The Perceptual Keystones of Phonological Alteration in Arabic

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الأسس الاستقبالية للتغييرات الصوتية باللغة العربية

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Abstract

Arabic language has a rich phonological textile which motivates several phonological processes involving phonetic alterations such as assimilation, substitution, and deletion. These processes have been tackled from different perspectives, yet, the process involving substitution or turning in Arabic which is called iqlab has never been tackled from a perceptual perspective. Accordingly, this study voices an interest in revealing the perceptual footings of iqlab using Gestalt Theory. Considering this objective, the main thrust of this study is to reveal the abidance of the rule of iqlab by the perceptual preferences of human perceptual system mirrored in Gestalt principles and to reveal the reflections of such preferences. After a thorough investigation, the results show that an inseparable relation exists between iqlab rules and the human perceptual preferences.

Keywords: perception, iqlab, phonological process, Gestalt principles, substitution, perceptual preferences.

خلاصة:

تمتلك اللغة العربية نسيج غني من النظام الصوتي الذي يحفز الكثير من التغييرات الصوتية ومثال ذلك الادغام، والابدال، والحذف. تناولت الدراسات هذه العمليات من عدة جوانب

ولكن لم تتناول تلك الدراسات الاقلاب باللغة العربية من منظور استقبالي. ولذلك أظهرت هذه الدراسة اهتمام بالاسس الاستقبالية لعملية الاقلاب استنادا الى مبادئ نظرية كيشتالت. واستنادا الى الهدف المرجو من هذه الدراسة فأن السعي سيكون لاجل اظهار مدى التطابق بين قوانين الاقلاب وتفضيلات النظام الاستقبالي التي تتمثل بمادئ كيشتالت واثار ذلك التطابق.

وبعد دراسة دقيقة أظهرت النتائج ان هنالك ترابط وثيق بين الاقلاب والتفضيلات البشرية الاستقبالية.

الكلمات المفتاحية: الاستقبال، الاقلاب، العمليات الصوتية، مبادئ كيشتالت، الابدال، التفضيلات الاستقبالية.

1- Introduction

Based on Natural Phonological Theory by Donegan and Stampe (1979), phonological processes describe phonetically motivated speech production and natural patterns of speech. Stampe (1979) points out that the sound patterns of a language are governed by human speech perceptual and productive mechanisms and thus they are both innate and natural.

The motivated phonological processes involve several alterations including assimilation, deletion, substitution, etc. Each process involves a change to the sound features of neighboring sounds resulting in an altered production of those sounds for perceptual and productive reasons.

Language is composed of a number of units that vary in size from a segment to a sentence. At the segmental level, a sound is composed of a number of features, some of which may be shared by other sounds (Ladefoged and Maddieson, 1999, p.5). The affinity may motivate alterations when sounds are articulated together, whether within the boundaries of the one word or across word boundaries. Theoreticians view the influence of neighboring sounds as a result of the speaker's desire to expend less effort and save more of the time needed for speech production. On the contrary, the listener may prefer to have maximal distinction of pronunciation. Eventually, a balance between effort and effect is struck (Jun, 1995).

Phonological processes in English language have been deciphered from different angles, cognitive, psycholinguistic, phonological, etc. Yet, studies of phonological processes in Arabic are mostly

taxonomic in nature and contribute little to the perceptual underpinnings of those processes, especially 'Iqlab' (substitution). Therefore, this study aspires to unveil the perceptual bedrocks of 'Iqlab' as a phonological process. This aim ignites an important question about the way 'iqlab' is perceived.

In an attempt to fulfil the aim of this study and answer its question, the researcher intends to illuminate the perceptual underpinnings of the phonological process 'iqlab' via adopting the principles of Gestalt Theory. In this context, accounting for the iqlab process in Arabic using Gestalt principles is a landmark showing a new direction of research in this area.

2- Literature Review

Researches on phonological processes have explored the subject from various dimensions, including cognitive, psycholinguistic, phonological, phonetic perspectives. Phonological processes were first systematically studied by structural linguists such as Trubetzkoy in the 1920s who introduced the concept of phoneme contrast and distinctive features, and how phonemes can change their features in accordance with the neighboring phonemes. Chomsky and Halle (1968) revolutionised phonology by arguing that phonological processes are formalised as transformations to surface forms. In the 1970s, psycholinguists such as Liberman et al. confirmed the cognitive basis of phonological processes. Later on, mental models such as the Trace Model (McClelland and Elman, 1986) integrated phonological processes with lexical access revealing how these processes impact speech recognition.

