تأثير إدغام النون التراجعية في القرآن الكريم على اكتساب البالغين للغة الإنجليزي

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المستخلص:

تتناول هذه الدراسة طريقة جديدة في دراسة اكتساب اللغة لدى البالغين حيث أنها تتناول الإكتساب اللغوي للنطق بالمقارنة إلي مدي تأثر مجموعة من الكبار بدراسة بعض القواعد الصوتية لقراءة القرآن (Czerepinski, 2000;Torki& Tabatabaei,2017; Zaid, 2011). و قامت الدراسة بمقارنة مجموعتين من الكبار في تخصصات أكاديمية مختلفة حيث أن كون خمسا منهم مجموعة التحكم أربعة المجموعة التجريبية. وتعرضت المجموعة التجريبية إلي قراءات قرآنية مختارة بها بعض قواعد التجويد التي تخص النون الساكنة في المواضع النهائية للكلمة . كما أن تعرضت كلتا المجموعتين إلي حصص لغة إنجليزية تركزعلي إدغام حرف ال /n/ في المواضع النهائية للكلمة مع الحرف الأول من الكلمة الجديدة في الخطاب المتصل. كما يحلل هذا البحث هذه الظاهرة من خلال نظرية القطعية الآلية (autosegmental theory) ومن خلال تحليل الأصوات مستخدما برنامج Praat وقد وجدت الدراسة أدلة سبكتروغرامية تشيرإلي أن المجموعة التي تعرضت إلي سماع تلاوة القرآن بقواعد التجويد قامت بإخراج أمثلة إدغام أكثر من المجموعة الأخري مما يشير إلي أن التعرض لقواعد التجويد قد يؤثر فعليا على النطق في اللغة الإنجليزية.

الكلمات الدالة: التجويد، الخطاب المتصل، تمثيل القطعية الآلية، الإدغام، الفنولوجيا

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1 مدرس بجامعة عين الشمس

The Effect of Regressive n-assimilation in the Glorious Qur'an on Adults' English Language Acquisition

Abstract

This study aims to investigate whether knowledge and application of Tajweed rules in Qur'an have an impact on learning L2 assimilation processes in adults. Alhough there is much research concerning the sounds of the Glorious Qur'an (**Czerepinski, 2000; Torki& Tabatabaei,2017; Zaid, 2011, etc.**), studying the acquisition of correct pronunciation of English in relation to learning Tajweed rules of assimilation found in the Qur'an is what this paper attempts to explore. The study draws a comparison between two groups of adults working in the academic field in various specializations. Five comprised the control group and 4 the experimental one. The experimental group were exposed to sessions of Qur'anic recitation, while all the groups took English sessions focusing on word-final assimilation of /n/ in connected speech. Research questions asked in this paper are: To what extent does exposure to Tajweed rules render adults in an experimental group better equipped to produce instances of English assimilation than those in a control group? To what extent does the adult experimental group outperform the adult control group in the post-test? This thesis explores the above through autosegmental theory; it also studies analyses of sound files done through the software Praat. It was found from the spectrographic data that the groups undergoing Qur'anic intervention produced more instances of total assimilation; this suggests that being exposed to Qur'anic Tajweed does, in fact, influence English pronunciation in some manner.

Keywords: Tajweed- Connected speech- Autosegmental representation- Assimilation- Phonology

1. Introduction

This paper investigates the acquisition of assimilation in English pronunciation by exposing a number of adults to rules of Tajweed they have previous knowledge of and then giving them English sessions

focusing on the same corresponding rules in English to determine whether and to what extent Qur'anic Tajweed impacts English pronunciation. The paper is divided into several sections including: hypothesis, research questions, review of the literature, method and materials, theoretical framework, discussion and results, and a conclusion.

2. Statement of the problem

Egyptian adults may face a problem regarding learning correct pronunciation of English. This problem can be tackled by exposing and teaching those adults some Tajweed rules of the Qur'an.

3. Hypothesis

Learning and practicing the correct rules of pronunciation of letters and words of the Glorious Qur'an as an Arabic text generally and with adherence to rules of Al-Tajweed specifically renders adults better equipped to reach perfect or near perfect pronunciation fluency in an additional language, namely English. The researcher proposes that exposing adults who have previous knowledge of rules of Tajweed to the same rules that employ similar rules of assimilation found in English provides them with an enriched database for correct language pronunciation. This will enable them to better enunciate English sounds and apply natural assimilation found in connected speech.

4. Research questions

1- To what extent does exposure to Tajweed rules render adults in an experimental group better equipped to produce instances of English assimilation than those in a control group?
2- To what extent does the adult experimental group outperform the adult control group in the post-test?

5. Review of the Literature

The following section focuses on adult language acquisition. In addition, it introduces different dialects of Arabic and discusses phonological processes of assimilation of nasal /n/ in these dialects as well as in English. An introduction on aspects of the Glorious Qur'an is, then, discussed with details on features of Tajweed

5.1. Adult language acquisition

Phonetics can be described as the study of sounds that all human beings are capable of producing through use of their mouths, tongues, vocal cords and other organs specific to speech production. Phonology, on the other hand, is the organization of the sounds produced to be utilized in a specific language and how these sounds form systems and patterns. It allows language users to be aware of what order of sounds is correct or incorrect, what morphological representations are acceptable, and what variations in language are permissible and what are not. Additionally, Best (1994,p.2)suggests that in acquiring languages, humans are equipped to produce any phonetic gesture, but only use a subset of what their vocal tracts are capable of producing.

