

ARTICULATORY ERRORS IN ARABIC SPEECH SOUNDS AND THEIR CAUSES FROM PHYSIOLOGICAL AND FIRST LANGUAGE BACKGROUND PERSPECTIVES

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Abstract

Background: Articulation errors remain a major challenge for Indonesian learners of Arabic due to differences in speech organ coordination and phonological systems.

Purpose: The usual sections defined in a structured abstract are Background, Purpose, Methods, Results, and Conclusions. This paragraph should not be indented.

Method: A qualitative Systematic Literature Review (SLR) was conducted by analyzing ten national and international journal articles on Arabic phonetics published between 2016 and 2024..

Results: Five error types were identified: substitution, omission, addition, distortion, and vowel duration errors. The most frequent errors involve pharyngeal, uvular, emphatic, and interdental sounds. These errors result from limited articulatory control and L1 phonological interference, which interact through reinforcement and error fossilization.

Conclusion: Arabic pronunciation errors are shaped by physiological and linguistic factors; therefore, pronunciation instruction should integrate makhārij al-ḥurūf training with cross-linguistic phonemic awareness

Keywords: articulation errors, physiological factors, mother tongue, phonological interference, Arabic phonetics.

Introduction

Articulation ability is a fundamental aspect of Arabic language learning, especially for non-native speakers (Hasan et al., 2025). In Indonesia, the pronunciation of Arabic sounds often undergoes distortion due to the influence of the mother tongue's phonological system and limited physiological control of the speech organs. This phenomenon affects the accuracy of meaning delivery and communication comprehension in Arabic language learning across various educational institutions (Zamzamy & Aziz, 2024). Persistent pronunciation errors not only hinder learners' communicative competence but also potentially alter lexical and grammatical meanings in the inflectional language of Arabic (Al-Kaosari, 2025). Therefore, analyzing articulation errors and their causes is essential for understanding the root of phonetic problems among Indonesian learners in a more scientific and applicable manner (Zaid & Putra, 2024).

Previous research has shown that Arabic pronunciation errors by Indonesian learners generally occur in pharyngeal consonants (ع, ح, خ, غ) and interdental consonants (ظ, ذ, ث). Most of these errors stem from differences in sound systems between Arabic and Indonesian, giving rise to phonological interference. Rahmawati (2021) identified that Indonesian learners tend to replace Arabic phonemes that do not exist in Indonesian with the acoustically closest

phonemes, such as replacing ḥā' (ح) with hā' (ه), or dād (ض) with dāl (د) (Rahmawati, 2021). Several studies have also highlighted the role of physiological limitations of articulatory organs such as the tongue, oral cavity, and vocal cords in producing sounds that do not meet Arabic phonetic standards. Wulandari (2019) found that the production of pharyngeal sounds requires complex coordination between pharyngeal muscles and the position of the back of the tongue, which is uncommon in Indonesian (Wulandari, 2019).

However, there is a research gap that requires deeper investigation. First, most previous studies tend to examine articulation errors partially either only from a linguistic perspective (phonological interference) or only from a physiological perspective (speech organ capability) without integrating both perspectives into a coherent analytical framework. Although articulation errors in second language learners are the result of complex interaction between biological and linguistic factors, they cannot be explained by a single perspective alone. Second, prior studies are more descriptive in nature, merely classifying error types without analyzing the causal mechanisms underlying their emergence. For instance, few studies explain why certain sounds are more difficult to pronounce than others, and how differences in articulatory structures between Arabic and Indonesian contribute to specific error patterns. Third, pedagogical implications from previous research findings remain limited. Although many studies identify errors, few propose evidence-based learning approaches that systematically address root causes.

This gap has significant theoretical and practical consequences. Theoretically, a partial understanding of articulation errors can produce a non-comprehensive second language phonology acquisition model, thus failing to explain individual variation in phonetic mastery (Munir, 2025). Practically, the absence of an integrative analytical framework causes pronunciation teaching strategies applied in the classroom to often be ineffective, as they do not target the root of the problem whether the error originates from articulatory motor limitations, negative transfer from the mother tongue phonological system, or a combination of both.

In terms of research positioning, this study does not intend to negate previous findings, but rather to support and extend existing knowledge by integrating physiological and linguistic perspectives into a holistic analysis. This research expands the focus by explaining how differences in phonetic anatomy and articulatory habits of Indonesian learners shaped by the mother tongue phonological system systematically contribute to patterns of Arabic sound errors (Aini, 2025; Muslich, 2024). Thus, this study not only identifies what is wrong, but also explains why the errors occur and how both causal factors interact.