Ohala (1990) proposed that assimilation emerges from natural phonetic tendencies, such as ease of articulation and perceptual ambiguity. Browman and Goldestein's framework (1989) modeled phonological processes as overlapping articulatory gestures rather than abstract rules. Warren (1970) focused on how listeners use contextual cues to resolve phonological processes like assimilation or reduction. Others have used Optimality Theory by Prince and Smolensky (1993) to model phonological processes. These models argue that phonological processes arise from ranked constraints rather than rules.

In Arabic, these processes have been tackled extensively covering language acquisition, dialectical variations and clinical phonology. Amayreh and Dyson (1998), for instance, investigated consonant acquisition by Arab children, revealing that complex phonemes

are acquired after simpler ones. Also, dialectical variation studies, such as Watson' study (2007), investigated the cross dialectical variation among Arabic dialects and revealed how each dialect is governed by its own phonotactic rules. Other studies shed light on the importance of mastering phonological rules, for instance, Tibi and Kirby (2019) who explored the links between phonological awareness and literacy development in Arabic speaking children. Most of the other studies tackling phonological processes are taxonomic in nature. In light of the mentioned literature, a gap needs to be bridged in terms of the possible links that exist between iqlab, one of the phonological processes in Arabic, and Gestalt perceptual principles.

3- Conceptual Framework

Since this study reveals an interest in finding possible links between the perception of iqlab as a phonological process in Arabic and Gestalt principles, it is necessary to unveil the concepts and principles of both.

3.1 Iqlab

This phonological process occurs in classical standard Arabic (language of the Holy Quran), as well as in colloquial Arabic. Accordingly, it can be classified into:

3.1.1 Iqlab of Nuun Sakinah and Nunation

Linguistically speaking, iqlab denotes the transforming or turning of something into something else (Albaalbaki, 2005, p.870). Terminologically, this term denotes turning the nuun sakinah (نْ) (non-voweled /n/) or the (نْ) at the end of the nunation into a (م) sound (/m/ is its counterpart in English) when it is followed by a (ب) sound (/b/ is its counterpart in English) with a ghunnah (nazalisation). This type of phonological processes is subsumed within the rules of reciting Holy Quran. It can occur within the boundaries of the same word, for example, in Sura Alhumazza/ verse 4, iqlab is found in (لَيُنۢبَذَنَّ) /ləjənbʊðənə/ meaning 'will be thrown' (Al-Hilali and Khan, 1996), /n/ is turned into /m/ and the word is pronounced (لَيُنمبَذَنّ). This is an example with the /n/ and /b/ being adjacent within the same word.

Iqlab can also be found with the two consonants in question belonging to two different words, with the non-vowelled /n/ occurring at the end of the first word and the /b/ occurring in the beginning of the second, for example, in Altarik sura/verse 7: (يَخْرُجْ مِنۢ بَينِ الصُلبِ والترائِب) /mɪn beɪn/ meaning 'among' (Al-Hilali and Khan, 1996). The non-vowelled /n/ at the end of (مِنۢ) is turned into /m/ to resemble the /b/ in the beginning

of the word (بَيِنِ) articulated together as /mɪmbeɪn/.

Another example is from Almulk sura/verse 13: (عَليمٌ بذاتِ الصدور) /əli:mʊn biðat əlsɪdu:r/ meaning 'He is knowing of that within the breast' (Al-Hilali and Khan, 1996). Iqlab in this example occurs between the /n/ in the nunation (dammatan) at the end of the first word (عَليمٌ) and the /b/ in the beginning of the second word (بذات).

3.1.2 Phonetic Features of Iqlab Consonants

Arabic language has a rich tapestry of phonemes giving it a phonemic system that is varied and complex at the same time. The co-articulation of the consonants leads to them being susceptible to alterations. Several processes can affect the realisation of these consonants, one of those is the phonological process of iqlab (turning) which metaphorically captures the notion of one entity being turned into another. This signifies the orchestration of two subsequent letters with the first becoming a phone with phonetic features that resemble the second.

The process involves three consonants in particular, these are nuun sakinah (نْ) (/n/ is its counterpart in English), nunation (dammatan, fathatan, or kasratan, which has no counterpart in English and ends with a nuun sakinah), baa (ب) (/b/ is its counterpart in English), and meem (م) (/m/ is its counterpart in English). Each of these consonants has phonetic features that are more or less similar to the other two. The features are as follows (as explained in Roach 2009):

1- /n/ is a *nasal* consonant with the air passing through the nasal cavity instead of the oral cavity with the soft palate being lowered. It is articulated with the tip of the tongue being placed on the alveolar ridge giving it an *alveolar* place of articulation. It is *voiced*, since it is pronounced with the vocal folds being closed mildly and vibrate when the air, coming from the lungs, passes through.
2- /m/ is also a *nasal* consonant with the air passing through the nasal cavity instead of the oral one. It is articulated with the lips pressed against each other making it a *bilabial* consonant. It is *voiced*, since it is pronounced with the vocal folds being closed mildly and vibrate when the air, coming from the lungs, passes through.
3- /b/ is a plosive that is pronounced with the air being blocked by the lips, giving it a labial place of articulation. It

is *voiced*, since it is pronounced with the vocal folds being closed mildly and vibrate when the air, coming from the lungs, passes between them.

