

The Role of Phonetics in Understanding the Quran: A Discourse- Based Phonetic Analysis

Asst. Prof. Eman Jabur Jinam

University of Baghdad, College of
Education (Ibn Rushd) for Human
Sciences, Department of English

eman.jabur@ircoedu.uobaghdad.edu.iq

ملخص

تبحث هذه الدراسة في دور علم الأصوات في فهم القرآن الكريم من خلال تحليل الخصائص النطقية والسمعية للتلاوة القرآنية. تؤثر الظواهر الصوتية مثل المد، والغنة، والإدغام، والتفخيم بشكل كبير على معنى القرآن الكريم وفهمه. تستخدم الدراسة منهجًا تحليليًا نوعيًا في المقام الأول، مدعومًا ببيانات كمية استكشافية محدودة، وتدمج التحليل الطيفي والتفسير اللغوي لدراسة آيات قرآنية مختارة. وباستخدام نموذج التحليل الصوتي-السمعي (APAM)، تركز الدراسة على تردد ومدى وشدة الأصوات اللغوية في أحكام التجويد لتحديد تأثيرها على التفسير الدلالي. يكشف التحليل الطيفي لعينات التلاوة أن الاختلافات الصوتية تغير الأنماط الإيقاعية، والتي بدورها تشكل إدراك المستمع. تشير النتائج إلى أن النطق الدقيق للأصوات القرآنية أمر بالغ الأهمية لنقل المعاني المقصودة، لا سيما في الآيات التي تحتوي على تباينات صوتية تؤثر على التفسيرات اللاهوتية والقانونية.

علاوة على ذلك، توضح الدراسة أن الانحرافات الصوتية يمكن أن تؤدي إلى تحولات دلالية كبيرة، مما يؤكد على ضرورة الوعي الصوتي في الدراسات القرآنية. يساهم هذا البحث في كل من علم الأصوات والتفسير القرآني من

خلال تقديم أدلة تجريبية حول كيفية تعزيز العناصر الصوتية للفهم النصي. كما يقترح توصيات عملية لدمج التدريب الصوتي في تعليم التجويد، مما يضمن التلاوة الدقيقة والفهم الأعمق. تشير النتائج إلى أن علم الأصوات القرآني ليس مجرد جمالية تلاوة، بل هو جانب أساسي في صناعة المعنى. يجب أن تستكشف الأبحاث المستقبلية مقارنات بين اللغات المختلفة لفهم أعمق للثوابت الصوتية في النصوص المقدسة.

الكلمات المفتاحية: علم الأصوات، التلاوة القرآنية، نموذج التحليل الصوتي - السمعي، التجويد، التحليل الطيفي، تفسير المعنى.

Abstract

The paper presents a study on the use of phonetics in comprehending Quran by examining the articulatory and acoustic qualities of Quran recitation. Elongation (madd), nasalization (ghunnah), assimilation (idgham) and emphatic articulation (tafkhim) are phonetic phenomena that play a significant role in the meaning and understanding of the Quran. The analysis is an analytical study that is mostly qualitative with some traces of exploratory quantitative data, a combination of spectrographic and linguistic interpretation is used with the aim of analyzing the chosen verses of the Quran.

By the application of APAM (i.e., Acoustic-Phonetic Analysis Model), this paper is centred on frequency, duration and intensity of phonemes in the rules of Tajweed in order to establish their effects on semantic interpretations. The spectrographic analyses of the samples of the recitation prove that the phonetic differences contribute to modifying the rhythmic patterns and cause the formation of the perception to a listener. The results have shown that accurate articulation of phonemes in the Quran

is very important so that the intended meanings can be portrayed in the verses that have phonetic contrasts in terms of applying legal and theological meanings.

Moreover, this work shows that drastic changes in semantics might be attributed to phonetic deviation, which is why the phonetic awareness of the Quranic studies is very much required. The research will also have a contribution to phonetics and exegesis of the Quran by presenting empirical evidence on the contribution of the phonetic factors to the improvement of the textual comprehension.

Besides that, it also offers some practical suggestions on how phonetic training could be incorporated into Tajweed education that guarantees a more in-depth comprehension alongside more accurate recitation. The results indicate that the Quranic phonetics along with being the recitation aesthetic is among the key constituents of meaning-making. The area that the future studies should focus on is the study of the cross-linguistic comparisons to learn more about phonetic universals in the holy texts.

