicated that though Mandarin speakers were able to identify word stress, the acoustic characteristics of stress were not identical to those of American speakers. They produced stressed words with a higher F0 and shorter duration than American speakers. Mandarin speakers also produced unstressed words with higher F0 and greater intensity than American speakers.

Wang (2008) explored the perception of stress by Mandarin Chinese learners of English and native English-speaking learners. Mandarin speakers' perception of stress significantly varied, like that of native speakers of English, by manipulating the three acoustic cues, but they

relied less on two cues, i.e., duration and intensity, and more on F0, higher than native English learners. Bu and Zhou (2020) explored problems faced by Chinese EFL learners in the acquisition of English stress. They identified wrong lexical stress assignment, prominence of unstressed syllables as stressed ones, and stress on every word as some factors that affect Chinese EFL learners' accent.

Field (2005) studied the role of lexical stress in intelligibility and the lexical allocation by native speakers and nonnative speakers of English. Both native and nonnative speakers responded similarly to the problems of incorrect allocation of stress. For both groups, the extent to which intelligibility was compromised depended greatly on the direction in which stress was shifted and whether changes in vowel quality were involved. The study afforded a number of possible insights into how lexical stress placement contributes to intelligibility. It demonstrated a significant decrease in intelligibility when stress was shifted to an unstressed syllable without an accompanying change of quality. Kaori (2012) looked at the perception and processing of lexical stress by Japanese (JS) speakers. The results indicated JS's perception of lexical contrastive stress at a deeper level than the phonetic surface level, the same like native English speakers. This suggests that JS are sensitive to prosodic information at the same level as NS in the processing of words that contain stress accent. Maczuga (2014) studied the production of German L2 stress by native speakers of English. This study examined the effect of training on the ability of English native speakers who are beginner-level learners of German to produce stress patterns in words from three distinct categories: native German words, German-English cognate words, and words with unstressed suffixes. The results revealed that training improved learners' production of German word stress and raised learners' awareness. Participants were more accurate in their production of native German words and those with unstressed suffixes than they were in their production of cognates.

Kondo's (2007) study examined the production of English lexical stress by Japanese speakers to determine which acoustic features associated with English lexical stress were difficult for Japanese speakers to acquire. Results of this study showed that Japanese speakers had good control of F0, duration, and intensity of stressed and unstressed vowels in English, and they were fluent speakers, but still, they could not achieve native like vowel duration. Zhang et al. (2008) studied the acoustic characteristics of English lexical stress produced by native Mandarin speakers.Ten English and 10 Mandarin speakers participated in the study. Results of this study showed that Mandarin speakers used all the acoustic correlates to

distinguish stressed syllables from unstressed syllables, but still were unable to produce native like stresspattern. Mandarin speakers were found to be significantly different from native speakers in formant patterns.

The review of the selected literature shows that speakers of languages other than English have difficulty in producing and marking native-like lexical stress and distinguishing stressed syllables from unstressed syllables. Second, it also indicates a wide research gap, as no published study was found related to the acoustic analysis of the English lexical stress produced by Pashto-speaking EFL learners. Thus, the present study attempted to fill in this wide research gap by exploring the lexical stress pattern and the use and variation in the use of the two important lexical stress correlates of duration and intensity in the production of English lexical stress by Pashto-speaking learners of English on the selected ten pairs of disyllabic English words (nouns and verbs).

Methodology

As this study attempted to explore the pattern of lexical stress and the acoustic features of duration and intensity correlates in marking stress shift for disyllabic English nouns and verbs by Pashto-speaking learners of English, the exploratory and descriptive research design was employed in this study. A stimulus consisting of 10 pairs of disyllabic English words (nouns and verbs with similar spellings) in context sentences was used for data collection (Appendix A). Praat was utilized for recording data, while FormantPro Praat was employed for marking syllable boundaries, obtaining duration and intensity, and analyzing the data.

Participants

The target population for the present study was L1 Pashto-speaking learners of English, enrolled in the undergraduate English degree program at Hazara University, Mansehra. Six Pashto-speaking undergraduate students of English (three female and three male) were selected through non-random, purposive, and convenience sampling procedures to participate in this study. They were taking an introductory course in Phonetics and Phonology during the time of data collection.