The novelty of this research lies in three main aspects. First, the application of an interdisciplinary approach combining physiological phonetics (anatomy and function of speech organs) with linguistic interference theory (phonological transfer from the first language) in analyzing Arabic articulation errors. Second, this study not only maps error forms but also identifies the causal mechanisms from two main dimensions: (1) physiological aspects of articulatory organs, and (2) the influence of the mother tongue background that creates certain articulatory habits (Aini, 2025). Third, this study offers a conceptual framework for developing pronunciation teaching strategies based on the specific phonetic profile of Indonesian learners.

Based on the foregoing, this research aims to: (1) analyze the forms of Arabic sound articulation errors made by Indonesian learners; (2) identify the causes of these errors based on physiological factors of the speech organs; (3) identify the causes based on the influence of the mother tongue background (phonological interference); and (4) explain the interaction patterns between these two causal factors in shaping articulation errors.

Method

This research employs a qualitative approach using a systematic literature review design (Ayu et al., 2021). This approach was chosen because the primary objective is to examine Arabic sound articulation errors and analyze their causes through critical review of previous research findings, rather than through direct field experimentation. The qualitative design of the literature review allows researchers to collect, evaluate, and synthesize scientific data available in various academic publications relevant to Arabic phonetics (Nusantara, 2021). The research design is descriptive-analytical with a comparative approach, describing, analyzing, and comparing findings from previous studies on Arabic pronunciation errors by Indonesian learners. The scope covers two main dimensions: first, articulation errors from the physiological perspective of speech organs such as the tongue, vocal cords, oral cavity, and pharynx; second, errors influenced by the mother tongue's phonological system.

Research data consists of national and international scientific articles relevant to the topic of Arabic sound articulation error analysis, published between 2016 and 2025. Articles were collected through various academic databases including Sinta, Garuda, institutional journal portals, DOAJ, Scopus, and Google Scholar. Inclusion criteria comprised peer-reviewed scientific journal articles discussing articulation or phonological errors in Arabic among non-native speakers particularly Indonesian speakers, containing empirical data or theoretical analysis of error causes (both physiological and mother tongue interference), written in Indonesian, English, or Arabic, and available as accessible full text. Exclusion criteria covered articles discussing only teaching methods without articulation error data, non-peer-reviewed conference proceedings, articles on morphological, syntactic, or semantic errors without phonological focus, publications lacking clear methodological information, duplicate articles, and normative textbooks or teaching materials.

The data collection procedure was carried out systematically through five sequential stages (Ariati & Juandi, 2022). The first stage involved identification through initial searches using keywords in Indonesian (*kesalahan artikulasi bahasa Arab, interferensi fonologis, makhārij al-ḥurūf*) and English (Arabic phonetics, articulation errors, phonological interference, Arabic as a second language, L1 transfer), yielding 20 articles. The second stage involved screening based on titles and abstracts, resulting in 15 articles. The third stage assessed eligibility through comprehensive reading of 15 articles based on methodological quality, depth of analysis, and clarity of articulation error findings, with 10 articles proceeding. The fourth stage confirmed inclusion of 10 articles 8 national and 2 international as primary data sources. The fifth stage involved documentation into an analysis matrix containing article identity, research focus, findings, and causes.

The main research instrument is the researcher as a human instrument (Alhamid & Anufia, 2019), supported by tables for recording key information from each article and classification sheets for articulation errors based on place of articulation (labial, dental, alveolar, palatal, velar, uvular, pharyngeal, glottal), manner of articulation (plosive, fricative, nasal, lateral, trill), and causal factors (physiological, mother tongue interference, or combination). Content analysis was used to interpret meaning, tendencies, and error patterns emerging from the reviewed literature, proceeding through data reduction, data presentation, and conclusion drawing stages (Erlianti et al., 2024; Kristanto & Padmi, 2020).

Result and Discussion

Forms of Arabic Sound Articulation Errors

Based on the review of national and international scientific articles, Arabic sound articulation errors among Indonesian learners are generally rooted in two main factors: physiological factors related to the capability of articulatory organs in producing Arabic sounds, and mother tongue background factors (phonological interference) that influence how learners adapt their phonological systems toward the target language (Dzulfikar & Mahliatussikah, 2025; Husain & Nurlaila, 2025; Ni'mah & Salamiyah, 2024). Both factors interact and contribute significantly to the emergence of sound production errors.