3.2 Gestalt Principles

The most prominent work tackling visual perception is Gestalt Theory. Since the time of its inception, Gestalt theory inspired significant contributions to the study of perception, learning, and social psychology, contributions that have a far-reaching influence. Gestalt theory is described as a school of thought whose main interest is in the notion of whole structures (Gestalt) "that the whole of anything is greater than the sum of its parts, and the features of the whole are not deducible from its isolated parts" (Evans, 2007, p.90).

Gestalt theory sprung from psychology in the early years of the 20th century by Austrian and German scholars who were interested in the human mind, specifically in 1912, when Wertheimer published a paper on a visual illusion called "Apparent Motion". Apparent motion is "the perception of movement that results from viewing a rapid sequence of stationary images", as in the movie, or objects, as when someone is in a train, for example, and the train passes by a number of lamp lights, the human mind would perceive them as being one light flashing right and left. Other scholars followed the footsteps of Wertheimer such as Kohler and Koffka.

This theory has a great influence on visual perception getting a foothold in perceptual studies. A major goal of Gestalt theory is to specify the brain processes that can account for the perceptual organisation rejecting the earlier assumptions that it is the result of learned relationships or associations (Britanica, 2020). The word Gestalt is a German word meaning "form", "shape", pattern", or "configuration" (Collins Dictionary).

Gestalt psychologists' main thrust was to set laws or principles that have the potential to describe the complex process of human perception. The principles are based on the human natural tendency to seek order in disorder, a process that takes place in the brain where those principles are employed making an individual perceive uniform forms instead of mere collections of unrelated images. Gestalt principles (or Gestalt laws) can be defined as "rules for the organisation of perceptual scenes" (Todorovic, 2008, p.1).

To account for the perceptual process, a number of principles are

set forth by Gestalt psychologists who sought to shed light on human perception in physiological terms. These principles are:

1- The integration of individual components into a larger inclusive component can be accounted for by a number of principles, one of them is the *proximity* principle. According to this principle, elements are grouped perceptually as a whole, constituting one and the same object, if they are close enough to each other (Todorovic, 2008, p.2).
2- The *similarity* principle where objects are perceived as belonging to the same group based on affinity in shape, colour, size, and any other features that could bring objects together (Rock and Palmer, 1990, p.87).
3- The *closure* principle is also a principle determining the elements that would be perceived as grouped together. Elements are perceived as belonging together if they constitute a closed figure. When certain information is missing from a perceived visual stimulus, human minds compensate for the missing parts by familiar colours, lines, or patterns (Bustamante and Mcleod, 2022, p.6).
4- The human brain would converge towards a state of minimum energy via simplifying perception, a mechanism called *Pragnanz* (simplicity). When visual stimuli are ambiguous or lacking information, the human perception would resort to the available information being registered by the eye's retina to interpret the received stimuli with a tendency to exert a minimal energy in thinking (Rock and Palmer, 1990, p.86).
5- *Continuity* is another principle denoting the tendency of the human perceptual system to have a continuous stream of data with no interruption.

4. Methodology

4.1 Data of the Study

The data used in this study includes examples from the Holy Quran involving the process of iqlab of consonants. Since the study is after the process not the product, one example for each rule is given. In the researcher's view, this is enough since the study is after the type not the tokens. The selected verses are translated adopting Al-Hilali and Khan's (1996) translation.

4.2 Methods of Analysis

The data is analysed following the below-mentioned steps:

1- After examining the verses in which iqlab occurs, the phonetic features of the consonants involved in the process are described based on the place, manner, and voicing of the consonants involved in the process.
2- The focus is also endowed to the direction of assimilation, the change that takes place, and the final product after turning the first sound to resonate the second.
3- The verses are transcribed phonetically, using IPA symbols to show the accurate way of their articulation, before and after iqlab, to reveal the phonetic alteration that takes place in the realisation of the sounds involved in the process.
4- The researcher also intends to phonetically account for the process of iqlab unveiling the phonetic bedrocks of the process.
5- Finally, a perceptual account of iqlab is set forth adopting the perceptual psycholinguistic principles suggested by Gestalt theorists. This step is hoped to show the possible links between iqlab as a phonological process in Arabic and the human mental tendency for finding patterns.

5. Results and Discussion

This study is based on the assumption that there is an inseparable relationship between the natural phonological process of iqlab in Arabic and gestalt principles, which ignites the necessity of investigating the links that possibly exist between the two. In this context and to bring the analogy of the concept underlying iqlab and the perceptual footings it is based on, this study has a main thrust of accounting for the motivations of iqlab both phonetically and perceptually.