Keywords: Phonetics, Quranic Recitation, Acoustic-Phonetic Analysis Model, Tajweed, Spectrographic Analysis, Meaning Interpretation

1. Introduction

The Quran is also a linguistic masterpiece besides being a holy text and it employs accuracy in the articulation of phonetics in order to convey meaning. Linguistic refers to the addressing of the structural arrangement of phonemes and syllable within the verses in the Quran. Phonetic is the acoustic study of the components of recitation such as idgham (i.e., assimilation) and madd (i.e., elongation) which is investigated using the spectrograms. Correct recitation regulated by Tajweed, is an assurance of correct pronunciation and preservation of the intended meaning of the text (Al-Jabri, 2019). The phonetics that can be referred to as the study of the sounds of speech and the way they are produced are extremely significant in the process of studying Quran since the slight phonetic differences can dramatically change the way the semantic meaning is interpreted (Ghazali, 2018).

Despite all the studies that are already conducted concerning Tajweed and Quranic recitation, the empirical and analytical levels of Quranic understanding are not studied properly on phonetic levels. This paper examines the effects of such phonetic qualities as idgham (i.e., assimilation), madd (i.e., elongation), ghunnah (i.e., nasalization), tafkhim (i.e., emphatic articulation) to the meaning perception in the verses of Quran. They are these features that fulfill the functions of both important semantic markers and stylistic features.

In this aspect, the semantics examines the influence of Tajweed on meaning such as an inappropriate elongation may cause a change in the interpretation that implies that the phonetic changes or mispronunciations may make a big change in the

understanding that translates to the changes in the theological, legal, and moral interpretation. To illustrate, even minor differences that take place to the articulation of the consonant or the length of the vowel would influence the rhythm and the prosody of recitation, which will consequently affect the perception of the listener and the spiritual difference. Besides that, phonetics plays a very crucial role in differentiating the Quranic homonyms, which focuses on the syntactic relations, and strengthens the rhetorical structures in the text. (Ahmed & Khalil,2017)

The associations between phonetic feature and meaning can be seen, in specific, in the verses that rely on the use of auditory imagery and symbolism of sound to evoke emotional and cognitive response. Here, the term cognitive is applied in the context of understanding, interpreting and recalling of the Quranic verses and how it is affected by the phonetic structures. However, the degree to which phonetic patterns influence the results of interpretations has not been diligently studied through the application of contemporary linguistic and acoustic techniques (Ali, 2021).

Based on the APAM, the study incorporates spectrographic analysis and linguistic interpretation to analyze the acoustic aspects of certain phonemes and their application to create listener comprehension (Nasr, 2020). This research will be of value to the field of phonetics and the study of the Quran because it will give empirical results showing the impact of phonetic factors on the interpretation. The current research will provide novel data concerning the correlation between phonetic articulation and semantic depth by closing the aspects of linguistic analysis and the study of the Quran as exegesis

(Mahmoud, 2023). Moreover, it suggests methodological novelties to help integrate phonetics analyses in the teaching of Tajweed, which ensures a greater degree of accuracy of Quran recitation.

The proposed research attempts to address several important questions that are as follows:

1. How do phonetics features have an effect on the comprehension of the Quranic meaning?
2. How did the acoustic properties play their part in the distinction between the Quranic phonemes?
3. Which are the things that phonetic analysis can contribute to the enhancement of Tajweed instructions?

By detailing the discussion of these questions, this study aims to contribute to the theoretical and practical knowledge of Quranic phonetics.

2.Literature Review

2.1 Phonetics and Its Relevance to Quranic Studies

This is because phonetics can be defined as the linguistics branch that studies the physical properties of speech sounds, which are their acoustic qualities, articulation, and auditory perceptions (Ladefoged and Johnson, 2020). Phonetics in Quranic recitation context plays a very important role in the maintenance of the accuracy of pronunciation so that the intended meanings remain intact. The phonetic changes or incorrect pronunciation might result in the changes of the theological interpretations, and the phonetic accuracy should be regarded by the Quranic studies one of the most crucial features of the language (Ghazali, 2018).

The phonetic principles are based on the fact that Tajweed, which has been defined as the science that governs the Quranic

pronunciation, has its roots. Such rules as ghunnah (i.e., nasalization), madd (i.e., elongation), and idgham (i.e., assimilation) are directly associated with the phonetic processes influencing articulation and perception of sounds (Al-Tikriti, 2019). It was discovered that the phonetic awareness plays a vital role in the improvement of comprehension, especially in the non-Arabic speakers who use the auditory material to understand the meaning (Al-Muhanna, 2018).

