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VOCAL INTENSITY AS QURANIC SYLLABLE DURATION CONTROL: A SPECTROGRAPHIC ANALYSIS(*)

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ABSTRACT

Pronunciation duration is an important aspect in Quranic recitation as it is one of the elements in *tajwid* rules obligatory of fulfillment. Error in pronunciation duration will lead to change of meaning in Quranic verse. Error in *tajwid* rules related to harakat value, is high among the community even though various methods are available to facilitate learning process. However, there are still phonetic aspects not yet discovered through technology such as vocal intensity which is potential for development as control method for duration in Quranic recitation. Thus, this study aims to investigate the relationship between vocal intensity and pronunciation duration through spectrographic analysis. This study employed quantitative approach where vocal intensity for two-

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harakat syllable was compared to one-*harakat* syllable through paired T test. The respondents of this study were famous imams from renowned mosques of the world where the recitation were obtained as mp3 file from the internet. This study found that vocal intensity for two-*harakat* syllable was significantly higher than for one-*harakat* syllable for the two sample verses analysed. This showed that the intensity of a syllable correlates to its duration. This finding suggests an intensity-based duration control method to improve Quranic recitation.

Keywords: *Intensity, Al-Quran, Duration, Spectrogram, Harakat*

1. INTRODUCTION

Vocal intensity is one of phonetic aspects which is measured using decible unit with symbol dB (Koffi, 2020) and calculated through formula as in Eq.1.

$$1\text{dB} = 10 \log_{10} = \frac{\text{Absolute intensity}}{\text{Reference intensity}} \quad \text{(Eq.1)}$$

In phonetics discipline, this vocal intensity is related to several other phonetic aspects such as vocal stress (Mousikou et al., 2024; Shen, 1993), duration (Akbar et al., 2024; Fry, 1954), speech rate (Feldstein and Bond, 1981) and even related to psychological aspect such as intimidation (Anikin et al., 2023), personality and mental health (Ostermann et al., 2022). According to Abdurakhimovna (2024), vocal intensity plays an important role in speech from aspect of vocal stress perception, emphasis and intonation. The study also stated that level of vocal intensity will determine the effectiveness of communication in delivering message of assertiveness, urgency and emotional condition. Related to this researcher's study, studies that relate vocal intensity to pronunciation duration are such as by Fry (1954), Shen (1993) and Akbar et al., (2024).

However, Yost (2007) denied the relationship where the study indicated that intensity and duration are perceived by different neurons. Yet, the same study admitted that at certain point, these correlates would act together upon perception. With regard to this "certain point", the researcher commence to investigate whether vocal intensity correlates to pronunciation duration in context of Quranic recitation where it might differ with past studies due to language context as Koffi (2021), which emphasised the lack of intensity-duration relationship in speech, attempted to generalise the findings to all

language, yet the study only focus on two language which were American English and Anyi language.

From a health perspective, regulating vocal intensity is crucial to prevent vocal fatigue and voice disorders. Excessive or unbalanced intensity can increase the risk of vocal cord strain, nodules, and dysphonia, especially in professional speakers or readers of long texts (Ruotsalainen et al., 2007). Readers who apply healthy vocal techniques tend to maintain consistent intensity variation, which directly supports listeners' perception of rhythmicity and speech segmentation (Abur et al., 2023). Physiological factors also play an important role, as good intensity control reduces tension in the phonatory muscles and vocal fold membranes. With proper vocal training, readers can achieve a balance between vocal strength and vocal cord relaxation, thereby maintaining vocal stamina for long reading sessions (Çelik, 2025). From these two perspectives, it can be understood that in reading the Qur'an, proper intensity control not only maintains acoustic quality but also protects the reader's vocal health, allowing them to maintain consistency in duration and emphasis throughout long readings without experiencing fatigue.

From a linguistic perspective, vocal intensity plays an important role not only in suprasegmental aspects such as stress and intonation, but also in broader linguistic structures. Morphologically, intensity can highlight certain affixes or word forms to emphasize grammatical or semantic meaning. In syntax, differences in intensity mark the focus of a sentence or highlight certain elements in the subject-predicate-object structure, thereby influencing the semantic and pragmatic interpretation of the sentence (Ibrahim & Abbas, 2010). At the pragmatic level, intensity helps convey the speaker's intent, such as expressing certainty, urgency, emotional emphasis, or social attitude, making communication more effective and expressive (Lacheret et al., 2023).

In addition to the internal structure of language, modern linguistic analysis emphasizes prosody as an important component in constructing overall meaning. Prosody includes variations in pitch, stress, duration, and tempo, which work together to mark the focus of information and the hierarchy of discourse in speech (Wolf et al., 2023). Thus, linguistic perception of vocal intensity variation is not only related to the form of sound, but also to how listeners map information and understand the structure of the message.