Materials and Procedures

Following the methodology of Zhang, Nissen, & Francis (2008), ten pairs of disyllabic English words were selected as target words. Each pair

consisted of a noun and a verb, having identical spellings. Out of these ten pairs, three pairs (contract, desert, and record) were selected from Zhang et al. (2008). The remaining seven pairs consisted of the following words: conflict, discount, insult, protest, reject, survey, and contest. All ten pairs of nouns and verbs were used in context sentences. The target words were italicized while designing the stimulus for data recording.

The researchers contacted the volunteer students (selected prior to the data recording date) to finalize the day, time, and place with consensus for data recording. Each participant was given the stimulus in printed form prior to the recording. They were asked to carefully read all the sentences. Additionally, one of the researchers instructed them to speak out all the sentences loudly, as naturally as possible, and as they would do in a normal conversation. They were instructed to speak each word three times, marked with A first with stress on the first syllables, where the target words were used as nouns, and the sentences marked with B with stress on the second syllable, where the target words were used as verbs. The participants were required to speak each sentence three times in both cases while keeping their stimulus in front of them during recording. After the instruction session, all participants were asked to wait outside the hall. After all the preparations were made by the second researcher for recording, all participants were called in one-by one. All responses were recorded in a multi-purpose soundproof hall, equipped with audio-visual aids. Praat software was used for all recordings with a 44100 Hz sampling frequency. The laptop was placed approximately half a meter away from the speaker's mouth. All three repetitions of each of the 20 sentences (ten nouns and ten verbs) were saved as individual sound files in WAV format and coded for later analysis, thus obtaining 120 sound files (60 for nouns and 60 for verbs).

Prior to computing mean duration and mean intensity, two more copies of each set of 60 sound files were made, thus totaling 360 sound files (180 for nouns and 180 for verbs), in order to mark syllable boundaries for three repetitions separately. Each set of 180 sound files was kept in four separate folders: one each for marking syllable boundaries of first syllables of nouns, second syllables of nouns, first syllables of verbs, and second syllables of verbs. In total, 720 sound files were obtained and processed. Using Praat and FormantPro (Version 1.0), interactive labeling was performed to mark syllable boundaries for the first and second syllables of all tokens of nouns and verbs, followed by processing all sounds without a pause and getting ensemble files in order to compute mean duration, mean meanduration, mean intensity, and mean meanintensity for all

repetitions of both the first and second syllables of nouns and verbs of all participants, and then for each three repetitions of each of the ten nouns and ten verbs (both first and second syllables) of all six participants. All data were imported to MS Excel sheet for further analysis. This was conducted to obtain an overall and clearer view of the lexical stress produced by Pashto-speaking students of English, their stress shift for disyllabic nouns and verbs, and a clearer picture of their lexical stress and stress shift for each of the ten nouns and ten verbs.

Results

The present study aimed to explore and analyze the pattern with which Pashto-speaking EFL learners in Pakistan produce and mark lexical stress on the selected disyllabic English nouns and verbs and whether or not Pashto-speaking students of English use and vary the stress correlates of duration and intensity in the production of lexical stress contrasts to mark stress shift and distinguish stressed syllables from unstressed syllables in disyllabic English pair words (nouns and verbs) the way native speakers of English do. In addition, the present study also attempted to find out any statistically significant differences in the mean duration and mean intensity of the three repetitions of all participants for the first and second syllables of ten pairs (nouns and verbs) of disyllabic words. Data was analyzed in light of the research questions.

In order to answer the first question, interactive labeling was done to mark syllable boundaries for the first and the second syllables of all 720 tokens of nouns and of verbs, followed by processing all sounds without a pause and getting ensemble files in order to compute mean duration and mean intensity for all the three repetitions of both the first and second syllables of nouns and verbs of all participants using Praat and FormantPro (Version 1.0). Descriptive statistics were used to analyze the data.