From a phonetic point of view, iqlab is a kind of assimilation, where the phonetic features of one sound are affected by the features of another adjacent sound. In other words, it is the process where one sound resonates another. This demands a closer investigation of the matter to be thoroughly looked into.

As mentioned earlier, iqlab involves three consonants, these are nuun sakinah /نْ/ (/n/ in English), whether an original phoneme of the word or as part of the syntactic diacritic nunation (dammatan, fathatan, or kasrata), meem (م) (/m/ is its equivalent in English), and (ب) (/b/ is its equivalent in English). The alteration occurs when the /n/ meets the /b/, whether within the same word or across boundaries with the

/n/ being a final phoneme in a word and the /b/ being an initial phoneme in the following word. In addition to adjacency, the /n/ must be unvowelled (sakin). The similarity in phonetic features motivates the /n/ to turn into a /m/ affected by the following /b/.

In terms of articulatory movements, iqlab decreases the number of movements needed to pronounce the two adjacent phonemes, omitting the movement of the tongue towards the alveolar ridge for the /n/. Instead, the lips are pressed together for both the /m/ and the /b/ at the same time since both have the same place of articulation (bilabial). Both consonants are articulated with one movement taking the time needed to produce two phonemes. The only difference is that the air for the /m/ is released through the nasal cavity, and the air for the /b/ is released through the oral cavity with a slight explosion. In short, the two phonemes will have the air obstructed at one point having the same closing phase, and the same consequent compression phase, the only difference will be in the release phase, where the /m/ having a nasal release (with ghunna or nasalization), and the /b/ having an oral release.

From a perceptual view, iqlab can be seen as adhering to the human perceptual preferences represented by Gestalt principles. In terms of the tendency towards perceiving units as wholes (gestalts) instead of individual components, iqlab fulfils this by prioritising whole units over individual phonemes taking into consideration the co-articulatory effects. The words are perceived as a whole with their articulatory movements being merged and affecting each other. In this case, the /n/ resonates the place of articulation of the /b/ becoming bilabial like it. Since the /n/ is an alveolar nasal consonant, it changes into a nasal bilabial consonant cloning the features of /m/, a member of its own group, the nasals.

Proximity is adhered to by iqlab, since a basic condition for it to be applied is the adjacency of the consonants involved in the phonological process. Another point of proximity is in terms of the phonetic features of the consonants involved. Both the /n/ and /b/ have places of articulation that are close to each other, one is alveolar and the other is bilabial. The proximity is adhered to even more by turning the /n/ into the consonant /m/ that is close to both the /n/ by being nasal, and to the /b/ by being bilabial. There is no doubt that the principle of proximity is being served indicating the tendency of the human perceptual system to perceive

adjacent sounds as being more similar.

Similarity is a principle that is applied by the process of iqlab. The consonants involved in the process /b, m/ share common features in terms of voicing (both are voiced), manner (both are plosives), with the /m/ being a nasal plosive and the /b/ an oral plosive, and the place of articulation is also identical, since both are bilabial consonants. Similarity in features is what motivates the co-articulation changes to take place, indicating that the human perceptual system prefers to make similar adjacent sounds to be even more similar.

Iqlab also aligns with principles of Gestalt by the tendency towards simplifying the articulation of consonant clusters. Adherence occurs when challenging sound combinations such as /n+b/ are transformed into a simpler and more fluid alternative /m+b/. Simplicity is incurred by decreasing the complexity of producing two adjacent consonants with varied places of articulation. With iqlab the movements of the articulators are less, as both sounds involved are articulated from the same place of articulation with less need to move the articulators to a different position for the second consonant. Accordingly, iqlab can be said to adhere to the principle of Pragnanz.

Further evidence of iqlab adhering to Human perceptual preferences is making adjacent sounds become more like each other creating a smoother transition and improving the flow of speech. This mirrors the Gestalt notion that the brain prefers seamless continuous patterns. This scores another affinity between iqlab and continuity as a Gestalt principle.

6. Conclusion

Based on the objective of this study, that is revealing the degree to which iqlab, as a phonological process in Arabic, abides by the perceptual preferences of the human perceptual system represented by Gestalt principles, the quest reached the conclusion that there is a fair amount of convergence between iqlab rules and Gestalt principles represented by wholeness, proximity, similarity, pragnanz, and continuity.

The affinity between both concepts tackled in this study reveals that the phonological processes of iqlab is based on natural human perceptual tendencies. This is mirrored in the convergence between the Gestalt principles, that are suggested based on natural tendencies of human perceptual system, and iqlab rules in Arabic.

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