From an acoustic phonetic perspective, vocal intensity is closely related to other prosodic parameters such as pitch and speech tempo. These elements form prosodic patterns that help listeners recognize phrase boundaries, information structure, and meaning hierarchy in speech (Karia, 2023). In the context of reciting the Qur'an, the interaction between intensity, pitch, and speed is very important. Readers must maintain a balance between the beauty of

recitation (*nagham*) and the accuracy of *tajwid* rules, so that the meaning of the verses is conveyed clearly and solemnly. In addition, cognitive factors also influence the regulation of vocal intensity. Qur'an reciters adjust the strength of their voice based on the complexity of the verse, the length of the phrase, and the meaning contained therein, so that they are able to maintain consistency and quality of recitation throughout long sessions (Khalil, 2022).

In reading the Quran, this linguistic aspect is increasingly important, where vocal intensity not only affects phoneme articulation and tajwid, but also rhythm, intonation patterns, and verse segmentation, which play a role in understanding the meaning of verses (Mohamed et al., 2021). Variations in intensity can also mark the end of a verse, a change in the focus of the message, or an emphasis on certain words that have important theological and rhetorical meanings. This shows that the relationship between intensity and duration in a linguistic context cannot be separated from the cultural, religious, and phonotactic context of the Arabic language itself (Habiburrahman et al., 2024).

In acoustic phonetics, it is explained that vocal intensity is closely related to other prosodic parameters, such as pitch and speech tempo. These elements work simultaneously to form prosodic patterns that help listeners recognize phrase boundaries, information structure, and meaning hierarchy in speech (Karia, 2023). In reciting the Qur'an, the interaction between intensity, pitch, and tempo is very significant because the reciter is required to maintain a balance between the beauty of the chant (nagham) and the accuracy of the tajwid rules, so that the message of the verse is conveyed clearly and solemnly. From an acoustic perspective, cognitive factors also play a role in regulating vocal intensity. Readers of the Qur'an indirectly adjust their voice intensity based on the complexity of the verse, the length of the phrase, and the meaning it conveys (Khalil, 2022).

Moreover, Koffi (2020) stated that the correlation between intensity and duration may only work when the intensity reaches 90 dB, which is a shouting volume. Meanwhile in this study, the researcher will investigate whether in Quranic recitation, which falls under normal speech category, still indicate the intensity-duration correlation, where this relationship would suggest vocal intensity as a potential candidate of duration control method in Quranic recitation.

The study of Arabic phonology refers to the emphasis of sounds as *annabr*, which is the highlighting of certain syllables or words through increased vocal strength or prolonged duration. *Annabr* functions as a marker of speech structure as well as a means of emphasizing meaning, especially in texts that are read formally, such as the Qur'an (Anīs, 1979). In the practice of reciting the Qur'an, *annabr* does not occur freely as it does in everyday speech, but rather

follows a pattern of recitation bound by the rules of *tajwid*, so that sound emphasis becomes part of a controlled articulation system.

Annabr in the recitation of the Qur'an has a semantic and pragmatic role because it helps highlight phrases that contain important messages. Voice emphasis often appears in verses containing affirmations (*ta'kīd*), warnings (*wa'īd*), or good news (*tabshīr*), so that listeners can grasp the focus of the meaning more clearly (Al-Zarkashī, 2001). Thus, the intensity of recitation does not only function as an acoustic phenomenon, but also as a linguistic device that reinforces the delivery of the message of revelation.

From an interpretive perspective, the manner of reciting verses is believed to influence their meaning. Differences in sound emphasis can create different emotional and rhetorical impressions, making *qirā'ah* a medium that helps guide listeners' interpretation of the content of verses (Abdul-Rauf, 2005). This shows that annabr can be seen as a link between the phonetic aspects of *tajwid* and the hermeneutic dimensions of interpretation, because the emphasis on sound helps to structure meaning without changing the text of the Qur'an itself.

In the practice of *tajwid*, the emphasis on sound is realized through the arrangement of the nature of letters, *makhraj*, and the length of reading. Letters that are *syiddah, jahr,* or *isti'lā'* require greater articulation energy, so that they naturally produce higher intensity than other letters. This condition shows that vocal intensity in *qirā'ah* is an integral part of the tajwid system that regulates the quality and duration of sounds normatively, as emphasized in the principle of giving rights to each letter (Ibn al-Jazarī, 2006).

The phonetic implications of this principle indicate that variations in intensity in the recitation of the Qur'an do not occur randomly, but rather follow the segmental characteristics of each letter. Strong letters such as *ṭā'*, *qāf,* and *ṣād*, for example, tend to be accompanied by increased subglottal pressure and articulatory tension, which results in increased intensity and a relative lengthening of the sound. Conversely, letters that are *rakhāwah* (flowing sounds) or *hams* (flowing breath) tend to exhibit lower acoustic energy. This pattern shows that intensity and duration interact as a direct consequence of the articulation mechanism, so that both function as phonetic markers that clarify the sound structure in recitation.

Based on this description, vocal intensity in the recitation of the Qur'an can be understood as an internal component of tajwid that has the potential to influence the control of syllable duration. The recitation of the Qur'an as a structured religious utterance provides a unique context, in which voice emphasis is directed by the rules of recitation, not merely by the spontaneity of the reader. Therefore, the study of intensity in qirā'ah is relevant as a bridge between

phonetics and tajwid, while also opening up opportunities for the development of more systematic methods of controlling the duration of recitation.