As indicated in Figures 1 to 4, Pashto-speaking learners of English generally demonstrated a pattern in producing lexical stress and marking stress contrasts on the selected disyllabic English nouns. They tended to exhibit longer duration on the second syllables and higher intensity on the first syllables, except in cases like “record”, “discount”, and “survey”, where the intensity of the second syllables was higher. Similarly, for the selected disyllabic English verbs, participants were found to produce lexical stress and mark stress contrasts with longer duration on the second syllables and higher intensity on the first syllable, with exceptions like “record” and “survey” where the intensity of the second syllables was

higher. These findings suggest that Pashto-speaking EFL learners primarily rely on intensity to mark stress contrasts in nouns and on duration in verbs. However, they seem to encounter difficulty in utilizing duration for nouns and intensity for verbs on the first syllables, indicating potential challenges in accurately producing and marking lexical stress. These observations may point to nonnative pronunciation deviance.

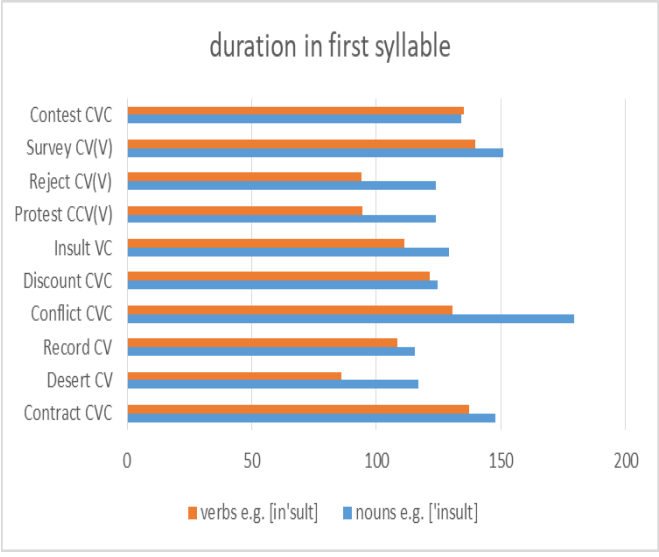

Figure 1: Mean duration (ms) in the first syllable

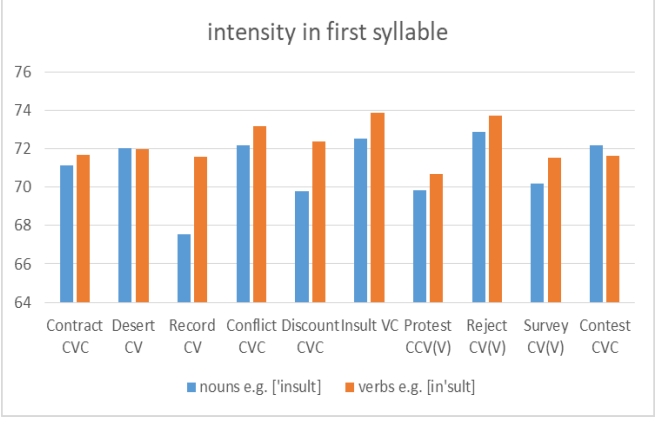

Figure 2: Mean intensity (db) in the first syllable

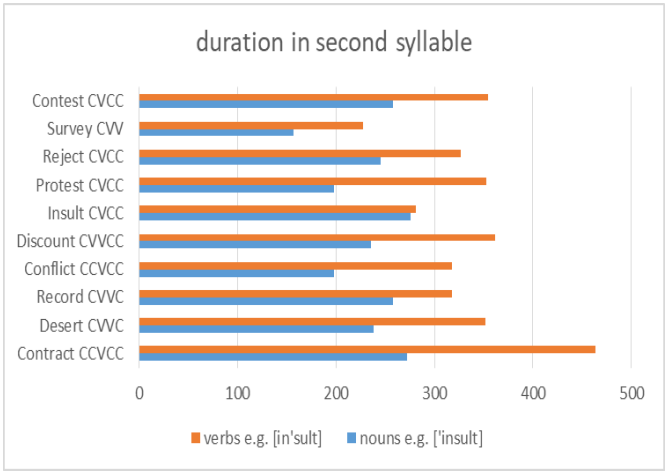

Figure 3: Mean duration (ms) in the second syllable

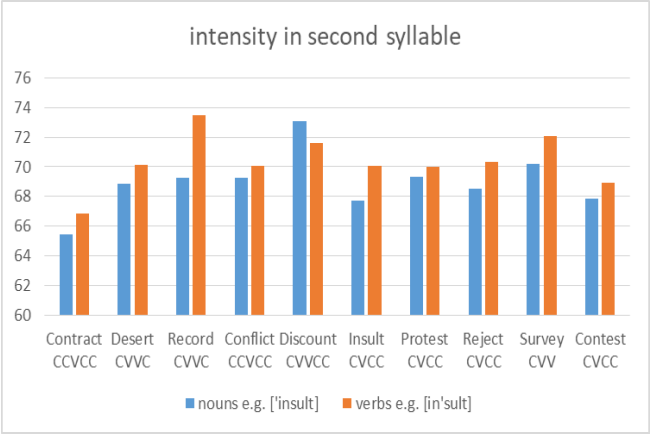

Figure 4: Mean intensity (db) in the second syllable

To address the second question, which aimed to examine the use and variation of stress correlates (duration and intensity) among Pashto-speaking EFL learners in marking stress shift in nouns and verbs and distinguishing stressed from unstressed syllables in disyllabic English words, mean scores for duration and intensity were computed separately for all repetitions of the first and second syllables of the selected nouns and verbs. Table 1 presents the results, indicating notable differences in the mean scores of durations and intensity between the first and second syllables of each of the ten nouns. However, the observed pattern diverges from that typically exhibited by native English speakers in the production of lexical stress contrasts.

Table 1: *Mean duration and mean intensity for the first and second syllables of nouns*

Words	Duration (ms) first Syllables	Duration (ms) second Syllables	Intensity (db) first Syllables	Intensity (db) second Syllables
Contract	147.92	272.05	71.13	65.44
Desert	116.79	238.22	72.04	68.84