Phonology is an integral part of the linguistics of any given language (Al-Ghamdi, 2001). Tesar (2007) argues that language learning in itself is not difficult if you build a certain language into the system, however "Human language learning is challenging because the class of allowable languages must include all possible human languages," (p.556) and this is where the challenge arises. Slabakova (2013, p.51) claims that there may be a critical period for first language acquisition, but not for second. This indicates that adults may just as easily acquire a second language as children do. She argues that earlier claims of inability of adults' acquiring a second language are not well-founded, since children learning a L2 early on are exposed to a significant amount of native input, whereas late learners, in most cases, have significantly less exposure. Muñoz (2008) points out that one of the

ways to evaluate who are better acquirers of a second language, children or adults, is to look at the aspect of rate. She says: "As a matter of fact, the issue of rate may be even more crucial when the time for learning is limited, as is the case in a foreign language learning setting. A higher ultimate attainment by younger (or early) starters and a faster rate of learning by older (or late) starters may be seen as two distinct age-related advantages." (pp. 197-1

Dąbrowska et al. (2020) state that adult L2 learners are quite competent in acquiring areas of a second language such as, 'functional' grammar. Other aspects of grammar such as, tense and agreement, morphology and idiosyncratic properties of some lexical items, may prove more difficult. Research often focuses on the second set of aspects, and so concludes that adult L2 learners are not as successful as children in L2 acquisition.

Dąbrowska et al. (2020) explain the progress of individuals who are termed 'heritage language speakers.' They state: "Heritage language speakers are speakers who learn a minority language at home as children and the majority language at school and (usually) in the playground. In early childhood, they are typically either monolingual in the heritage language or bilingual but dominant in the heritage language. By middle childhood, most are balanced bilinguals; by the time they become teenagers, they are typically dominant in the majority language; and by adulthood, some speakers with a heritage language background are effectively monolingual. Heritage language speakers typically have relatively good pronunciation, but their grammars are often incompletely developed (compared to monolingual speakers) and sometimes deviant: in fact, their speech is similar in many ways to the output of adult L2 learners" (Montrul, 2008; Kim et al., 2010.)

Krashen et al. (1979) posit three generalisations with regard to age, rate and eventual attainment in second language acquisition. They provide evidence for three claims:

1) Adults proceed through early stages of syntactic and morphological development faster than children (where time and exposure are held constant).

2) Older children acquire faster than younger children (again, in early stages of morphological and syntactic development where time and exposure are held constant).

3) Acquirers who begin natural exposure to second languages during childhood generally achieve higher second language proficiency than those beginning as adults.

(Krashen et al., 1979, p. 573)

5.2. Age Factor in Language Acquisition

Age alone is not a factor for inability to acquire a new language. It is normal for adults in some cultures to acquire a second language with accent-free speech while children may acquire an accent. Moreover, adults may learn to make phonological distinctions of a new language. Difficulty in acquiring a second language depends mainly on the distinctions (phonological, grammatical, etc.) found between the first and second language. Experience and age are not mutually exclusive when it comes to first and second language acquisition (Lust, 2006). The following section discusses the critical period hypothesis introduced by Lenneberg (1967).

5.3. Critical Period Hypothesis (CPH)

Lenneberg (1967) hypothesizes that language can only be acquired before a critical period or age. He states the following:

Language cannot begin to develop until a certain level of physical maturation and growth has been attained. Between the ages of two and three years language emerges by an interaction of maturation and self-programmed learning. Between the ages of three and the early teens the possibility for primary language acquisition continues to be good.... After puberty, the ability for self-organization and adjustment to the physiological demands of verbal behavior quickly declines. (p.158)

This hypothesis was put to the test on individuals acquiring a second language. Johnson and Newport (1989, p.60) argue that, in general,

competence is gained with development, but that this is not the case for language acquisition where it reaches its peak before a certain "critical period." However, late learners of language are still able to comprehend and produce a first language; even if it is done with greater difficulty, it is far from impossible.

They also argue that children are perceived as superior to adults in acquiring their first language, but that as long as a first language has been acquired during childhood, the ability to acquire an additional language remains intact into adulthood. This deems children and adults equal in their ability to acquire a new language, where some may even view adults at an advantage due to their greater level of maturity and mental capacity.

Yavas (1998) claims that, to attain native-like fluency in a language, there is general consensus that phonology is the aspect of language that is the hardest to master. Children who learn a language before puberty can, and often do, acquire native-like pronunciation, unlike their parents who may acquire perfect fluency, but still have non-native pronunciation. This has led researchers to suggest that there is a critical age period, where children before they reach the age of puberty are capable of perfecting a second language they may acquire completely. This applies significantly to phonology where children who have acquired a second language before puberty strikes have a clear advantage over their peers who begin to acquire a language after this period. Some scholars such as Long (1990) and Flege& Fletcher (1992), however, believe that the benchmark for ability to acquire native-like phonology is the age of six, and that this ability gradually declines after this time. Although it is highly likely that a child will acquire native-like pronunciation before puberty when learning a second language, other conditions (socio-effective, cognitive, input) must also be optimal and available in order to attain native-like speech.

The following section focuses on the phonological process, assimilation and how it is realized in English and Arabic.

5.4. Connected speech processes

Connected speech is characterized by being different from words pronounced in isolation where "the more casual and informal the speech register is, the

more the citation forms of words may change" (Al-Ameen & Levis, 2015, p.2).

Ladefoged and Johnson (2011) explain that a word presented in isolation is called the citation form where it is not subjected to vowel reduction or changes of any kind which are seen in connected speech. Assimilation is a phonological process or phonological alternation (Zsiga 2011) whereby two neighboring sounds become similar in phonetic features due to their contiguous nature, where one sound is considered the conditioning sound – it influences the other sound, and the other is the conditioned sound. The main function of assimilation is to facilitate pronunciation, maintain ease of speech and economize speech production. It aims to render speech more natural as opposed to producing "mechanical speech" which happens if word units are pronounced in isolation. Assimilation also differs according to speaking rate and style. It can be observed in rapid, connected speech, but less in careful eloquent speech (Ladefoged and Johnson, 2011).

5.5. Nasal Assimilation in English

Place assimilation of articulation is the most common type of phonological alternation; this is especially true of nasal place assimilation (McCarthy &Smith, 2003; Zsiga,2011) and is found in many languages including English and Arabic. It is common for a nasal consonant to become homorganic with a following consonant. Zsiga (2011) remarks: "Nasals may be especially prone to assimilate because nasal resonances interfere with the formant information that conveys place of articulation" (p.19).