From orher persepective, the concept in the formerly discussed phonetics discipline serves as a foundation that can be further implemented in improving *tajwid* method for syllable duration control. To define, *tajwid* is giving of rights to each Quranic letter recited which is defined in *Muqaddimah* poetic line as:

إعطاء الحروف حقها من كل صفة ومستحقها

(Ibn al-Jazari, 2006:3)

Tajwid is an element obligatory of preservation in Quranic recitation based on evidence:

أَوْ زِدْ عَلَيْهِ وَرَتِّلِ ٱلْقُرْءَانَ تَرْتِيلًا ﴿٤﴾

"Or a little more; and recite al-Quran with *tartil*"

(al-Muzzammil, 73:4)

Tartil in this verse refers to order of rights to be fulfilled for a letter, known as *tajwid* (Ibn al-Jazari, 2001). Besides that, *Muqaddimah* poetic line also states that those who do not preserve tajwid in Quranic recitation, he commits sins:

والأخذ بالتجويد حتم لازم من لم يجود القرأن آثم

(Ibn al-Jazari, 2006:3)

One of *tajwid* elements or rights to be fulfilled in Quranic recitation is accurate pronunciation duration. At some of words that contain *mad* letter, the existence of *mad* letter claims a long pronunciation duration. If the long pronunciation duration is not fulfilled, it resembles erasing of the mad letter from its existence or known as *had al-huruf*, and it is one of major errors in Quranic recitation or known as *al-lahn al-jali* (al-Qudah, n.d.).

In *tajwid*, pronunciation duration is represented by *harakat* value as in statement:

> "Measurement unit to measure and estimate duration of *mad*, *sakta* and *ghunnah*"

(al-Jarami, 2001:127)

Preservation of this harakat value in Quranic recitation is trained in learning process through assistive medium such as movement of curling and releasing of finger (Ma'bad, n.d.; al-Jarami, 2001; al-Marsafi, n.d.), movement of finger to body parts (Sulaiman and Din@Nasirudin, 2014) and tapping (Hassanuddin, 2011; Md Zin et al., 2014; Miyarsi, 2015).

Although past studies show that harakat value preservation skill can be trained through various assistive medium, a study by Mohd Yasin (2020) reported that this harakat value can be trained via control of articulatory organs based on temporal ability in human without using any assistive medium. This can be observed in accurate Quranic recitation of famous imams without any assistive medium. Therefore, researches hypothesises that a phonetic factor may play a role in control of Quranic pronunciation duration without any other assistive medium. Researcher opines that one of phonetic aspects that can be related to duration is vocal intensity. This is because vocal intensity is one of phonetic aspects that can be connected to pronunciation duration based on study by Fry (1954), Shen (1993) and Akbar et al. (2024). Hence, this study will examine whether vocal intensity correlates to pronunciation duration in Quranic recitation context through spectrographic analysis. The relationship between vocal intensity and pronunciation duration discovered can be developed as a method for duration control which will help to enhance accuracy in Quranic recitation. At the same time, the meaning of each word in al-Quran in preserved as different durations of syllable in a word would convey different meanings. In phonetics, if a sound in a speech is distorted and carries a different meaning, then the sound is regarded as phonemic. In this case, duration of a syllable in al-Quran is phonemic and should be observed accurately in recitation.

From other aspect, studies by Maratigor (2010) and Miyarsi (2015) indicated that although various methods have been employed previously to assist *tajwid* learning related to pronunciation duration such as *mad* rule, students were still confused and performed errors in recitation of the rule. Meanwhile, 14% of *tajwid* error regularly committed by students were of *mad* rule category related to pronunciation duration. In fact, based on latest studies by Mohamed Razali et al. (2021), Hanapi et al. (2022) and also Ghazali and Razak (2023), level of achievement in Quranic recitation among secondary school, polytechnics and higher learning institution students were still low. These three studies also reported that among the main factors that cause low achievement in Quranic

recitation is ineffective learning method. Moreover, there is a need of self-method which can guide students in doing exercise at home (Mohamed Razali et al., 2021). Moreover, Mohamad Salleh et al. (2024) suggested that alternative methods should be incorporated in al-Quran teaching process as to increase motivation among students to learn al-Quran.

After literature review through four databases which are Web of Science, Scopus, Mendeley and Google Scholar using keywords of 'Quran', 'duration', 'intensity' and 'stress' in Malay and English language, there is no previous study that relates vocal intensity aspect in preserving pronunciation duration during Quranic recitation besides three studies. First, a study by Ramli et al. (2016) which connected vocal stress to intensity, although this study only involved pronunciation in spoken Arabic language and not al-Quran. Second, a study by Wahyudin and Djuaini (2019) which only explained the relationship between stress and meaning of Quranic verses. Meanwhile, the closest study in context of researcher's study is by Akbar et al. (2024) which stated that vocal intensity correlates with duration, but this study was not represented with quantitative data. Therefore, this study will analyse whether there is a relationship between vocal intensity and harakat value in Quranic recitation through spectrographic analysis. If there is a proportional connection between those parameters, then this phonetic aspect can be developed as a learning method for control of pronunciation duration in Quranic recitation without any assistive medium such as movement of finger or any instrument.