Record	115.41	258.09	67.52	69.28
Conflict	179.32	198.36	72.17	69.27
Discount	124.71	235.28	69.77	73.07
Insult	129.24	276.17	72.55	67.73
Protest	124.04	197.86	69.83	69.36
Reject	123.95	245.72	72.86	68.54
Survey	150.96	157.30	70.18	70.23
Contest	134.02	257.72	72.19	67.87

Analysis of the mean scores shows that Pashto-speaking learners of English use and mark lexical stress contrasts on disyllabic English nouns with longer duration on the second syllables and higher intensity on the first syllables, except for the three nouns record, discount, and survey, where the mean density is higher on the second syllables. This suggests that they may face challenges in successfully marking and varying stress contrasts to produce and distinguish stressed and unstressed syllables as native speakers do, specifically with longer duration and higher intensity of the first syllables.

Regarding the use of stress correlates of duration and intensity in the production of lexical stress contrasts by Pashto- speaking learners to mark stress shifts and distinguish stressed syllables from unstressed syllables on disyllabic English verbs, results in Table 2 demonstrate a clear difference between the mean scores of the stress correlates of duration and intensity forthe first and second syllables of the selected verbs.

Table 2: *Mean duration and mean intensity for the first and second syllable verbs*

Words	Duration (ms) first Syllables	Duration (ms)second Syllables	Intensity (db) first Syllables	Intensity (db) second Syllables
Contract	137.17	463.47	71.70	66.88
Desert	86.06	351.99	71.99	70.14
Record	108.35	317.82	71.58	73.51

Conflict	130.53	317.80	73.18	70.10
Discount	121.28	361.55	72.37	71.58
Insult	111.10	281.49	73.88	70.09
Protest	94.46	352.94	70.70	69.97
Reject	93.91	326.84	73.70	70.34
Survey	139.66	227.65	71.54	72.04
Contest	135.11	354.66	71.64	68.91

Analysis and comparison of the mean scores for each of the verbs' first and second syllables indicate that Pashto- speaking EFL learners produce and mark lexical stress on the selected disyllabic English verbs with longer duration of the second syllables and higher intensity of the first syllables, except for the two verbs- record and survey- where the mean scores for the stress correlate of intensity are higher for the second syllables. This unique pattern of lexical stress production and marking does not match the pattern observed in native speakers of English. The acoustic features of their stress pattern for such verbs include longer duration and higher intensity on the second syllables.