Assimilation may be partial (incomplete) as is the case in which one sound takes on some features of another, as explained above. Total (complete) assimilation results in gemination whereby two sounds become identical and are pronounced the same. For example, when /n/ is followed by /b/ the resulting sound is /m/ which carries some features of- but is not identical to- the original sound: this is considered partial assimilation e.g. one pen where the /n/ sound takes on features of bilabiality but not plosiveness of the /p/ sound. However, when /n/ is followed by /m/ total assimilation takes place as /n/ is sounded as /m/ e.g. *one man*. (Crystal, 2008, p.40).

5.6. Literature on Arabic and the Glorious Qur'an

Arabic is one of the South-Central Semitic languages which belong to the Afro-Asiatic language family. It is spoken by approximately 420 million people worldwide (Ridout, 2018). With regard to its phonology, it is characterized by having a limited vowel system and a rich inventory of guttural consonants (Watson, 2002, p.1). According to (Classical Arabic vs. (Modern) Standard Arabic, 2012), Classical Arabic is a descriptive term, while Standard Arabic is a prescriptive term of the language. It is stated however, that Modern Standard Arabic, is a misnomer as there was no development from an older version of Arabic nor was there a modern standardization of the language. The word "classical" is used with reference to time rather than form or structure. Moreover, although Arabic did go through evolution, there are ambiguities regarding Classical Arabic dialects and the different dialects of the Arab world today. In regard to the Qur'an being classified as Standard or Classical Arabic, it is said that: "Indeed, Classical Arabic isn't limited to the Quran, nor for that matter, is the Quran limited to Standard Arabic"(Classical Arabic vs. (Modern) Standard Arabic, 2012.) Al-Hashmi (2004) defines Qur'anic Arabic as the highest register of Classical Arabic. Classical Arabic is believed to be derived from the language of the western Hijazi tribe of Quraysh (Watson, 2002, p.8).

Arabic is characterized by diglossia, where two forms of Arabic in any Arabic speech community are observed. Colloquial Arabic or Spoken Vernacular Arabic (SVA) is the informal form of Arabic spoken by any given Arabic country. There are many dialects under the umbrella of SVA: Levantine Arabic, Moroccan Arabic, Egyptian Arabic, etc. Different dialects are also found within the same country depending on region, gender, age, education, ethnicity and so on. (Watson, 2002, p.9)

Upon embarking on learning to correctly read and understand the Qur'an, one must be aware of the different rules required to reading the Qur'an correctly; these are named Tajweed rules and involve several phonological processes. The meanings also involved in understanding the Qur'an must be studied from the texts of trained scholars who have accumulated extensive knowledge of the Qur'an at the hands of earlier qualified scholars and so on. Qur'anic Arabic is different from both Modern Standard Arabic (MSA) and Spoken

Vernacular Arabic (SVA). It is currently specific only to reading of the Glorious Qur'an.

The formal rules which are used to establish correct reading of the Qur'an are named rules of Tajweed, and they constitute *'ilmu-t-tajweed* or science of Tajweed. The word tajweed تجويد itself in Arabic means to refine and improve the quality of reading. The word comes from the root /jwd/ that gives the meaning of refinement and beautification (Quotah, 1995). These text-specific rules do not apply to other dialects of Arabic nor are they obligatory except with regard to reading of the Qur'an; thus, they may be considered outside the domain of modern phonology. Quotah (1995) says that Tajweed "stresses the importance of enunciating each phoneme from its point of articulation, and rules and processes governed by Tajweed include nasality, assimilation, extra-long vowels (madd), pharyngealization, vowel epenthesis, pauses and a certain sense of rhythm. Most of the phonological processes of Tajweed are specific to Quranic recitation, though a few exist in spoken Arabic." (p.9)

5.7. Tajweed rules and assimilation in the Glorious Qur'an

Assimilation is found in many instances in the glorious Qur'an. It makes for easy fluid-like reading where merging helps in maintaining harmony when reciting verses. It also aims to facilitate articulation by utilising the organs of speech optimally while exerting as little effort as possible. While assimilation in some languages including English is not mandatory, in the case of Qur'anic Arabic, assimilation dictated by rules of Tajweed is compulsory in order to achieve correct recitation. Although many examples of assimilation in the Qur'an exist, this study is mainly interested in two of the "nuun" rules and in studying how they are similar to assimilation rules which act as their counterpart in English.

Assimilation in Arabic is more complex than in English although both languages retain many of the similarities found in assimilation. Cases of *idgham naqis wa kamil* إدغام ناقص وكاملا and *idgham mutamathilayn or mithlayn* وإدغام متماثلين او مثلين found in Arabic namely, major and minor assimilation is not found in English, although total and partial assimilation is present in both languages (Aly, 2012).

It is important to distinguish the different nuun /n/ sounds present in the Qur'an, and then identify how they merge with the consonants they precede. Equally important is the manner of articulation of the different nuun sounds and how they are executed. Among the nuun sounds is a quiescent nuun (nuunsakenaنون ساكنة) which means there is no vowel action upon it i.e.unvowelized.

5.7.1. Assimilation/blending/merging/ gemination/ idgham (ادغام):

There is *idgham kamil*(total or complete assimilation)and *idgham naqis* (incomplete assimilation). Scholars agree that the sounds (l, r, n, m) completely merge to preceding /n/ where no trace of the n sound can be detected. They are also in agreement that when an /n/ sound merges to a following (y, w) the merging is not complete and a ghunna is left over from the nuun (Czserepinski, 2000).

This idgham is further divided into two categories: *idgham bi ghunna* إدغام بغنة (idgham with nasality present) and *idgham biduun ghunna* إدغام بدون غنة (idgham without perceived nasality) (Al-Hashmi, 2004).When /n/ assimilates to /b/ as in /min bayna/من بينَ, iqlab occurs where the /b/ sound becomes an /m/ and the end pronunciation is /mimbayna/. Total assimilation also occurs with /m/ following /n/ in /min ma/ من ما produced as /mimma/. There are many other rules of assimilation of regressive /n/ present in the Qur'an, but the previous two are the focus of this paper.