2. METHOD

In this study, the recitations were analyse through Praat, a software used in acoustics analysis of speech (Version 5.3.56; Boersma dan Weenink, 2013). Data were analysed in quantitative approach through statistical test on difference between vocal intensity of vowel phoneme for two-*harakat* syllable and one-*harakat* syllable. According to *tajwid*, two-*harakat* syllable has longer duration compared to one-*harakat* syllable. Samples were selected through purposive sampling method, where the samples were chosen according to certain criteria that fulfill the objectives of study (Kothari and Garg, 2014). In this study, a number of 31 famous reciters with accurate Quranic recitation were chosen as subjects to complete the need of statistical test for normal distribution as the findings in this study will represent the population (Kothari dan Garg, 2014).

For each reciter, recitation from two sample verses from *surah al-Fatihah* were taken in form of mp3 file. This *surah* was selected as it is a compulsory surah to be recited during prayer and the need to recite it accurately is obligatory. Two samples were enough to build a foundation for a new method of syllable duration control as for each samples, 31 reciters were analysed that will show uniformity among Quran reciters even though they were scattered around the world, and at the same time reveals the miracles of al-Quran in aspect of uniformity. Sample verses from the *surah* and their compositions according to study are as in Figure 1 and 2. All compositions consist of the same vowel type which is of *fathah* diacritic.

Figure 1

Second verse of surah al-Fatihah

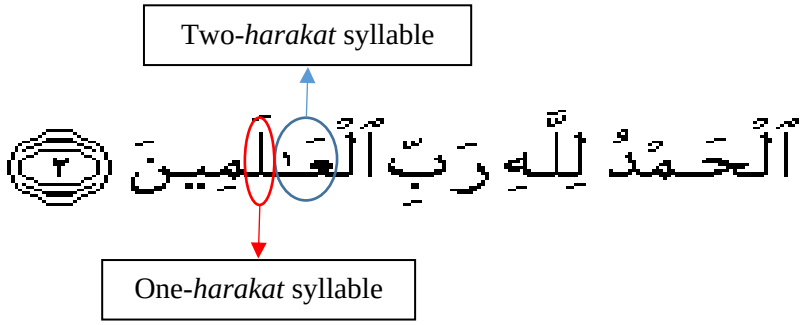
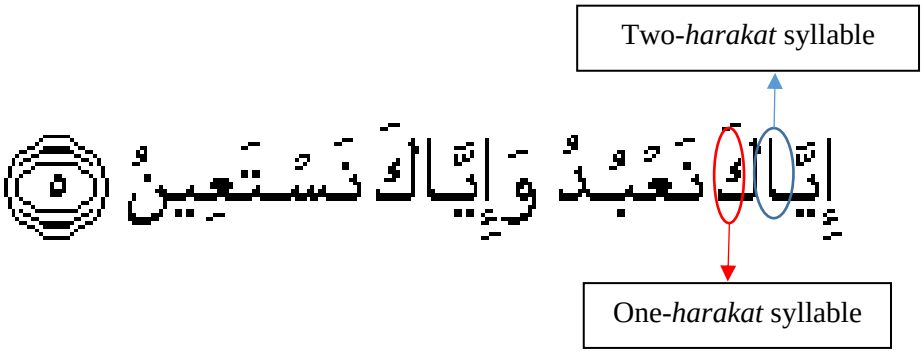


Figure 2

Fifth verse of surah al-Fatihah



Next, analysis of each recitation was done through spectrogram application in Praat software (Version 6.4.25; Boersma and Weenink, 2024) which was displayed according to settings of dynamic range of 50 Decible, window length of 0.025 second and view range of 0-5000 Hertz based on study by Styler (2017) to ease recognition of vowel formant pattern. This visual evaluation was facilitated by audio assessment to improve recognition accuracy (Newman dan Verhoeven, 2002). Then for each verse sample, average vocal intensity in decibel (dB) unit along vowel formant pattern between two-harakat syllable and one-harakat syllable was compared through paired T-test using Microsoft Excel software version 16.0.18324.20194. The hypotheses of this test for both verse sample were modified from Kothari dan Garg (2014) as follows:

$H_{0:}$ There is no difference between average of vocal intensity for two-*harakat* syllable and average of vocal intensity for one-*harakat* syllable

H_1: Average of vocal intensity for two-*harakat* syllable is higher than average of vocal intensity for one-*harakat* syllable

The α value for this test was set at 0.05. The results of this test were discussed whether to accept or reject the null hypothesis. From the hypothesis, it can be concluded whether vocal intensity can be implemented as a method for duration control in Quranic recitation or not.

3. RESULTS

This study gained several findings which were from aspect of spectrographic display observation, vocal intensity values for one-*harakat* and two-*harakat* syllable and statistical analysis on difference of vocal intensity between one-*harakat* and two-*harakat* syllable.

Examples of spectrographic analysis performed were as in Figure 3, Figure 4, Figure 5 and Figure 6. These figures represent Muhammad Ayyub's recitations, one of the reciter chosen as subject in this study.