Moreover, a simple comparison of mean values of the stress correlate of duration and intensity for the first and second syllables of each of the ten nouns and verbs reveals some phonetic manipulations. This is indicated by the higher mean scores to mark and produce stress contrasts by the Pashto-speaking EFL learners. Thus, analysis of the results suggests that Pashto-speaking EFL learners do use and vary the stress correlates of duration and intensity in the production of lexical stress contrasts to mark stress shift in nouns and verbs and distinguish stressed syllables from unstressed syllables in disyllabic English pair words, but in a manner unique to their speech patterns, rather than precisely mimicking native speakers. Specifically, native English speakers typically use longer duration and higher intensity on the first syllable for disyllabic nouns and on the second syllables for verbs. Overall, the lexical stress pattern of Pashto-speaking EFL learners for disyllabic English nouns and verbs appears to deviate from that of native English speakers.

Although the analysis of mean values for all three repetitions of each of the ten selected verbs and nouns provides us with important information and insights into the pattern of lexical stress among Pashto-speaking learners of English and their utilization of stress correlates such as duration and intensity in marking stress shifts and contrasts in disyllabic English nouns and verbs, drawing an overall clearer picture and reaching candid conclusions is challenging without a systematic analysis and comparison

of data. Therefore, a third research question was necessary in order to determine if there were any statistically significant differences in the mean duration and mean intensity for both the first and second syllables of the ten pairs (nouns and verbs) of disyllabic words. To address this question, mean scores were computed for the stress correlates of duration and intensity for the first and second syllables of all ten pairs of nouns and verbs.

Table 3: *Mean duration and intensity with standard deviation for first and second syllables of nouns and verbs*

	N	Mean	Std. Deviation	Std. Error Mean
Duration (ms)				
Noun first Syllable	180	134.64	37.22	2.77
Noun Second Syllable	180	233.68	65.71	4.89
Verb First Syllable	180	115.82	33.67	2.51
Verb Second Syllable	180	335.62	80.03	5.96
Intensity (db)				
Noun first Syllable	180	71.02	4.33	0.32
Noun Second Syllable	180	68.96	4.26	0.31
Verb first Syllable	180	72.23	4.04	0.30
Verb Second Syllable	180	70.36	3.98	0.29

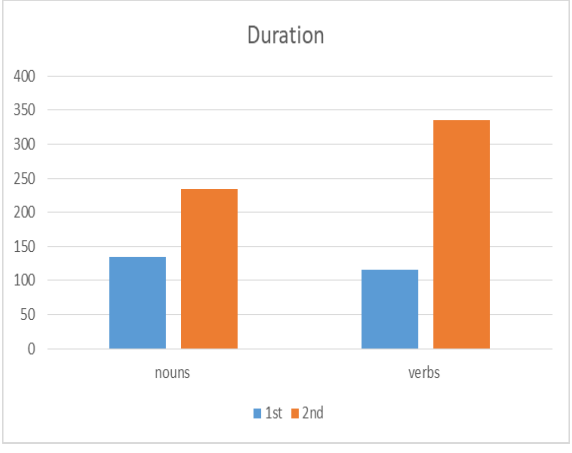

Figure 5: Overall Mean Duration (ms)

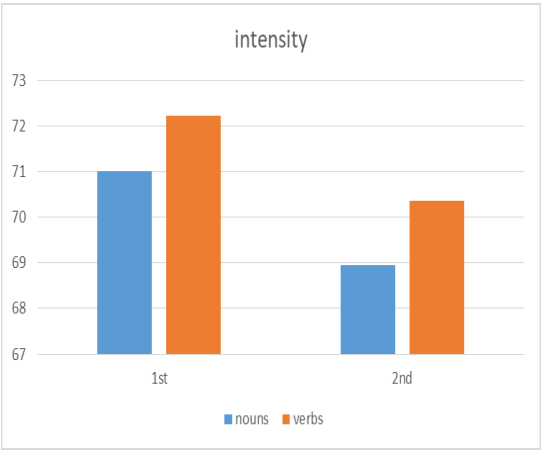

Figure 6: Overall Mean Intensity (db)

Based on the analysis of the statistical values, it is evident that all participants used and varied the stress correlates of duration and intensity to mark stress contrasts on nouns. However, the higher mean duration score (233.68 ms) for the second syllables of nouns as compared to their mean duration score for the first syllables of nouns (134.64 ms) in Table 3 and Figures 5 and 6 indicate some unusual phonetic manipulation of the stress correlate of duration, which might be associated with the effects of others stress correlates in the second syllables. Nevertheless, the slightly lower mean intensity score (68.96 db) for the second syllables of nouns, compared to the higher mean intensity score for the first syllables of nouns (71.02 db), shows that the participants used the stress correlate of intensity to mark stress on the first syllables of nouns more clearly than the stress correlate of duration.