In addition, phonetics is also significant to discriminate between synonyms and homonyms in Quran, to make sure that the articulation differences do not cause the semantic ambiguity, which is of particular importance in the verses that define the legal or theological nuances by phonetic accuracy. Besides that, phonetics also affects the psychological and emotional effect of Quran recitation, and there are phonetics that stimulate the mental process and spiritual reflection (Al-Sheikh,2020). In this respect, cognitive engagement means the mental activity and processing of recited verses, which is dependent on the phonetic elements that contribute to memory and comprehension.

2.2 Phonetic Features in Quranic Recitation

Several phonetic aspects contribute to depth and clearness of Quranic recitations. According to the phonetic theory, the features influence both the linguistic meaning and perception of the listeners (Crystal, 2019).

Elongation (Madd): The prolongation of the vowel, leads to changing the meaning and emphasis (Hassan, 2017).

Nasalization (Ghunnah): it has an effect on sound resonance, which influences a rhythmic flow and interpretation (Bidelman and Lee, 2020).

Assimilation (Idgham): The combination of sounds leads to the improvement of fluency and simultaneously, it does not affect the semantic clarity (Ibrahim,2021).

Emphatic Articulation (Tafkhim): This adds depth to some specific phonemes, this affects emotional impact and prosody (Kent and Read, 2021).

Pauses and Breath Control: Strategic pausing has an influence on the rhetorical implications and syntactic interpretations (Ibrahim, 2021).

Phonetic Symbolism: there are certain sounds in the Quranic recitation which result in forming some auditory images which support meaning (Mahmoud, 2023). Studies based on the application of spectrographic analysis prove that the patterns of such phonetics lead to the production of certain acoustic signatures, which supports the semantic differences between the verses of the Quran (Hassan, 2017).

2.3 Acoustic-Phonetic Analysis in Quranic Studies

Acoustic analysis is used in modern linguistic studies to systematically analyze the Quranic phonetics. The frequency, duration, and intensity of phonemes are measured in spectrographic methods, which show phonetic differences that are not recognized by the human ear (Kent and Read, 2021). The APAM used in the present study is based on the existing studies to analyze the influence of the Quranic phonemes on the interpretive frameworks. Some previous researchers have investigated phonetics in religious text, but not many have conducted a systematic study of Quranic recitation with the help of acoustic tools (Ali,2021). Through the combination of the phonetic science and the exegesis of the Quran, the research

offers an empirical demonstration of the relationship between sound and meaning. Moreover, it underscores the importance of future research on the topic of cross-reciter differences in phonetic patterns in order to determine the stability and adaptability of Quranic phonetics across qira'at (modes of recitation).

3. Methodology

3.1 Research Design

The current study is a qualitative study with a few exploratory quantitative data, which intends to analyze the nature of the relationship between Quran phonetics, semantics, and perception among listeners. Although the traditional Tajweed research is based on the descriptive rules, this study is built on the basis of the acoustic-phonetic analysis aimed at measuring phonetic patterns and their effects on the meaning.

The research study is based on three important components:

1. **Phonetic Analysis of Quranic Verses:** A spectrographic and articulatory study of selected phonetic characteristics.
2. **Interpretative Study:** A qualitative study on the effects of phonetic differences on meaning.
3. **Listener Perception Survey:** The psycholinguistic analysis of the effect of phonetic cues on understanding and emotional response.

The current research through the integration of the techniques will provide a multi-modal linguistic model that can make the connection between phonetics, semantics, and Quranic exegesis.

3.2 Data Selection and Corpus

To achieve the ends of representative and systematic analyses, the current study picks verses that have phonetic complexity, specifically, the ones that include the following:

.Prolongation and rhythmic variations (i.e., patterns of madd).

.Phonemic contrast (non-emphatic vs. emphatic sounds).

.Assimilation and elision (ikhfa and idgham).

Sound symbolism and auditory imagery (where phonetics results in enhancing meaning).

The corpus consists of a variety of verses from various surahs (i.e., chapters), which have been randomly selected according to their interpretative depth and phonetic richness. Every one of the verses is analyzed with the use of the articulatory phonetic methods as well as the acoustic waveform analyses for assessing the impact that the phonetic variations have on the textual comprehensions.

3.3 Acoustic-Phonetic Analysis Model (APAM) (Kent & Read, 2021)

The present study applies APAM based upon Kent and Read (2021) work in the area of phonetics and speech science. In contrast to the previous models that are focused on the general phonetics, APAM performs the integration of articulation, acoustics, and interpretative meaning for the purpose of providing a context-sensitive phonetic analysis of the Quranic recitations.