Figure 3

Vocal intensity analysis through spectrogram for one-harakat syllable in second verse of surah al-Fatihah

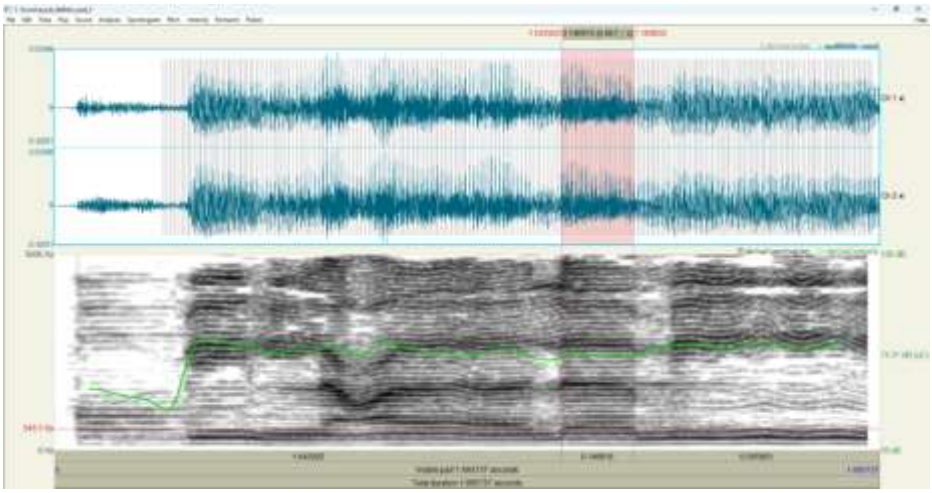


Figure 4

Vocal intensity analysis through spectrogram for two-harakat syllable in second verse of surah al-Fatihah

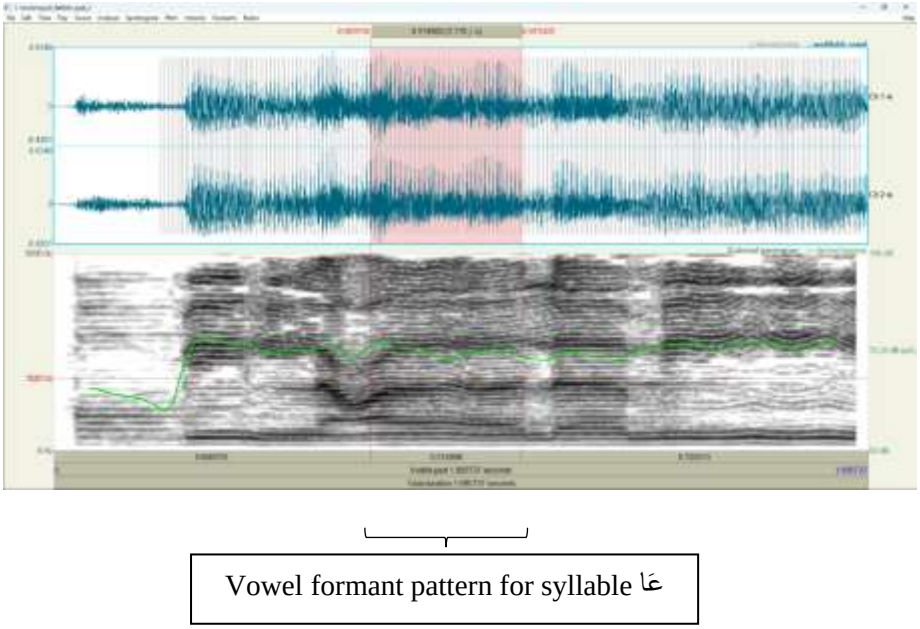


Figure 5

Vocal intensity analysis through spectrogram for one-harakat syllable in fifth verse of surah al-Fatihah