6. Theoretical Framework: Autosegmental Theory

Goldsmith (1976) discusses a new multi-linear approach which explores how sound features are linked together on different tiers. This approach is named *Autosegmental Theory*. Auto- because each feature is independent in its own right and presented on its own individual tier or level without having to depend on neighboring segments. A segment as defined by Van de Weijer (2006, p.626) is "the abstract (or mental) representation of a sound that is postulated in phonology". The word *segment* is used in the

sense that it is "... the minimal unit of phonological representation." (Goldsmith, 1990, p.10.) McCarthy (1982) states that the theory is autosegmental because it acknowledges that different classes of features can appear on different levels, i.e. tiers while each level remains unspecified with regard to features on the other levels.

Generative phonology was a ground-breaking concept when first introduced and remained pivotal to phonological representation for some time. However, it soon proved to be insufficient in explaining different phonological aspects. Its history may be divided into two phases: the first of which was concerned with the rule system that linked phonological structures to phonetic ones; this is termed the *derivational* aspect and it is concerned with formulation of phonological rules, rule application, rule ordering and interaction with morphological rules. The second aspect- the *representational* one- focuses on the structure of phonological representations at each level of the derivation (Hulst& Smith, 1984).

Goldsmith (1976) characterizes traditional linguistic representation by what he calls the "Absolute Slicing Hypothesis" which attempts to place phonological representation of segments in a linear sequence by slicing acoustic features of a word into vertical columns, where each sound is represented by the set of rules defining it. The slices or segments are defined as unordered sets of specified features which specifically characterize functions from points in time to the condition of the articulatory organs or the acoustic properties of sounds (Gussenhoven& Jacobs, 2017; Hulst& Smith, 1984.) This hypothesis fails to meet the demand for interpretation of some features such as pitch in English and nasalization in Guarani, for example (Goldsmith, 1976.) This necessitated the development of a novel approach to phonological analysis.

The object of Autosegmental theory is to investigate how and which properties are passed on from one segment to another (Van de Weijer, 2006). Autosegmentalism is "the notion that distinctive features, rather than segments, are the atoms of phonological representation". (McCarthy 2001, p. 11393). It is also a claim about how language is represented by humans' minds.

Autosegmental representation is done through charts with *association lines* between segments on each tier (Goldsmith, 1990). Each tier represents a

sequence of gestures or acoustic transitions. Hulst& Smith (1984) compare this phonological representation to a musical score where the tune is on one line and the text is on another.

Unbroken association lines indicate associations that already exist, while a dashed or dotted line in an autosegmental rule indicates part of the structural change. Similarly, an 'x' through an association line will indicate that the association line is to be deleted by the rule. A simple circle around a segment means that it is not associated to any segment on the facing tier. (Goldsmith, 1990, p.17)

A tier which ties all features together is known as the *skeletal* or *CV- tier*. This considered the main tier which lines up consonants and vowels. The elements present on this core tier are called V-slots or C-slots which vowels and consonants must associate with in order to be realized. This tier is a principle one which serves all other tiers in representing the phonological organization of the entire structure. The skeletal tier also shows how segments may associate to one or more units- equivalent to syllables- on the tier, i.e. a short consonant or vowel will associate to one unit, whereas a long one will associate to two.

The tier defining the quality of consonants and vowels present on the skeletal tier may be referred to as the *phonemic tier* or *melody tier*. This tier contains most of the defining features of place and manner of articulation (Lieber, 1987). These segments, not being present on the skeletal tier itself but an independent one, are termed *autosegments*. The skeletal tier along with the phonemic tier constitute the "phonological core" (Halle &Vergnaud, 1980, as cited in Lieber, 1987).

Goldsmith (1990) states that the entire goal of autosegmental analysis is the reduction of natural phonological processes by way of deletion and reassociation of elements. Another point to take note of is unlinked or *floating* autosegments, which are autosegments that are not linked to any slot in the core; if it is tonal it will be linked to the nearest vowel, but in the case of harmony it will be deleted (Halle and Vergnaud, 1981). Goldsmith (1976) ascertains that the greater the number of tiers in a stage of derivation, the more "superficial" that stage is.

Clements & Keyser (1983) argue that the minimum number of tiers in an autosegmental representation is two: where one consists of segments

termed "autosegments" and the other segments termed "anchors" which are linked together under Association Conventions which are a finite number of parallel tiers associated with one another but exhibiting independence at the same time. These connections are governed by principles termed Association Conventions responsible for linking tiers in non-rule governed situations. (Pulleyblank, 1986).

The class of anchors may be determinable by the following statements:

1) Tonal autosegments are anchored to V-elements or σ- elements of syllable structure.
2) Vowel harmony autosegments are anchored to vowels.
3) Nonconsonants are anchored to V-elements of syllable structure.
4) Consonants are anchored to C-elements of syllable structure.
   (pp.62-63)

Lines associating segments on two tiers may not cross. This constraint is the only universal uncontroversial aspect of autosegmental representations; it is inviolable because the order of autosegments on a particular tier would change with regard to other tiers (Gussenhoven& Jacobs, 2017).

The researcher investigated several phonological theories in search of the optimum theory to use in the research at hand. Autosegmental phonology was chosen because, although it was originally developed to target the study of tone languages and suprasegmental features, it was later extended to apply to other features of language such as harmony and assimilation. Since the focus in this thesis is on assimilation rules in Arabic and English, the theory achieves this goal appropriately and is quite fitting for this purpose. Another positive aspect of autosegmental theory is that it is simple and straightforward enough to comprehend with ease but also possesses enough complexity with its orchestration to account for all aspects dealt with in detail.

To the knowledge of the researcher this theory has not been applied in the manner this paper ventures to explore. However, many studies incorporating non-linear phonology have been done, and child language has been the target of such studies (see Bremen,1990; Stemberger, 1988). The goal here is to acknowledge children's formation and usage of

assimilation processes in both English and Qur'anic Arabic and compare the accuracy of the output in alliance with autosegmental analysis. Autosegmental theory was chosen for this study because it clearly explains aspects of assimilation in a clear, concise and straightforward manner.

7. Methodology

The aim of this study is to determine whether and in which way Tajweed rules of the Glorious Qur'an have an impact on learners of English as a second language, particularly proficiency of pronunciation. The study employs a quantitative approach where collection of data and analysis are done on a small sample of the population.