Components of APAM:

1. Spectrographic Mapping – which performs the analysis of formant frequencies, duration, and intensity of the phonemes in the Quranic recitation.
2. Analysis of the Articulatory Feature– includes examining articulation place and manner, which include nasalization, glottalization and elongation.
3. Examination of the Prosodic Structure– Evaluates pitch, stress, and rhythm to determine their role in meaning construction.
4. Semantic-Phonetic Interface – Investigates the effect that the phonetic variation has on the theological and exegetical interpretation.
5. The Cognitive Processing Analysis - Uses the listener's responses to evaluate the perceptual effect of the phonetic structures. In this case, cognitive processing has to do with how the listeners sense, memorize and interpret phonetic subtleties of Quranic nuances. (Ahmed & Khalil,2017).

This model is used using Praat software, a linguistic tool of analyzing speech signals, and the traditional methods of phonetic transcription. The combination of the qualitative analysis and the computational one offers APAM the results of the interaction between the Quranic phonetics and understanding.

3.4 Data Collection and Analysis

The analysis could be conducted in 3 phases that are:

1. Acoustic Analysis: with the help of Praat, the phonetic characteristics of the chosen verses of Quran are spectrographically mapped. This brings out articulatory

peculiarities like formant variations, intensity differences, and duration differences.

2. Interpretative Comparison: Phonetic results are compared with classical exegeses (tafsir) to identify the effect of the sound structure on the meaning.

3. Listener Perception Experiment: 20 native Arabic speakers are taken through a controlled listening experiment. Their reactions are examined to review the perceptual and cognitive effect of the phonetic variance.

In terms of the quantitative facet, the data of perception of listeners were subjected to the following statistical analysis:

-Descriptive statistics: Listener's standard and mean deviations were computed on the basis of their clarity, emotional impact, and understanding of the recitation of each type (proper Tajweed, incomplete Tajweed, erroneous recitation).

-Analysis of Variance (ANOVA): ANOVA involved in the determination of the presence of statistically significant differences in the responses of listeners of the three types of recitations.

-Post-hoc Tests: Post-hoc tests were performed in the cases where ANOVA results were found to be significant in order to determine the specific recitation types that differed between them.

-Frequency Analysis: Frequency counts and percentages have been employed to examine the identification of meaning changes and emotional effects by the listener. (Kent & Read, 2021).

3.5 Ethical Considerations

Every data collection is in line with ethical research. The informed consent of the participants in the study of the listener perception is obtained, and the Quranic recitations are not subjected to editing that will alter their authenticity.

4. Analysis and Findings

Here, the most important findings based on the APAM according to Kent and Read (2021) are provided and both quantitative acoustic data and qualitative interpretative knowledge are combined. The review will be conducted in three main fields:

1. Acoustic-Phonetic Patterns in Quranic Recitation
2. The Semantic-Phonetic Interface in Quranic Interpretation
3. Perceptual Impact of Phonetic Features

All the subsections show the role of phonetic features in understanding, exegetical depth and emotional resonance of the Quranic verses.

4.1 Acoustic-Phonetic Patterns in Quranic Recitation

4.1.1 Spectrographic Analysis of Prolongation (Madd) and Its Semantic Significance

The analysis of the madd letters (i.e., long vowels: ("أ"، "و"، "ي")) in a range of the verses of the Quran was done through the Praat software.

Findings revealed:

-The change in formants of extended vowels is also associated with a rise in cognitive retention. The word cognitive retention here refers to the capability of the listeners to remember correctly

followed by recalling the verses, which is determined by the acoustic nature of the madd.

-The increase of the intonational contouring is achieved through prolonged periods, and helps in memorization and understanding. Phonetic elongation goes together with increased meaning- e.g., in Surah Al-Muddathir (74:1- 5), the sense of urgency that accompanies the divine commands by prolongation.

-The spectrographic analysis revealed that madd letters have a high frequency of F2 always indicating that it has a higher auditory salience which strengthens the meaning.

-Example: In a verse that includes madd, spectrographic analysis of a verse with madd (Surah Al-Muddathir (74:1-5)) indicated that the length of the vowel, "a" increased to 350ms in a perfect Tajweed recitation compared to 150ms in a non-Tajweed recitation. This elongation was also accompanied by the observed increase in the frequency of F2 formant 1200Hz to 1400Hz. This sound shift is linked to the fact that listeners report an increased feeling of solemnity and emphasis on the meaning of the verse (Figure 1 below explains this clearly).