Analysis of ten research articles shows that Arabic sound articulation errors in Indonesian learners can be classified into five main categories. First, substitution errors (sound replacement), the most dominant form, include: (1) replacement of interdental sounds [ذ, ث, ظ] with alveolar sounds [ز, د, ذ]; (2) replacement of emphatic sounds [ض, ط, ظ] with plain sounds [ز, د, ذ]; (3) replacement of pharyngeal sounds [ع, ح, هـ] with glottal sounds [ء, هـ]; and (4) replacement of uvular sounds [ق, غ] with velar sounds [ك, خ] or glottal sounds.

Second, omission errors (sound deletion), where certain sounds that should be present in a word are not pronounced. Muslimin et al. (2021) found that omissions frequently occur in word-final consonants, especially sounds unfamiliar in Indonesian such as [ع] or [ح] in final position (Hamid et al., 2021). This phenomenon is closely related to Indonesian's tendency toward open syllable structure (CV), making it difficult for learners to close words with consonants requiring complex articulation.

Third, addition errors (sound addition), particularly inappropriate addition of auxiliary vowels or madd. Indonesian learners tend to add short vowels to geminate consonants or consonant clusters to facilitate pronunciation (Maysaroh, 2024). For example, the word [مَكْتَب] (maktab) is pronounced as [مَكْتَاب] (makatab) with the addition of /a/. This reflects a compensatory strategy to overcome articulatory difficulties demanded by Arabic phonotactic structure.

Fourth, distortion errors (sound quality deviation), where pronunciation deviates from phonetic standards without complete replacement by another sound. Distortion frequently occurs in emphatic sounds that lose their thickening pressure, or pharyngeal sounds whose articulation point shifts to a more anterior position (Rohmatika, 2023). Sounds undergoing distortion can still be recognized as target sounds, but their acoustic quality differs from standard Arabic pronunciation.

Fifth, vowel duration errors, where learners fail to properly distinguish long vowels (madd) from short vowels (qasr). Thoyib's research (2018) shows that Indonesian learners often ignore vowel duration differences because Indonesian lacks phonemic distinctions based on vowel length. This significantly impacts word meaning in the inflectional Arabic language, where vowel length differences can alter word categories or lexical meaning (Suparno, 2018).

Table 1. Classification of Articulation Errors Based on Place and Manner of Articulation

Place of Articulation	Arabic Letter	Dominant Error Type	Error Form	Difficulty Level	Sources
Pharyngeal	ح، ع	Substitution: ع → أ، ه، ح → ع	Replaced with glottal sounds	Very High	Wulandari (2019); Putra, et al (2023); Rohmatika (2023)
Uvular	ق، غ	Substitution: ق → ك، غ → خ (weakened)	Replaced with velar sounds	High	Rahmawati (2021); Lathifah (2017); Hamid, et al (2021)
Interdental	ث، ذ، ظ	Substitution: ث → ت/س، ذ → د/ز، ظ → ز/د	Replaced with dental/alveolar	High	Thoyib (2018); Lathifah (2017); Fitriana (2020)
Emphatic (Mufakhkham)	ص، ض، ط، ظ	Distortion: loss of emphatic pressure	Becomes plain consonant	High	Rahmawati (2021); Putra (2023); Hamid et al (2021)
Velar	ك، خ	Substitution: خ → ه/ح	Shifts to pharyngeal/glottal	Moderate	Rohmatika (2023)
Palatal	ش، ج	Substitution: ش → س	Shifts to alveolar	Moderate	Lathifah (2017)
Labiodental	ف	Substitution: ف → p/v	Influence of regional dialect	Low	Fitriana (2020)
Alveolar	ت، د، س، ز، ن، ل، ر	Distortion of ر (weak trill)	Insufficient vibration	Low-Moderate	Wulandari (2019)

Physiological Factors as Causes of Articulation Errors

From a physiological perspective, articulation errors in Arabic among non-native learners are primarily caused by the limited capability of articulatory organs to produce sounds that Arabic specifically requires. Wulandari (2019) revealed that producing pharyngeal sounds demands complex coordination between pharyngeal muscles and the position of the back of the tongue a coordination uncommon among Indonesian speakers (Wulandari, 2019). The pharyngeal region in Arabic requires active contraction of the pharyngeal walls combined with the retraction of the tongue root, creating a narrowed constriction not practiced in Indonesian phonetics.

Emphatic sounds (ض، ط، ظ) require a specific tongue configuration known as pharyngealization or secondary articulation of the tongue root. This involves simultaneous retraction and lowering of the tongue root while maintaining the primary place of articulation, a coordination pattern that does not exist in the Indonesian phonological system (Rahmawati, 2021). Uvular sounds (ق، غ) similarly require the tongue back to contact or approach the uvula, a region of the vocal tract that is not actively used in Indonesian phoneme production. This anatomical limitation explains why uvular sounds consistently rank among the most error-prone sounds for Indonesian learners.