The researcher conducted an experiment on a group of adults who worked in the academic field. The experiment was designed to take place over three days. It was structured as an English course to be taken by all participants, in addition to Qur'an recitations for an experimental group for the same number of sessions, with the researcher functioning as primary instructor. A total of three classes were conducted in the course, with three sessions exposing one group of adults (the experimental group, group A) to three Tajweed rules of the Glorious Qur'an and another group (including all the adults, group B) participating in an English course which focused on applying three assimilation rules corresponding to the Tajweed rules taken in the Qur'an sessions. The pre-test was given a few days before the first session and the post-test was delivered a few days after the final session.

7.1. Instruments used

A Sony DSC-HX90 Compact camera with 30x Optical Zoom was used in the recording of all the sessions. The researcher also used Praat, which is a free software specializing in linguistic analysis of languages, to determine spectrographic details of sounds.

7.2. Data collection

Data were collected over the period of the sessions, and each time, two separate courses were given (Tajweed and English). The setting of the

experiment was a private academy in Maadi, Cairo where a lecture hall was used to conduct the experiment. Elicitation techniques were used in data collection as well as recording of video sessions for the workshops. Data were collected over three English sessions, with each averaging around 90 minutes, and each covering different assimilation rules. The researcher's role was to present diverse data expressing each individual rule in an entertaining manner. Leading questions were asked and the participants were prompted for the answers sought. By directing the conversation in this manner, she ensured that the participants' output complied with the aim of the experiment.

7.3. Participants

The researcher relied on convenience sampling when recruiting people to participate in the study. **Convenience** sampling is defined as selecting people who are available or convenient for a project, usually those who are accessible and/or live close by. This type of sampling is considered **non-random** sampling (VanderStoep & Johnston, 2009, p.27). Participants of the study were colleagues of the researcher and included nine individuals: seven females and two males with a mean age of 36.2. These adults' native language was Egyptian Arabic and they had varying degrees of proficiency in the English language which was their second language. Three of the participants had doctoral degrees in either mathematics or statistics, while the rest were PhD and MSc. students of different specializations. Four of the participants comprised the experimental group, and were exposed to Qur'anic recitations by a well-known Egyptian reciter. Recitations were done on an individual basis and the same Tajweed rules were applied. Since the participants of the experimental group were mature adults and had marked the "extremely competent" option for knowledge of Tajweed rules of the Qur'an in the application form filled out at the beginning of the experiment, there was no need for "drilling" these rules.

Examples of material introduced in the English course were how-to videos and pop songs, as well as viewing images and describing them in short phrases, for example. Another similar technique was the adoption of word

games to encourage participants to find hidden connected phrases. Tongue-twisters were also used in conveying the selected rules in said word games.

7.4. Procedure

A pre-test and a post-test were designed to explore whether and in which ways the presentation of Qur'anic intervention would aid the acquisition of English language pronunciation. A few selected images were shown to the participants who were encouraged to explain and iterate what they saw in two-word units. Regarding the Qur'an sessions, Qur'an was recited in an ostensive context. Each session was dedicated to focusing on several rules of assimilation in Tajweed. In course two, i.e. the English session that followed each Qur'an session, corresponding rules of assimilation in the English language were focused on and practiced by both group A and B to see how the experimental group were impacted from their Qur'anic session.

Qur'anic recitation depended solely on auditory input with multiple instances of repetition to ensure that the Tajweed rule the researcher wanted to focus on were recited thoroughly. The Qur'anic recitation was carried out by playing recorded readings by Sheikh Mohamed Siddiq El-minshawy- a late Egyptian Qur'anic reciter- who to this day remains one of the most frequently played Qur'anic reciters on Egyptian radio.

Every session of the experiment began with the Qur'an course which was attended by only a fixed number of participants who comprised the experimental group. Each session averaged a total of 45 minutes. Several Tajweed rules were introduced per session and studied accordingly. This process included several steps:

1) Recitation of relevant ayahs in predetermined chapters i.e. surahs سور

2) Recitation of selected ayahs expressing the rule from memory.

Examples with instances of assimilation were first extracted from the output of these courses, then analyzed with Praat software (Boersma&Weenink, 2021) and represented using Autosegmental

phonological representation. Praat is a free software which specializes in linguistic analysis of languages. After conducting the courses and videotaping the sessions, the researcher edited and cut the videos in order to extract portions including only assimilated text in manageable time fragments; these fragments were converted into WAV files by the Any Video Converter Ultimate tool. Each segment was given a name consisting of the speaker and spoken context. Each sound file was, then, manually transcribed into a text file.

Furthermore, the researcher used the Penn Phonetics Lab Forced Aligner program, (P2FA: Yuan and Liberman 2008) where the WAV files were down- scaled from 48000 Hz to 11025 Hz using the Audacity software (Audacity Team (2021) Audacity®. Version 2.4.1. Audio editor and recorder) in order to be correctly accepted by the aligner. The aligner combines an audio file with its transcribed text file to generate a text grid file that is recognized by Praat. The researcher then input sound files and their corresponding text grid files into Praat in order to identify individual sounds and word boundaries of adjacent words and to determine the degree of regressive assimilation in assimilable environments; to identify whether there was no, partial, or total assimilation. This was done by measuring the formant frequencies of vowels occurring before the alveolar consonant or the formant transitions preceding the assimilated consonant.

8. Assimilation rules in Tajweed and English

The study focuses on three different Tajweed rules pertaining to assimilation in Qur'an as well as those having a respective role in English. The rules adopted are as follows:

Tajweed	English
1) Assimilation-> Idgham with /n/ الإدغام بالنون	1) Assimilation of /n/ to /n/ (gemination)
2) Concealment-> Ikhfaa of /n/ when followed by /f/	2) Assimilation of /n/ to /f/

الإخفاء بالفاء	
3) Concealment-> Ikhfaa of /n/ when followed by /k/ الإخفاء بالكاف	3) Assimilation of /n/ to /k/

(Table 1, Tajweed rules vs. rules of assimilation and gemination in English)

Examples from Qur'anic verses and the English language conveying the above rules are found in the following table (2):