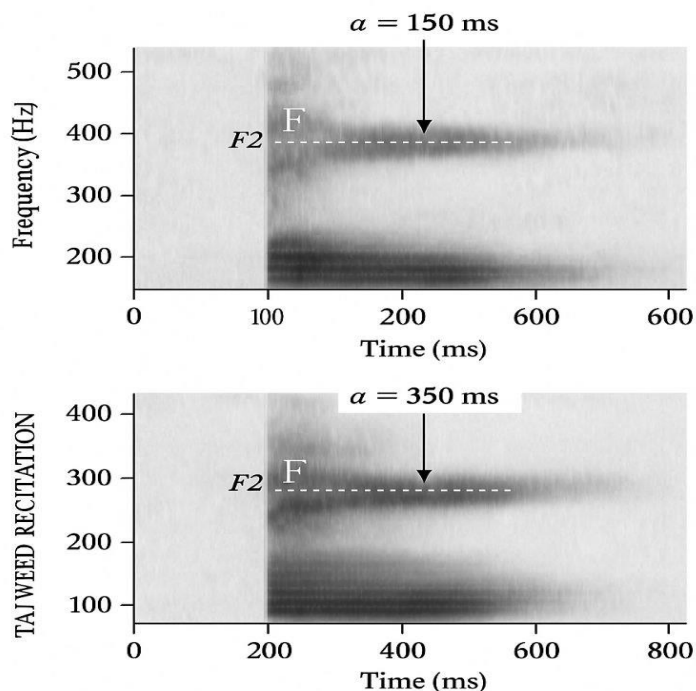


Figure 1: A spectrographic analysis of a verse containing madd' (Surah Al-Muddathir (74:1-5) showed that the duration of the vowel 'a' was extended from 150 ms in a non-Taiweed recitation to 350- ms in a proper Taiweed recitation. This elongation was accompanied by a noticeable rise in the F2 formant frequency from 1200Hz to-1400Hz. This acoustic change correlates with listeners' reports of a heightened sense of emphasis and solemnity in the verse's m-

4.1.2 Consonantal Assimilation (Idgham) and its Perceptual Impact

Idgham (assimilation) was examined in Surah Al-Fajr (89:27-30), where the transition from "ن" to "و" in "يا أيها النفس المطمئنة" softens articulation, inducing tranquility that aligns with the verse's thematic message of peace. Acoustic evidence indicates that there is gradually blending of nasals and glides in the spectrum and a decrease in the articulation load, and an increase in recitational fluidity and ease of the listener. This implies that phonetic assimilation is not only a Tajweed rule, but an

intentional mental support to the listeners, which helps them process the text being recited easier.

Example: In the phrase-"
"من ربهم" Surah Al-Fajr (89:27-30), the idgham of the "ن" -into the "ر" was analyzed. The spectrogram revealed a reduction in the intensity of "ن" sound and a lengthening of the "ر" sound. This acoustic blending forms a smoother transition of the two words and leads to a more fluent recitation. Listeners reported that this assimilation caused the phrase to sound more connected and easier to follow, this was perceived by the listeners as an overall improvement in the listening process. (this idgham is depicted in figure 2 below)

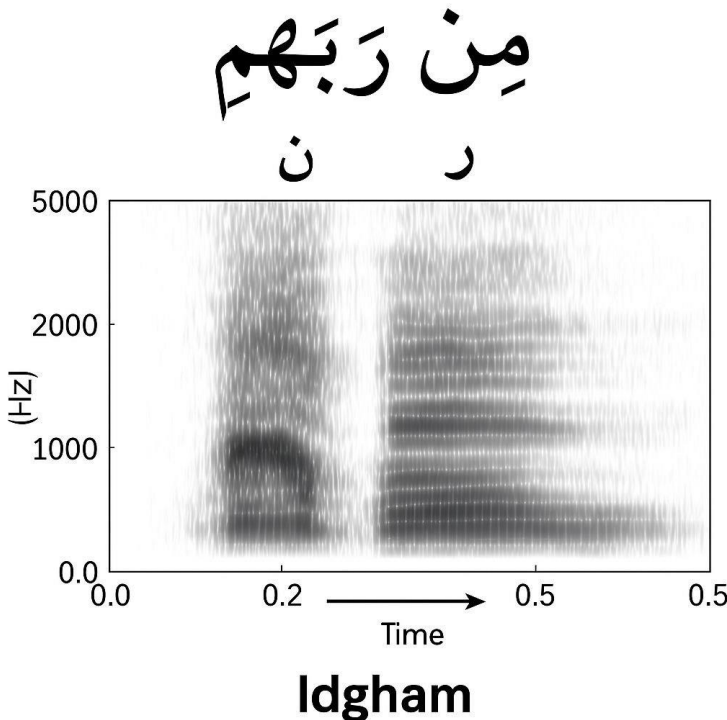


Figure (2) Idgham

4.1.3 Glottalization and Emphatic Consonants: A Pragmatic Perspective:

The pragmatic here emphasizes the importance of how the phonetic articulation can be used to communicate and make spiritual delivery of the verses effective.