Interdental sounds (ث، ذ، ظ) present a different physiological challenge. These sounds require precise tongue placement between the upper and lower teeth a configuration absent in Indonesian articulation patterns. The motor coordination for interdental sounds demands fine neuromuscular control that Indonesian speakers have not developed through their L1 acquisition process (Lathifah et al., 2017). This physiological unfamiliarity, compounded by the absence of such sounds in Indonesian, creates persistent articulation difficulty.

Mother Tongue Background Factors as Causes of Articulation Errors

The second major factor in Arabic articulation errors among non-native learners is phonological interference from the mother tongue. In second language acquisition studies, this phenomenon is known as negative transfer the influence of the first language sound system on the production of second language sounds. Indonesian, as the L1 of the majority of learners, has a phonological system that differs significantly from Arabic (Thoyib, 2018). Phonemes such as ح، ق، ط، ص، ذ، ث، ظ، ض، and ع do not exist in Indonesian, so learners frequently substitute them with the closest phoneme in their mother tongue (Setyadi, 2018).

Thoyib (2018) explains that this interference occurs because the L1 phonological system forms articulatory motor habits that are difficult to change without high phonemic awareness (Thoyib, 2018). Research by Fitria Lathifah et al. (2017) shows that most students tend to pronounce ض like d, ث like t, or ذ like d, because interdental and emphatic production habits do not exist in Indonesian (Lathifah et al., 2017). This phonological difference also affects the production of long vowels (madd) and short vowels (qasr), which are often overlooked by learners because they have no functional equivalent in the mother tongue (Na'amah, 2024).

Similar findings were confirmed by research at IAIN Bengkulu showing that Arabic Language Education students experienced articulation errors on phonemes ث (šā'), ذ (žāl), ف (fā'), and هـ (hā'). The research affirmed that interference between Arabic and Indonesian phonological systems is the dominant cause, reinforced by insufficient motivation and inadequate articulation mastery (Putri Gustini, 2021). Furthermore, research by Khoirul Bariyah (2022) at Pondok Pesantren Darul Lughah Waddirasatil Islamiyah showed that female students using Madurese as their mother tongue experienced multi-level interference when speaking Arabic (Bariyah et al., 2022), indicating that negative L1 transfer is systemic rather than isolated to sound aspects.

These findings demonstrate that mother tongue interference plays a major role in shaping articulation error patterns. From the perspective of contrastive phonetics, such errors can be classified as negative transfer the negative influence of the first language sound system on the second language (Mantasiah, 2020). To address this, phonemic awareness-based training is needed to strengthen learners' sensitivity to differences in articulation points between the two languages. In this context, the Quranic phonetic approach proposed by

Balala (2020) can serve as a strategic alternative, where learners not only train their articulatory organs but also naturally internalize the Arabic phoneme system (Balala, 2020).

This approach aligns with the new paradigm of Arabic phonetic teaching that emphasizes the development of articulatory setting conditioning the speech organs to gradually and systematically produce non-native sounds. Through this approach, learners can understand that phonetic ability is not merely sound reproduction, but also a linguistic motor skill that requires continuous practice (Gilakjani, 2016). Thus, the synthesis of various findings points to the need for phonetic learning strategies oriented toward makhraj and phonation training, supported by contrastive awareness of the mother tongue phoneme system.

Interaction of Physiological and Mother Tongue Factors in Shaping Articulation Errors

In-depth analysis of research findings shows that Arabic sound articulation errors cannot be explained partially from only one factor, but are the result of complex interaction between physiological limitations of speech organs and the influence of the mother tongue's phonological system. This interaction creates systematic and predictable error patterns based on the phonetic characteristics of both languages.

The first interaction mechanism: double reinforcement. Arabic sounds that are physiologically difficult to produce and simultaneously lack equivalents in Indonesian experience far higher error rates than sounds with only one causal factor. For example, pharyngeal sounds [ع, ح] experience more persistent errors because: (1) physiologically they require complex coordination between the pharynx and tongue root uncommon among Indonesian speakers, and (2) linguistically there is no similar sound reference in the Indonesian phoneme system (Wulandari, 2019).