1) /n/	**1)** green necklace-brown nest-green knife -brown knife- brown nose- can knock- thirteen neighbours- seven nuggets, etc.
a) fathuqu falan nazeedakum ʔila ʕathaba <- فذوقوا فلن نزيدكم إلا عذابا ayah 30, An-nabaʔ	
b) aʔitha kunna ʕiðaman naxirˤa أئذا كنا عظاما نخرة <- ayah 11, An-nazeʕaat	
c) min nuṭfatin xalaqahu faqadarˤa <- من نطفة خلقه فقدر ayah 19, ʕabasa	
d) wa ma liʔaħadin ʕindahu min niʕmatin tujza وما لأحد عنده من نعمة تجزي -> ayah 19, Al-layl	
e) wujuhun yawmaʔithin naʕima/ ʕamilatun naṣiba وجوه يومئذ ناعمة عاملة ناصبة /-> ayahs 3/8, Al-ʁasheya	
f) fathakirˤ ʔin nafʕat ʔithikrˤa فذكر إن نفعت الذكرى <- ayah 9, Al-aʕla	
2) Concealment /f/	**2)** green fly- brown fork- ten fans-

a) Ɂitha assamaaɁ unfaṭarˤat إذا السماء انفطرت> ayah 1, Al-infiṭarˤ b) ya Ɂayuha alɁinsanu Ɂinaka kadiħun Ɂila rˤabika kadhan fa mulaqih يا أيها الإنسان إنك كادح إلي ربك كدحا فملاقيه> ayah 6, Al-inshiqaq c) lam yakun illatheena kafarˤu min Ɂahl ilkitabi walmushrˤikeena munfakina ħata taɁtiyahum ulbayinah لم يكن الذين كفروا من أهل الكتاب والمشركين منفكين حتي تأتيهم البينة> ayah 1, Al-bayinah d) wa takun uljibalu kalɁihn ilmanfushوتكون الجبال كالعهن المنفوش> ayah 5, Al-qarˤiˤa e) Ɂalam yajidka yatiiman fa Ɂaawa/ wa wajadaka ḍaallan fa hada/ wa wajadaka ˤaaɁilan fa Ɂaʁna ألم يجدك يتيما فآوي/ووجدك ضالا فهدي/ووجدك عائلا فأغني> ayahs 6/7/8, Ad- ḍuha f) Ɂaw Ɂiṭˤamun fi yawmin thi masʁaba أو إطعام في يوم ذي مسغبة> ayah 14, Al-balad g) Ɂinahu laqawlun faṣl إنه لقول فصل> ayah 13, At-tarˤiq	on Friday- in February- can follow- can find- brown face- seven flowers- one friend, etc.
3) /k/ a) qalu tilka Ɂithan karˤatun xaasirˤah قالوا تلك إذا كرة خاسرة> ayah 12, An-naziˤaat	**3)** one cake- brown cow-ten colours-green car- seven cans- one carrot-brown camel- seven cups-ten cats- can cook- can clap, etc.

b) wa ʔitha nnujum unkadarˁat/ ʔinahu laqawlu rˁasuulin karˁim/ liman shaaʔ minkum ʔan yastaqeem وإذا النجوم انكدرت/إنه لقول رسول كريم/ لمن شاء منكم أن يستقيم -> ayahs 2/19/28, At-takweerˁ	
c) kirˁaman katibeen كراما كاتبين -> ayah 11, Al-infiṭarˁ	
d) ʔin kulu nafsin lamma ʕalayha ħaafiɗ̣ إن كل نفس لما عليها حافظ -> ayah 4, At-tarˁiq	
e) ʔarˁaʔayta ʔin kana ʕala lhuda/ ʔrˁaʔayta ʔin kaththabba wa tawalla/ naṣiyatin kaathibatin xaṭiʔah أرءيت إن كان علي الهدي/ أرءيت إن كذب و تولي/ ناصية كاذبة خاطئة -> ayahs 11/13/16, Al-ʕalaq	
f) wa waḍaʕna ʕanka wizrˁak ووضعنا عنك وزرك -> ayah 2, Ash-sharˁħ	
g) bi ʔithn rˁabihim min kuli ʔamrˁ بإذن ربهم من كل أمر -> ayah 4, Al-qadrˁ	

(Table 2, examples of Tajweed rules vs. examples from English assimilation)

The English course designed in this study focuses on regressive assimilation of nasal /n/ sound. This was studied by presenting examples applying the rule and then analyzing examples of English produced by output from the adult participants. Each session involved the researcher focusing on correct pronunciation of the sound under focus and then connecting an adjective, colour or number ending in /n/ to another word

beginning with that sound to account for assimilation across word boundaries. Likewise, singular words including internal assimilation of regressive /n/ were also presented via songs and excerpts from the internet. The researcher employed several techniques to ascertain that the participants would produce the forms she wanted. One technique was through the use of word games that included selecting different cards with pictures printed on them and saying the words together several times to ensure that the assimilation was realized. Another example of word games was by doing word puzzles, where the participant would search for a particular word which would be connected to another and be read together to state the rule. Another technique was listening to songs and having them repeat the song back. Sentences such as "I see one carrot..." were used along with different items that the participant would select to focus on the rule being studied. These are a few examples of all of the techniques employed. Each person would get a chance to practice the required rule, as well as sometimes working in pairs, or as a whole group.

9. Discussion

9.1.　Autosegmental representation

The rules of assimilation can be appropriately represented by autosegmental graphs. In the following, two types of autosegmental representation are proposed; one for Qur'anic Tajweed rules and one for spoken English.

Qur'anic Tajweed:

1)　Assimilation-> Idgham with /n/ الإدغام بالنون
Example: عظاماً نخرة ʕiðaman naxira -> ʕiðamannaxira
In this case, when /n/ merges with a following /n/, an obvious case of gemination occurs along with production of ghunna (extra nasality from the nasopharynx) where the two /n/s result in an elongated segment. This is represented autosegmentally as follows:
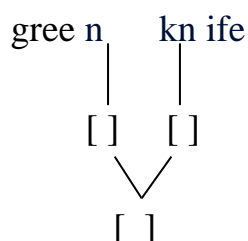
ʕiðama n   n axirʕa
| |
[ ]   [ ]
\/
[ ]
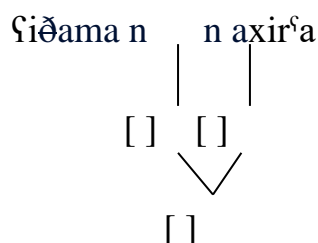
English:

1) Assimilation of /n/ to /n/ (gemination)

The occurrence of two identical sounds in sequence results in gemination which is the production of a long segment of the original sound. This can be seen in the following example, green knife and its autosegmental representation:

gree n   kn ife
| |
[ ]   [ ]
\/
[ ]

(Adapted from Abu Salim, 1987.)