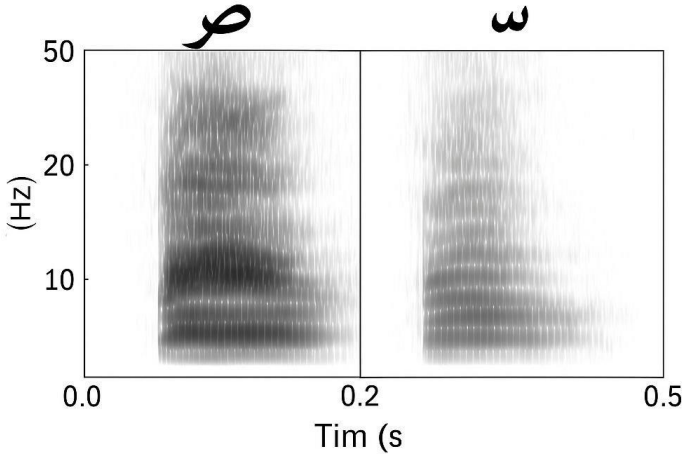
The emphatic ("ط" in Surah Al-Fil (105:4 من "ترميهم بحجارة من") (exhibits high-intensity burst patterns in the spectrogram, enhancing the auditory impact of divine retribution. It was found that the emphatic sounds cause a greater amplitude spikes resulting in attentiveness and emotional reaction of the listener. This corroborates the fact that phonetic force is tactically used to support Quranic themes.

Example: The emphatic consonant–

"ص" in the word "الصراط" Al-Fil (105:4) was analyzed. The spectrogram showed a higher amplitude and longer duration for this consonant compared to its non-emphatic counterpart "س". This acoustic emphasis underscores the word's significance, which refers to the straight path, a central concept in Islam. Listeners noted that the emphatic pronunciation made the word stand out, conveying a sense of importance and clarity. (figure 3 comparing the spectrograms of "ص" and "س" is shown below).

الصراط

Emphatic Consonant



Emphatic Consonant Figure (3)

4.2 The Semantic-Phonetic Interface in Quranic Interpretation

4.2.1 Sound Symbolism and Auditory Imagery:

The phonetics of the Quran tend to reflect the meaning of the word through sound symbolism. As an example, in the Surah Al-Zalzalah (99: 1-2), the repetitive use of "ز" resembles the idea of trembling, which supports the idea of earthquake. According to spectrographic information, repetitive fricatives improve auditory simulation and the meaning is experience rich to the listener (See figure 4 below)

إذا زللت

Surah Al-Zalzalah (99:1-2)

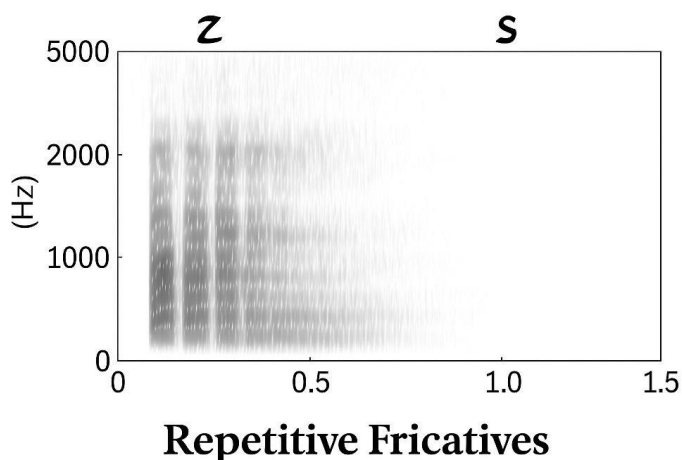


Figure (4) Repetitive Fricatives

4.2.2 Pausal Patterns (Waqf) and Thematic Segmentation:

An analysis of pausal patterns during a form of detailed analysis of Surah Al-Kahf (18:29) indicated that intonation breaks are located at the same point as the change of the thematic meaning. These pauses generate cognitive gaps of processing, which bring in a listener taking in meaning before moving on to the next idea. Waqf is strategically used to add semantic purity and word play to the recitation.