Additionally, the participants were found to be using and varying the stress correlates of duration and intensity to mark stress contrasts in verbs and shift stress from first syllables to second syllables more clearly than in nouns. This helped distinguish the stressed syllables from the unstressed syllables as indicated by the much higher mean duration score (335.62 ms) and slightly lower mean intensity score (70.36 db) for the second syllables of verbs compared to the mean duration and mean intensity scores for the second syllables of nouns (233.68 ms and 68.96 db). However, there seems to be some kind of unusual phonetic manipulation of the stress correlate of intensity in the first and second syllables of verbs, as indicated by the slightly higher means intensity score for the first syllables of verbs (72.23 db) compared to the mean intensity score of the verbs' second syllables (70.36 db). This might be associated with the effect of vowel quality or some other stress correlate of the first syllables of the target verbs.

For a better understanding of the results and to reach a candid conclusion, a One-Sample *t*-Test was used to determine if the two groups have a similar or different amount of variability between scores. One-Sample *t* Tests revealed that the second syllables of nouns (M =233.68, SD= 65.71, t=47.70, sig. = 0.00) are produced with longer duration compared to the first syllables (M=134.64, SD=37.22, t= 48.53, sig. = 0.00). Additionally, the second syllables in verbs (M = 335.62, SD= 80.03, t=56.26, sig. = 0.00) were produced with longer duration compared to the first syllables (M=115.82, SD=33.67, t= 46.14, sig. = 0.00).

Table 4*: Comparison of duration and intensity for nouns and verbs' first Syllables with second syllables*

Correlates and Syllables	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Duration (ms)						
Noun first	48.53	179	.00	134.64	129.16	140.11
Syllable	47.70	179	.00	233.68	224.01	243.34
Noun second				115.82		
Syllable				335.62		
Verb first	46.14	179	.00		110.87	120.77
Syllable	56.26	179	.00	71.02	323.85	347.39
Verb second				68.96		
Syllable				72.23		
Intensity (db)				70.36		
Noun first	219.62	179	.00		70.39	71.66
Syllable	216.83	179	.00		68.34	69.59
Noun second						
Syllable						
verb first	239.65	179	.00		71.63	72.82
Syllable	236.91	179	.00		69.77	70.94
verb second						
Syllable						

Results in Tables 3 and 4 also show a significant difference in the intensity of the first and second syllables of both nouns and verbs. One-Sample t-test revealed that the first syllables of nouns (M = 71.02, SD= 4.33, t=219.62, sig. = 0.00) and verbs (M=72.23, SD=4.04, t= 239.65, sig. = 0.00) are louder than the second syllables (M=68.96, SD=4.26, t= 216.83, sig. = 0.00) and verbs (M=70.36, SD=3.98, t= 236.91, sig. = 0.00),

respectively. The difference is significant.

The analysis of all the results indicates that the overall use and variation in the use of the two important stress correlates of duration and intensity in the production of lexical stress in nouns and verbs suggest that Pashto-speaking learners of English do not produce lexical stress the same way as native English speakers do. They also mark stress shift in nouns and verbs in order to distinguish stressed syllables from unstressed syllables. The apparent discrepancy in the phonetic manipulation of the stress correlate of duration and intensity in the case of nouns and verbs, respectively, seems to be either due to the influence of the learners' first language or the effects of some other stress correlates in the corresponding syllables.