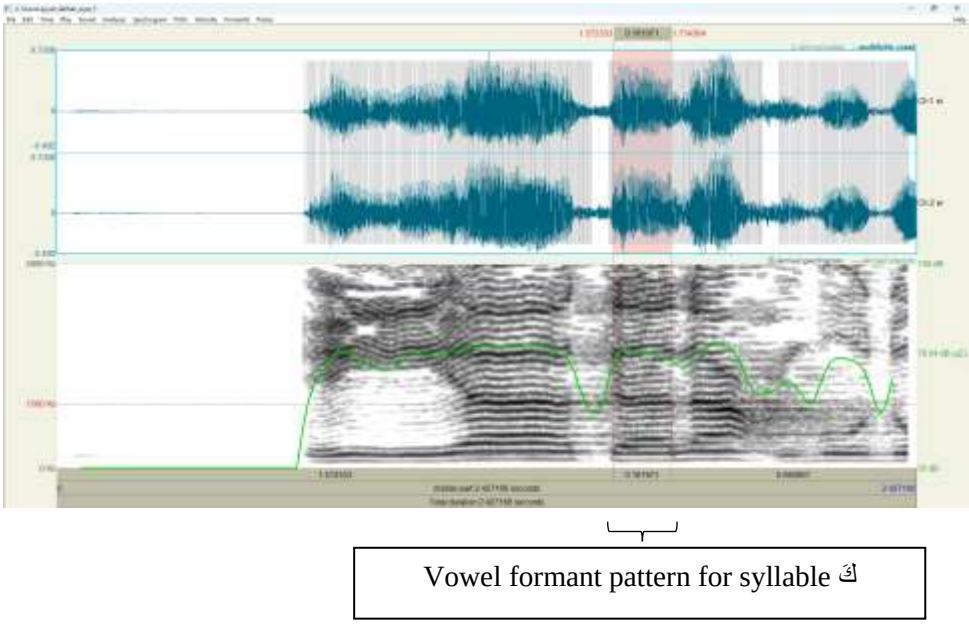
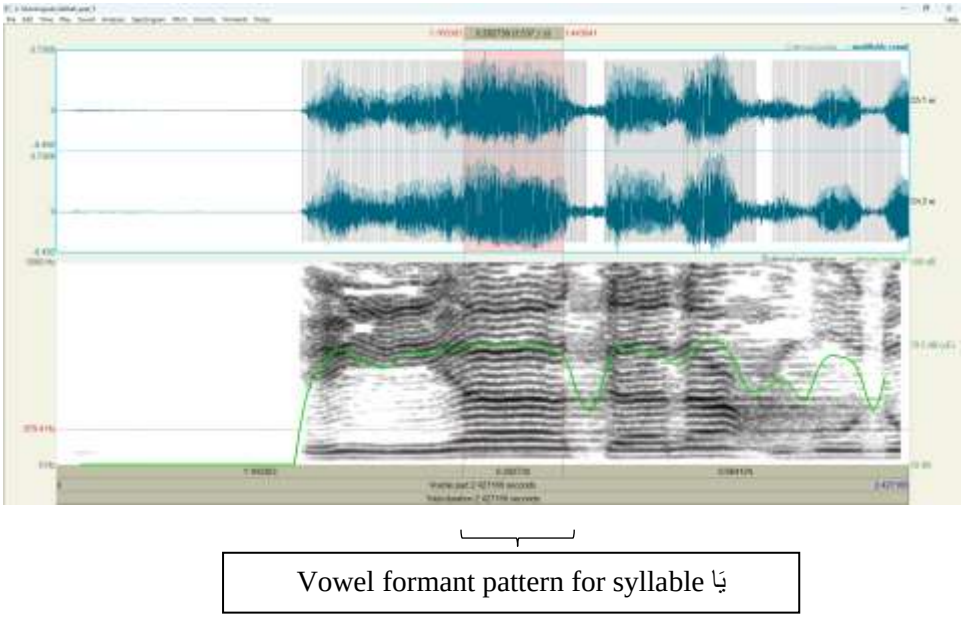


Figure 6

Vocal intensity analysis through spectrogram for two-harakat syllable in fifth verse of surah al-Fatihah



Green horizontal line in Figure 3, Figure 4, Figure 5 and Figure 6 shows level of vocal intensity across timeline. Average vocal intensity value along vowel formant pattern for studied syllable was dictated. After vocal intensity analysis through spectrogram and paired T-test were performed, the following data and test results were observed. Data in Table 1 visualises value of observed vocal intensity for one-*harakat* and two-*harakat* syllable in second verse of *surah al-Fatihah*.

Table 1

Vocal intensity for second verse of surah al-Fatihah

RECITER	**VOCAL INTENSITY FOR TWO-*HARAKAT* SYLLABLE (عَا) (unit dB)**	**VOCAL INTENSITY FOR ONE-*HARAKAT* SYLLABLE (لَ) (unit dB)**
Faris ʻAbbad	82.103	78.131
Idris Abkar	71.625	68.195
ʻAli Al-ʻAjmi	77.375	75.889
Ibrahim Al-Akhdar	79.064	79.301
Muhammad Ayyub	75.077	74.311
Bandar Balila	76.546	74.207
Mahmud ʻAli al-Banna	76.868	76.008
ʻAbdullah Basfar	75.090	73.152
ʻAbd al-Basit	76.233	73.942
Musa Bilal	76.932	77.714
Salah al-Budayr	73.924	73.386
Salah Bukhatir	71.872	68.361
Yasir al-Dusari	77.413	76.398
Ibrahim al-Jarami	79.571	79.308
Muhammad Jibril	73.698	70.730
ʻAbdullah ʻAwad al-Juhani	75.391	76.096
ʻAdil al-Kalbani	72.688	70.473
Muhammad al-Luhaydan	72.537	70.520
Misyari al-ʻAfasi	80.371	78.787
Mahir al-Muʻayqali	74.685	72.772
Raghib Mustafa Ghalwasy	72.255	66.877
Ahmad Nuʻayna‘	72.283	67.704

Khalid al-Qahtani	79.244	78.351
Nasir al-Qatami	77.081	76.071
Hani al-Rifa'i	74.580	70.339
Tawfiq al-Sayigh	76.421	75.201
Abu Bakr al-Syatari	74.527	72.584
'Abd al-Rahman al-Sudays	76.471	75.420
Ayman Suwayd	77.871	74.653
Muhammad al-Tablawi	74.454	71.852
'Abd al-Wali al-Arkani	81.206	79.397
AVERAGE	**75.982**	**74.069**

Data in Table 1 were analysed through paired T-test to test H_0 hypothesis. The test results are as in Table 2.