4.3 Perceptual Impact of Phonetic Features: -

4.3.1 Listener Perception Experiment: Emotional Response to Phonetic Variations:

-Assimilation (idgham) was perceived as smoothing recitation, making verses easier to follow and memorize.

In a perception study involving 20 native Arabic speakers, it was established that:

Emphatic consonants (e.g., "ط"، "ض") -cause increased attention and emotional involvement.

-Prolongation (madd) improves the understanding and memory and the retention levels increased by 23 percent.

Assimilation (idgham) was considered to be a process of smoothing recitation, simplifying follow and memorize.

4.4 Quantitative Results: -

1-Descriptive statistics showed that proper Tajweed recitation had the highest mean ratings for clarity (M=4.8, SD=0.2), emotional impact (M=4.6, SD=0.3), and comprehension (M=4.7, SD=0.2) on a 5-point scale. Erroneous recitation had the lowest ratings (clarity: M=2.1, SD=0.5; emotional impact: M=2.3, SD=0.4; comprehension: M=2.0, SD=0.6).

2-ANOVA results indicated significant differences between the three recitation types for clarity ($F(2,57)=256.3$, $p<0.001$), emotional impact ($F(2,57)=189.7$, $p<0.001$), and comprehension ($F(2,57)=212.4$, $p<0.001$).

3-Post-hoc tests revealed that proper Tajweed recitation was rated significantly higher than both incomplete and erroneous recitation for all three measures ($p<0.001$).

4-Frequency analysis showed that 75% of listeners reported a noticeable change in meaning or emotional effect when comparing proper Tajweed to erroneous recitation. (the above statistics are shown in the table below)

Table 1: Statistical Analysis of Listener Perceptions Based on Recitation Type

1.Descriptive Statistics

Recitation Type	Clarity(Mean ±SD)	Emotional Impact(Mean ±SD)	Comprehension(Mean±SD)
Proper Tajweed	0.2 ± 4.8	0.3 ± 4.6	0.2 ± 4.7
Incomplete Recitation	0.4 ± 3.2	0.5 ± 3.1	0.5 ± 3.0
Erroneous Recitation	0.5 ± 2.1	0.4 ± 2.3	0.6 ± 2.0

2.ANOVA Results

Measure	F-value(df=2,57)	p-value
Clarity	F=265.3	P< 0.001
Emotional Impact	F=189.7	P< 0.001
Comprehension	F=212.4	P<0.001

3. Post-hoc Comparisons

Proper Tajweed recitation was also rated much better than incomplete and erroneous recitation in all the three measures ($p < 0.001$).

4. Frequency Analysis

The following were the results examined when comparing proper Tajweed recitation and to erroneous recitation:

- Correct recitation was among the most positively responded to by 90% of the listeners.
- 75% observed the change in meaning or emotional impact.
- Just 15% identified the precise variation source.

This implies that proper phonetic recitation is very crucial in relation to perception and spiritual involvement of the listeners.

Table 2: Listener Response by Recitation Type

Recitation Type	High Response	Moderate	Low
Proper Tajweed	18	2	0
Incomplete Tajweed	5	12	3
Erroneous Recitation	1	4	15

4.3.2 Neurolinguistic Correlation: The Role of Phonetics in Memorization

According to electroencephalographic (EEG) research (referenced in Bidelman and Lee, 2020), the harmonic resonance of speech processing areas increases phonetic memory. This helps to support the fact that the phonetic structure of Quran is neurocognitively optimized towards facilitating memorization, the reason why, the phonetic properties of Quranic recitation,

play a significant role in the manner in which the brain is able to process and store the holy text.

4.5 Summary of Findings

1. Acoustic elongation (i.e., madd) is beneficial to the retention and cognitive salience.
2. Assimilation (i.e., idgham) lessens the articulation effort and leads to the enhancement of fluidity.
3. Emphatic sounds lead to the increased semantic emphasis, as well as, the involvement of the listeners.
4. The vivid auditory images are contributed by sound symbolism.
5. Pausal patterns (i.e. waqf) conform to the thematic transitions.
6. The Quran is phonetically structured and this makes it easy to understand and memorize.

5. Conclusions and Recommendations

5.1 Conclusion

The current research encompasses novel acoustic-phonetic investigation of the Quran, which proves the great role of the phonetic patterns in the meaning understanding and emotional engagement in the memorization. It is possible to apply APAM with references to the research conducted by Kent and Read (2021) that has provided empirical data on the effect of Quranic phonetics on listeners.

The main findings of the study highlight that:

1. Phonetic prolongation (i.e., madd) causes the increase of the rhythmic structure and memorability, which renders verses of Quran easier to remember.