Discussion and Conclusion

The present study aimed to investigate the pattern of lexical stress production among Pashto-speaking EFL learners on disyllabic English nouns and verbs. It also sought to determine if Pashto-speaking learners of English utilize and vary the stress correlates, such as duration and intensity, to mark stress shifts in nouns and verbs and differentiate stressed syllables from the unstressed ones in disyllabic English pair words. Additionally, the study examined the statistical differences in the mean scores of stress correlates- duration and intensity- across the first and second syllables of all disyllabic nouns and verbs. After analyzing the results, it was observed that Pashto-speaking EFL learners produced lexical stress and marked stress contrasts on the selected disyllabic English nouns with longer duration on second syllables and higher intensity on second syllables, except for 'record', 'discount', and 'survey', where the intensity of the second syllables was higher. Similarly, for the selected disyllabic English verbs, the participants tended to produce lexical stress and marked stress contrasts with longer duration on the second syllables and higher intensity on the first syllables, except for 'record' and 'survey', where the intensity of the second syllables was higher. The pattern of stress variation differed from that of native speakers of English. Consequently, it suggests that Pashto-speaking EFL learners may face challenges in accurately producing and marking lexical stress on disyllabic English nouns and verbs, indicating non-native pronunciation deviance.

Results indicate that Pashto-speaking learners use and vary the stress correlates of duration and intensity to mark stress contrasts in verbs and

nouns, although not consistently. They clearly shift stress from the first syllables to the second syllables in the case of verbs, distinguishing stressed syllables from unstressed syllables. However, they do not consistently shift stress from the second syllables to the first syllables in nouns, making it difficult to distinguish stressed syllables from unstressed ones. Additionally, there is a statistically significant difference in the duration and intensity between the first and second syllables of both nouns and verbs. Second syllables of nouns and verbs exhibit longer duration compared to the first syllables, while the first syllables of nouns and of verbs are louder than the second syllables. The unusual phonetic manipulations observed in the intensity of the first syllables of nouns and the duration of the second syllables of verbs may be attributed to the effects of other stress correlates present in those two syllables.

Thus, the analysis of all results suggests that Pashto-speaking EFL learners (a) produce and mark lexical stress contrasts on disyllabic English nouns and verbs with an unusual pattern compared to native English speakers, (b) they are not fully capable of producing lexical stress contrasts and marking stress shift for both nouns and verbs, though they use and vary the two stress correlates to mark stress contrasts in verbs and nouns, (c) they exhibit clearer and more efficient stress shifting and marking stress in the case of verbs compared to nouns, and (d) there is a statistically significant difference in the duration and intensity of the first and second syllables of both nouns and verbs. Second syllables of nouns and verbs are produced with longer duration compared to the first syllables, while the first syllables of nouns and of verbs are louder than the second syllables. Further research studies need to be carried out to study other stress correlates, such as the fundamental frequency (F0), vowel quality and reduction, and pitch peak; in addition to duration and intensity, to obtain a clearer picture of the acoustic features of English lexical stress among Pashto-speaking EFL learners in disyllabic English pair words (i.e., nouns and verbs).

The study will contribute valuable insights into the interplay between linguistic backgrounds, language acquisition, and pronunciation in the Pakistani context. Moreover, the findings will have implications for language teaching and curriculum development tailored to the needs of Pashto-speaking EFL learners and other multilingual communities in Pakistan.

The findings of acoustic analysis can have significant implications for language teaching and learning in Pakistan. Educators can design targeted

interventions to help Pashto-speaking EFL learners overcome challenges related to English lexical stress acquisition. By raising awareness of the differences between Pashto and English stress patterns and providing targeted pronunciation instruction, educators can empower learners to improve their English pronunciation and communication skills.

To address errors in stress placement, Pashto-speaking EFL learners can benefit from focused pronunciation instruction and practice activities that highlight the differences in stress patterns between English and Pashto. Teachers can provide explicit explanations of stress placement rules in English and offer guided practice exercises where learners can identify and produce the correct stress patterns in pairs of words with similar spellings but different meanings. Additionally, using auditory discrimination tasks and drills can help learners develop their awareness of stress patterns in English words and improve their ability to produce them accurately in spoken language. Overall, by addressing these errors through targeted instruction and practice, Pashto-speaking EFL learners can enhance their pronunciation skills and overcome challenges related to stress placement in English words, ultimately improving their overall proficiency in the language.

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