Table 2

Results of paired T-test for second verse of surah al-Fatihah

	VOCAL INTENSITY FOR TWO-*HARAKAT* SYLLABLE (عَا) (unit dB)	**VOCAL INTENSITY FOR ONE-*HARAKAT* SYLLABLE (لَ) (unit dB)**
Average	75.982	74.069
Observation	31	31
Hypothesised average difference	0	
t value	7.114	
P(T<=t) one-tailed	3.26×10^{-8}	
Critical t value one-tailed	1.697	

Based on Table 2, average of vocal intensity in second verse of al-Fatihah for two-harakat syllable was higher than one-harakat syllable which was 75.982 > 74.069. T value observed was higher than critical t value which was 7.114 > 1.697, and P value obtained was smaller than α which was $3.26 \times 10^{-8} > 0.05$ indicating that there was a significant difference between average vocal intensity of two-harakat syllable and one-harakat syllable, and not zero difference as hypothesised in H_0. Therefore, H_0 in this test is rejected and H_1 is accepted. This means that the vocal

intensity for two-*harakat* syllable is proved statistically that it is significantly higher than vocal intensity for one-*harakat* syllable in recitations of sample verse by all reciters.

Next, data in Table 3 visualises voal intensity value obtained for one-*harakat* syllable and two-*harakat* syllable in fifth verse of *surah al-Fatihah*.

Table 3

Vocal intensity for fifth verse of surah al-Fatihah

RECITER	**VOCAL INTENSITY FOR TWO-*HARAKAT* SYLLABLE (يَا) (unit dB)**	**VOCAL INTENSITY FOR ONE-*HARAKAT* SYLLABLE (كَ) (unit dB)**
Faris ʻAbbad	80.415	76.862
Idris Abkar	72.522	70.815
ʻAli Al-ʻAjmi	75.326	75.916
Ibrahim Al-Akhdar	79.670	79.308
Muhammad Ayyub	79.492	78.102
Bandar Balila	77.381	77.076
Mahmud ʻAli al-Banna	78.532	76.152
ʻAbdullah Basfar	79.677	77.950
ʻAbd al-Basit	74.547	73.286
Musa Bilal	80.126	77.581
Salah al-Budayr	75.589	75.262
Salah Bukhatir	73.540	72.600
Yasir al-Dusari	77.295	76.781
Ibrahim al-Jarami	79.902	79.670
Muhammad Jibril	75.428	74.718
ʻAbdullah ʻAwad al-Juhani	74.079	74.990
ʻAdil al-Kalbani	76.811	67.386
Muhammad al-Luhaydan	75.142	71.245
Misyari al-ʻAfasi	78.459	78.614
Mahir al-Muʻayqali	76.609	68.502
Raghib Mustafa Ghalwasy	77.534	75.227
Ahmad Nuʻayna‘	76.026	74.460
Khalid al-Qahtani	78.939	78.842

Nasir al-Qatami	78.095	75.958
Hani al-Rifa'i	71.714	69.515
Tawfiq al-Sayigh	78.566	75.496
Abu Bakr al-Syatari	70.305	70.040
'Abd al-Rahman al-Sudays	79.902	80.438
Ayman Suwayd	78.470	75.515
Muhammad al-Tablawi	73.580	72.984
'Abd al-Wali al-Arkani	79.547	78.268
AVERAGE	**76.878**	**75.147**

Data in Table 3 were analysed through paired T-test to test H_0 hypothesis. The test results are as in Table 4.

Table 4

Results of paired T-test for fifth verse of surah al-Fatihah

	VOCAL INTENSITY FOR TWO-*HARAKAT* SYLLABLE (يَا) (unit dB)	**VOCAL INTENSITY FOR ONE-*HARAKAT* SYLLABLE (كَ) (unit dB)**
Average	76.878	75.147
Observation	31	31
Hypothesised average difference	0	
t value	4.282	
P(T<=t) one-tailed	8.75×10^{-5}	
Critical t value one-tailed	1.697	

Based on Table 4, average of vocal intensity for fifth verse of al-Fatihah for two-harakat syllable was higher than one-harakat syllable which was 76.878 > 75.147. T value observed was higher than critical t value which was 4.282 > 1.697, and P value obtained was smaller than α which was $8.75 \times 10^{-5} < 0.05$ indicating that there was a significant difference between average vocal intensity of two-harakat syllable and one-harakat syllable, and not zero difference as hypothesised in H_0. Therefore, H_0 in this test is rejected and H_1 is accepted.

4. DISCUSSION

Quantitative findings showed that there was a significant difference between average vocal intensity of two-harakat syllable and one-harakat syllable in second verse of *surah al-Fatihah*. This points that vocal intensity is higher in longer syllable pronunciation for second verse of *surah al-Fatihah*. This different vocal intensity influences syllable pronunciation duration in Quranic recitation.

Quantitative findings also showed that there was a significant difference between average vocal intensity of two-harakat syllable and one-harakat syllable in fifth verse of surah al-Fatihah. This indicates that vocal intensity is higher in longer syllable pronunciation for fifth verse also. Therefore, quantitative analysis on the two verses indicated significant difference in vocal intensity between one-harakat syllable and two-harakat syllable.