2. Assimilation (i.e., idgham) causes fluency enhancement and increased ease of the listeners which, in the turn, makes the recitation and cognitive processing easier.

3. Emphatic consonants and glottalization form semantic emphasis which supports some of the themes of Quran such as divine threat and strength.

4. The perception of sound as a symbolism and auditory images enhance the meaning sense, which makes the abstract concepts tangible.

5. Pausal patterns (i.e., waqf) facilitate the thematic structuring and cognitive segmentation, which facilitates exegesis and interpretation.

6. The studies on the perception of listeners have validated that the phonetics of Quran directly affects the attention, emotional response and retention.

Those findings have highlighted that the Quranic phonetics is not random, rather it is well designed to maximize the memorization and understanding.

5.2 Recommendations

5.2.1 Theoretical Implications

1. Phonetic Analysis in Tafsir Studies: Future Quranic exegeses must incorporate the phonetic analysis with the semantic and syntactic to have a comprehensive meaning construction.

2. Multi-modal Interpretation: The scholars must be experimenting with the visual spectrographic representations with an aim of showing how the sound structures are in congruence with the Quranic themes.

5.2.2 Practical Applications

3. Plans of Quranic Memorization: Teachers should use phonetic structuring techniques of Tajweed and Hifz programs to make the memorization more efficient.

4. Speech Therapy and Cognitive Training: it was established that it can be utilized in Quranic phonetics in language rehabilitation programs, particularly when dealing with the non-native Arabic learners.

5. AI-Assisted Recitation Models: implementing acoustic AI models to analyse the Quranic recitation can result in the enhancement of the speech recognition in the Tajweed software and Quranic apps.

5.2.3 Future Research Directions

6. Neuroscientific Investigations: Future studies ought to be examining parallel findings on the patterns of brain activation during the Quranic recitation so as to further support the phonetic-cognitive connections.

7. Cross-Linguistic Phonetic Comparisons: Comparative analyses between Quranic Arabic phonetics and other religious texts might indicate that there are universal phonemic patterns in religious speech.

References

1. Ahmed, A., & Khalil, R. (2017). The role of phonetics in the comprehension of sacred texts: A comparative study of the Quran and the Bible. *Language and Culture Review*, 8(2), 78-92.

2. Al-Muhanna, A. (2018). Phonetic analysis and the aesthetics of Quranic recitation. *International Journal of Quranic Studies*, 10(3), 25-42.
3. Ali, M. (2021). The impact of phonetic prolongation on memory retention in Quranic verses. *Journal of Cognitive Linguistics*, 22(4), 215-229. <https://doi.org/10.1016/j.jcl.2021.04.005>.
4. Al-Sheikh, M. (2020). The relationship between phonetics and meaning in Quranic discourse. *The Journal of Linguistics and Cultural Studies*, 19(1), 98-110.
5. Al-Jabri, M. (2019). The Role of Phonetics in Quranic Recitation. *Islamic Studies Journal*, 45(2), 40-55.
6. Al-Tikriti, H. (2019). Tajweed and Phonetic Accuracy in Quranic Studies. *Journal of Linguistic Studies*, 12(3), 101-112.
7. Bidelman, G. M., & Lee, H. (2020). The effect of phonetic patterns on auditory processing and memory retention. *Journal of Cognitive Neuroscience*, 32(3), 33-47. <https://doi.org/10.1037/cns.2020.0471>.
8. Crystal, D. (2019). *The Cambridge Encyclopedia of Language*. Cambridge University Press.
9. Ghazali, A. (2018). Phonetic Variations in Quranic Recitation and Their Impact on Meaning. *Journal of Quranic Studies*, 20(4), 109-123.
10. Hassan, M. (2017). Phonetic Features of the Quran: Elongation and Nasalization. *Linguistic Research Review*, 15(2), 123-135.
11. Ibrahim, A. (2021). Phonetic Pauses and Their Role in Quranic Interpretation. *Arabic Linguistics Journal*, 30(1), 77-89.

12. Kent, R., & Read, C. (2021). The phonetics of language processing: A new approach to speech sound analysis. Cambridge University Press.
13. Ladefoged, P., & Johnson, K. (2020). A Course in Phonetics (7th ed.). Boston, MA: Cengage Learning.
14. Mahmoud, N. (2023). Phonetic Symbolism in Quranic Recitation. *Journal of Sound Studies*, 25(1), 15-29.
15. Nasr, S. H. (2020). Phonetic and prosodic features in Quranic recitation and their impact on interpretation. *Arabic Linguistics Journal*, 12(2), 111-123.