Qur'anic Tajweed:

2) Concealment-> Ikfaa of /n/ when followed by /f/

الإخفاء بالفاء

Example: munfakin منفكين -> muɱfakin

Another allophone of /n/ is realised when it is followed by /f/. The voiced labiodental nasal sound produced is represented by /ɱ/. The /n/ sound retains its voiced quality but place of articulation transfers to that of the labiodental fricative /f/, thus producing the labiodental nasal sound, /ɱ/.
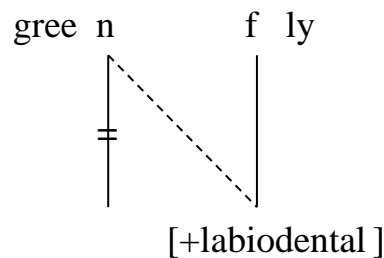
```
        n              f
        |              |
        ‖        ╲      |
        |          ╲    |
        |            ╲  |
              [+labiodental]
```
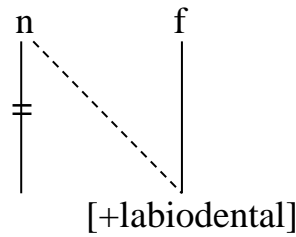
English:

2) Assimilation of /n/ to /f/

Alveolar /n/ assimilates to labiodental /f/ producing the sound /ɱ/. As was the case in Tajweed rules, the /n/ sound retains its voiced quality, but place of articulation transfers to that of the labiodental fricative /f/.

Example: green fly

```
gree  n          f  ly
      |           |
      ‖     ╲      |
      |       ╲    |
      |         ╲  |
          [+labiodental ]
```
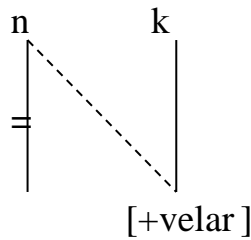
Qur'anic Tajweed:

3) Concealment-> Ikhfaa of /n/ when followed by /k/

الإخفاء بالكاف

Example: rˤasulun ka rˤim كريم رسولٌ -> rˤasuluŋ karim

Here, alveolar /n/retains its voicedness, but is instead produced with a velar place of assimilation and is represented by the symbol /ŋ/.
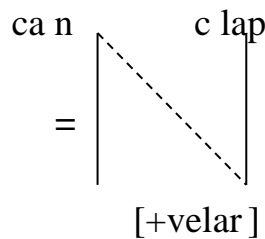
n   k

[+velar]

English:

3) Assimilation of /n/ to /k**/**

The velar nasal /ŋ/ is produced when /n/ precedes /k/, where the place of articulation of /n/ shifts from alveolar to velar.

Example:

ca n   c lap

=

[+velar]

When analyzing the data, what the researcher initially intended to do was analyze acoustic data presented in the spectrograms of the different recordings. However, realistically speaking this was not always possible due to a number of factors; the main ones being the inconvenient environment of the majority of the audio recordings with external noise factors and unclarity of the spoken speech involved. This led to obscure representation of sound units in many of the audio files. This in turn directed the researcher to rely upon formant transition cues in the sound files which represented this clearly, as well as resorting to personal assessment of the sounds she heard when transition cues were arbitrary and had no defined pattern.

10.   Results

This study was an experimental study applied on adults and divided into an experimental and control group. It aimed to determine which groups were more successful in achieving native-like competency in usage of some assimilation rules. The study comprised nine adults of whom four composed the experimental group. The experimental groups received sessions in

Qur'anic recitation with Tajweed rules implemented, in addition to English sessions. There was a varying degree of participation from the attendees, and this is clear in the uneven number of examples produced by each child participant. Additionally, not all the adult participants attended the complete number of sessions, nor did they all participate equally, with some willingly responding on many occasions, while others were more inclined to take a backseat unless they were probed by the researcher.

This was an evaluation for development of the adults' performance as they were exposed to the rule on more than one occasion even if they had not attempted to participate during the sessions themselves. The letters n, p and t correspond to no, partial and total assimilation, respectively. Likewise, the letters ng, pg and g correspond to no gemination, partial gemination and total gemination, respectively. The following section clarifies the differences found in the output of each group: each of the three rules is represented with respect to the control group first, and then with the experimental group, as follows:

Rule (1) Assimilation of /n/ to /n/ (gemination)

1-Control group:

Name	Pre-test		Post-test		Degree of gemination			
Din	1) In November		1) In no		3) ng		1) g	
	2) 14 names		2) Unnoticed		4) g		2) g	
Gha	1) In November		1) In no		3) g		1) g	
	2) 14 names		2) Unnoticed		4) g		2) g	
Mar	1) In November		1) In no		3) g		1) g	
	2) 14 names		2) Unnoticed		4) ng		2) g	
Pan	1) In November		1) In no		3) g		1) –	
	2) 14 names		2) Unnoticed		4) g		2) g	
Sam	1) In November		1) In no		3) g		1) g	
	2) 14 names		2) Unnoticed		4) g		2) g	

(Table 3, assimilation/gemination of /n/ to /n/ for adults' control group)

2-Experimental group:

Name	Pre-test	Post-test	Degree of gemination			
AbdR	1) In November 2) 14 names	1) In no 2) Unnoticed	1) g 2) g		1) g 2) g	
Asm	1) In November 2) 14 names	1) In no 2) Unnoticed	1) g 2) pg		1) g 2) g	
Dal	1) 14 names	1) In no 2) Unnoticed	1) g		2) g 3) g	
Rab	1) In November 2) 14 names	1) In no 2) Unnoticed	1) g 2) g		1) g 2) g	