From other aspect, it is noted that even the recitations were by different reciters from all around the world, comprising of different geographical origins and different dialects, the result still shows consistency of the relationship between voice intensity and duration in Quranic syllable pronunciation. It also suggests that the reciters would utilise vocal intensity as a method to control syllable duration. Sample size of 31 reciters fulfills the statistical need of achieving a normal distribution in which the result would be able to represent the whole population of Quran reciters.

Based on findings from both verses, vocal intensity for two-harakat syllable is higher than vocal intensity for one-harakat syllable, in alignment with higher duration for two-harakat syllable compared to one-harakat syllable. These findings supported the studies by Fry (1954), Shen (1993) and Akbar et al. (2024) where vocal intensity correlates to duration and opposed to Yost (2007) and Koffi (2021) which denied the relationship between intensity and duration. However, the difference in the results arises from the research subject context. In this sense, different languages studied in each study would have different attribute regarding intensity-duration correlation. Moreover, this study also refutes that the intensity-duration correlation only works in 90 dB intensity (Koffi, 2020), as all the intensity data in the researcher's study fell between 66-83 dB, yet intensity still correlated to duration. In the researcher's study, the relationship between intensity and duration has been established where the two parameters were shown to correlate in Quranic recitation through analysis performed.

Besides that, this study also acknowledges a need mentioned by Mohamed Razali et al. (2021) which is a self-method that can assist students in doing exercise before meeting the teacher for assessment session. By understanding that vocal intensity is a method of duration control, the student will practise Quranic recitation by focusing on vocal intensity to obey the duration rule, despite just mere numerical information from harakat values as some student might not be able to achieve accurate duration just by numerical values. This study also provides an alternative to problem of lacking in effective method for *tajwid* learning as stated by Maratigor (2010) and Miyarsi (2015), Mohamed Razali et al. (2021), Hanapi et al. (2022) and also Ghazali and Razak (2023) to improve *tajwid* skills among students. As there are many already available methods in *tajwid* learning, and rate of error in Quranic recitation are still high (Mohamed Razali et al., 2021; Hanapi et al., 2022; Ghazali and Razak, 2023), these method provides an alternative to present methods as an added value in teaching and learning process. And the discovery of this method answers the call by Mohamad Salleh et al. (2024) who suggested that alternative methods should be implemented in teaching process of al-Quran to motivate students to learn al-Quran.

The findings from these two verses serve as a guideline that can be applied to other verses in al-Quran, where vocal intensity can be manipulated in controlling the duration of syllable. In simple words, a person may use vocal intensity to control whether a syllable should be short or long during recitation based on *tajwid*. Moreover, the two verses used were from surah al-Fatihah, a surah frequently recited in daily prayer, which will serve as a daily practise to implement the method in achieving accurate Quranic recitation, while at the same time preserving its meaning. Eventhough this study only examined two verses as sample, it serves as a foundation for the concept of relationship between vocal intensity and duration in Quranic recitation. Furthermore, deeper studies should be performed in future researches to complement the information on the relationship between these two parameters for other verses in al-Quran.

5. CONCLUSION

Maintaining pronunciation duration (*tashkīl*) in reciting the Qur'an is fundamental to ensuring compliance with established tajwid rules and maintaining semantic accuracy. In response to limitations in existing tajwid

learning approaches, particularly those related to harakat realization, this study analyzes the relationship between vocal intensity and syllable duration across various harakat values. The results show a clear and consistent relationship between these two acoustic parameters, where syllables with higher harakat values are characterized by higher vocal intensity accompanied by longer articulation duration.

These findings provide empirical support for incorporating vocal intensity as a complementary acoustic indicator in harakat teaching, in addition to temporal measurements. By integrating intensity-based feedback, learners can achieve greater precision in harakat production while maintaining lexical meaning. From a phonetic perspective, these results contribute to the acoustic modeling of Quranic recitation by highlighting intensity-duration interactions as a systematic feature in harakat realization. Practically, this approach also has the potential to help teachers and learners identify articulation errors more objectively, especially in the case of short-long sound differences that are often difficult to detect by ear alone. In addition, the use of acoustic parameters allows for a more standardized and measurable evaluation of recitation. This opens up opportunities for the development of data-based tajwid assessment instruments that can complement conventional assessments.

Furthermore, these findings open up opportunities for the development of technology-based tajwid learning tools, such as visual or auditory feedback systems that utilize intensity and duration parameters simultaneously. Such an approach has the potential to help learners internalize the differences in harakat values more objectively, not only through auditory perception but also through measurable acoustic representations. On a theoretical level, the results of this study enrich the study of religious phonetics by showing that the recitation of the Qur'an has a structured acoustic pattern that can be modeled scientifically, thereby bridging the gap between classical tajwid tradition and modern phonetic approaches.

This study is limited to specific types of harakat and specific samples of the Qur'an. Future research is recommended to expand the scope by including additional harakat categories, broader phonological contexts, and verses from different surahs. Further investigation involving a larger population of speakers and advanced acoustic analysis techniques is also recommended to improve the generalization of findings and deepen understanding of vocal intensity patterns

in Qur'anic phonetics, thereby supporting more accurate and objective recitation practices.

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