The second interaction mechanism: L1-based articulatory compensation. When learners face physiological difficulty in producing certain sounds, they tend to seek compensatory solutions using the closest sound from the mother tongue inventory. Research by Thoyib, Hamida (2018) and Fitria Lathifah et al. (2017) shows consistent substitution patterns: emphatic sounds [ص, ض, ظ] are systematically replaced with plain sounds [س, د, ز] not because learners are unaware of the difference, but because the articulatory muscles have not been trained to produce emphatic pressure, and simultaneously Indonesian lacks plain-emphatic phonemic distinction to serve as motor reference (Lathifah et al., 2017; T. Thoyib & Hamidah, 2018).

The third interaction mechanism: error fossilization through repeated practice without correction. Research by Bariyah et al. (2022) and Rohmatika (2023) shows that without appropriate corrective intervention, articulation errors tend to fossilize (Bariyah et al., 2022). This occurs because: (1) learners lack sufficient phonemic awareness to detect subtle sound differences, and (2) repeated practice without feedback reinforces incorrect articulatory habits.

Based on synthesis of the ten reviewed studies, Arabic sounds can be classified into three categories based on the intensity of causal factor interaction: Category 1 (High errors due to strong interaction): pharyngeal [ع, ح], uvular [ق, غ], emphatic [ص, ض, ظ], interdental [ث, ذ] error rates above 60% in various studies. Category 2 (Moderate errors due to partial interaction): velar [خ], palatal [ش], labiodental [ف]. Category 3 (Low errors due to cross-linguistic similarity): nasal [م, ن], plosive [ت, د], lateral [ل] (Rahmawati, 2021).

A conceptual interaction model can be formulated as follows (Kania Sabariah, 2012): Articulation error rate is a function of physiological difficulty level (F) and L1-L2 phonological difference level (L), expressed simply as: Error Rate = F × L. When both factors are high,

errors become maximal and most resistant to correction. When one factor is low, errors can be more easily addressed by focusing on the dominant factor.

Table 2. Types of Arabic Sound Articulation Errors: Examples and Causal Factors

No.	Type of Articulation Error	Phoneme/Case Example	Main Causal Factor
1.	Error in place of articulation (makhraj)	The letter ض (dadh) is pronounced like د (dal)	Insufficient control of articulatory organs (tongue and gum), phonetic habits from the mother tongue (Indonesian has no emphatic consonants)
2.	Error in manner of articulation (shifat al-huruf)	The letter ص (sad) is pronounced without emphatic pressure (becomes /s/)	Lack of understanding of letter properties, limited practice in distinguishing emphatic and plain consonants
3.	Error in voiced and voiceless phoneme production	The letter ذ (dhal) is pronounced like z, or ث (tha') is pronounced like s	Phonetic interference from the mother tongue which does not recognize dental fricatives; inability to position the tongue between the upper and lower teeth
4.	Vocalization error (short and long vowels)	Long and short vowels /a/ and /a:/ are not properly distinguished	Influence of mother tongue prosody, lack of phonemic duration awareness in Arabic
5.	Systemic phonological error (mother tongue interference pattern)	Systematic phoneme replacement, e.g. all emphatic sounds → plain sounds	Mother tongue phonological habits, compensatory strategy due to articulatory motor difficulties

Source: Analysis of reviewed literature

Conclusion

This research shows that Arabic sound articulation errors among Indonesian learners are the result of complex interaction between physiological factors of speech organs and the influence of mother tongue background. From a physiological perspective, pronunciation errors occur primarily due to limited coordination of articulatory organs such as the tongue, pharynx, and vocal cords in producing Arabic-specific sounds requiring high articulatory control, such as pharyngeal sounds (ع, ح, خ, غ) and emphatic sounds (ض, ط, ظ). From the mother tongue background perspective, articulation errors are primarily influenced by differences in phonological systems between Indonesian and Arabic, where learners tend to replace foreign sounds with the closest sound in their mother tongue due to articulatory motor habits formed since early childhood.

Synthesis of review findings shows that both factors do not stand alone but mutually influence each other. Physiological errors are often exacerbated by negative transfer from the mother tongue, while articulatory training without phonemic awareness also fails to effectively correct pronunciation errors. Therefore, improving Arabic pronunciation for Indonesian learners requires an integrative approach combining makhārij al-ḥurūf-based phonetic training and cross-linguistic phonological awareness.

Practically, this research recommends that Arabic phonetic teaching emphasize continuous articulatory motor training and implementation of Quranic phonetics-based learning models. Theoretically, this research enriches applied phonetics studies by presenting an interdisciplinary perspective combining physiological analysis and mother tongue interference as the basis for understanding articulation errors in non-native learners

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