(Table 4, assimilation/gemination of /n/ to /n/ for adults' experimental group)

Rule (2) Assimilation of /n/ to /f/

1-Control group:

Name	Pre-test	Post-test	Degree of assimilation	
Din	1) One frog 2) In five	Can fly	1) n 2) p	t/n
Gha	1) One frog 2) In five	Can fly	1) t 2) n	p
Mar	1) One frog 2) In five	Can fly	1) p 2) n	n
Pan	1) One frog 2) In five	Can fly	1) n 2) p	p/n
Sam	1) One frog 2) In five	Can fly	1) n 2) t	t/p

(Table 5, assimilation of /n/ to /f/ for adults' control group)

2-Experimental group:

Name	Pre-test	Post-test	Degree of assimilation	
AbdR	1) One frog 2) In five	Can fly	1) n 2) p	p/t
Asm	1) One frog 2) In five	Can fly	1) n 2) p	t
Dal	1) One frog 2) In five	Can fly	1) p 2) p	p/t
Rab	1) One frog 2) In five	Can fly	1) p 2) p	t

(Table 6, assimilation of /n/ to /f/ for adults' experimental group)

Rule (3) Assimilation of /n/ to /k/

1-Control group:

Name	Pre-test	Post-test	Degree of assimilation	
Din	1) Cancun 2) On call	Unicorn cake	1) t 2) n	n
Gha	1) Cancun 2) On call	Unicorn cake	1) p 2) n	n
Mar	1) Cancun 2) On call	Unicorn cake	1) n 2) p	n
Pan	1) Cancun 2) On call	Unicorn cake	1) n 2) n	n
Sam	1) Cancun 2) On call	Unicorn cake	1) p 2) n	n

(Table 7, assimilation of /n/ to /k/ for adults' control group)

2-Experimental group:

| Name	Pre-test	Post-test	Degree of assimilation	
AbdR	1) Cancun 2) On call	Unicorn cake	1) n 2) n	n
Asm	1) Cancun 2) On call	Unicorn cake	1) p 2) n	n
Dal	1) Cancun 2) On call	Unicorn cake	1) n 2) n	t
Rab	1) Cancun 2) On call	Unicorn cake	1) p 2) n	n

(Table 8, assimilation of /n/ to /k/ for adults' experimental group)

To determine the progress of each group, and to establish if in fact there was improvement from the pre-test, the researcher calculated the number of instances uttered by each group for each rule in the pre-test and post-test. A value was given to each instance: for no assimilation/gemination, n=1, for partial assimilation/gemination, p=2, for total assimilation/gemination, t=3. Each instance was given its corresponding value and the sum was divided by the maximum number that could be possibly achieved.

Example for rule (1), control group in pre-test: 2*1+0*2+8*3/10*3=86.6%

The data for the control group is displayed in the following table and graph:

| Control group		Pre	Post
	Rule (1)	86.6%	90%
	Rule (2)	63%	62.5%
	Rule (3)	50%	33%
	Sum of rules	66.5%	61.8%
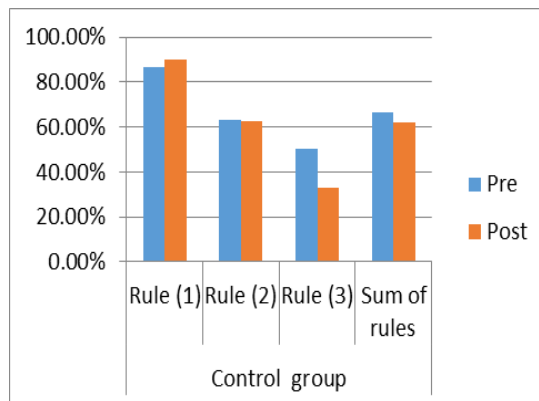
(Table 9, control group results)

The column, Sum of rules, displays the average output of the group for both the pre- and post-tests.

The data for the experimental group is displayed in the following table and graph:

		Pre	Post
Experimental group	Rule (1)	95%	100%
	Rule (2)	58%	66.6%
	Rule (3)	41.6%	50%
	Sum of rules	64.8%	72%
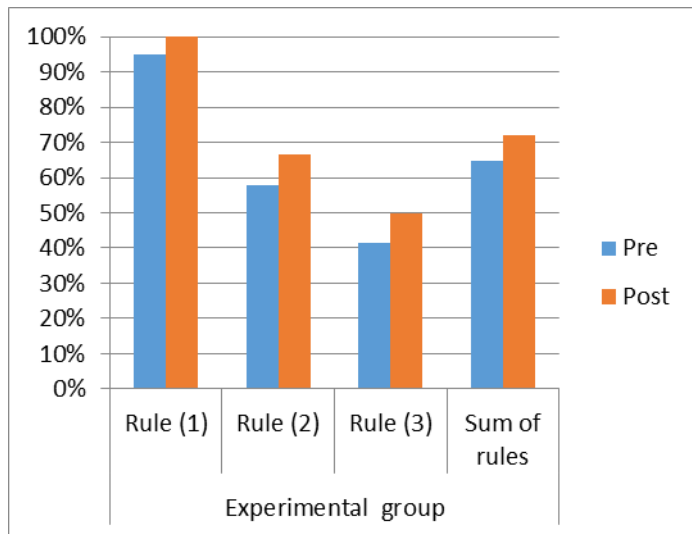
(Table 10, experimental group results)

11. Conclusion

The results indicate that there was an overall progress in applying assimilation for the experimental group by over 7%. Contrarily, the control group displayed around a 5% decline in progress. This indicates that exposure to Tajweed rules may impact an individual's brain unconsciously and lead to application and implementation of assimilation rules in English. Although the phonological process of assimilation in English is not mandatory as it is in the recitation of Tajweed, it is nevertheless a natural part of spontaneous speech and aids in fluid fluent speech production which could help in the acquisition of correct pronunciation and ultimately facilitate second language acquisition. However, it is noteworthy to mention that the participants, whether in the

experimental or control groups, were not exclusively consumed by the study or confined to a lab. Moreover, the duration of the study time was quite limited, so it is advised for those willing to tackle this point in the future to take the time factor into consideration.

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