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An Investigation of Ease of Articulation of the English Diphthongs as Experienced by Iraqi EFL Learners at the University Level

A Thesis Submitted to the Council of the College of Education/University of Misan in Partial Fulfillment of the Requirements for the Degree of Master of Arts in English Language and Linguistics

By

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بسم الله الرحمن الرحيم

(وفوق كل ذي علم عليم)

صدق الله العظيم

سورة يوسف الآية 76

In the name of God, Most Gracious, Most Merciful

(Over all endued with knowledge is One, the all-knowing)

God Almighty has spoken the truth

Yusuf: 76

Ali, A. Y. (1989: 579)

Dedication

To my family

Supervisor's Certification

I, hereby, certify that this thesis which is entitled "***An Investigation of Ease of Articulation of the English Diphthongs as Experienced by Iraqi EFL learners at the University Level***" has been prepared under my supervision at the Department of English, College of Education, University of Misan, in a partial fulfillment of the requirements for the Degree of Master of Arts in English Language and Linguistics.

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The Examining Committee's Declaration

We, hereby, certify that we have read this thesis which is entitled ***"An Investigation of Ease of Articulation of the English Diphthongs as Experienced by Iraqi EFL Learners at the University Level"*** written by Ali Abdulhussain Chyad, and, as an Examining Committee, have examined the candidate in its contents, and that, in our opinion, it is adequate as a thesis for the Degree of Master of Arts in English Language and Linguistics.

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Abstract

The present study investigates the phenomenon of Ease of Articulation that Iraqi EFL learners at the university/postgraduate MA level might experience when articulating the English diphthongs. The study falls into five chapters. The first chapter introduces the preliminaries of the study which consist of: the problem, the research questions, the hypotheses, the procedures, the objectives, the limits and the significance of the study.

The second chapter is devoted to reviewing the literature related to the topic of the study. It reviews Iraqi, Arabic and foreign studies that investigate the topics of articulatory effort and English diphthongs.

The third chapter is assigned to exploring the theoretical part of the study. It begins with explaining the concept of Ease of Articulation, discussing its definitions and its demonstrations in various linguistic phenomena. Then, the chapter deals with the notion of articulatory effort; how it can be conceptualized and what parameters can be employed to regulate it. The chapter also outlines the model of Articulatory Phonology and finally describes the English and Iraqi Arabic pure vowels and diphthongs.

The fourth chapter is concerned with the practical part of the study. It presents details about the subjects, stimuli, procedure and method and statistical tests. It also includes a scale of easiness of the production of the English diphthongs as experienced by the subjects of the study and the factors that are responsible for such easiness or difficulty.

The final chapter includes the conclusions, recommendations and further research suggestions. The results validate the three hypotheses of the study. The study also comes up with the conclusion that the closing diphthongs are easier than the centring diphthongs, and that the factors of foreign language and mother tongue sounds resemblance, the precision and direction of the tongue displacement required for the articulation of the English diphthongs are the most decisive factors in the experienced easiness or difficulty.

List of Abbreviations

Abbreviations	Equivalents
AP	Articulatory Phonology
C	Consonant
CA	Colloquial Arabic
EoA	Ease of Articulation
IA	Iraqi Arabic
IPA	International Phonetic Alphabet
LEP	Least Effort Principle
L1	First Language
MSA	Modern Standard Arabic
RP	Received Pronunciation
UPSID	University of California Phonological Segment Inventory Database
V	Vowel

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List of the English Phonemic Inventory

Adopted from (Roach, 2009:x)

Pure Vowels			
Symbols	**Example Words**	**Symbols**	**Example Words**
ɪ	‘pit’ /pɪt/	iː	‘key’ /kiː/
e	‘pet’ /pet/	ɑː	‘car’ /kɑː/
æ	‘pat’ /pæt/	ɔː	‘core’ /kɔː/
ʌ	‘putt’ /pʌt/	uː	‘coo’ /kuː/
ɒ	‘pot’ /pɒt/	ɜː	‘cur’ /kɜː/
ʊ	‘put’ /pʊt/		
ə	‘upper’/ʌpə/		
Diphthongs			
Symbols	**Example Words**	**Symbols**	**Example Words**
eɪ	‘bay’ /beɪ/	eə	‘pear’ /peə/
aɪ	‘buy’ /baɪ/	ʊə	‘poor’ /pʊə/
ɔɪ	‘boy’ /bɔɪ/	əʊ	‘go’ /gəʊ/
ɪə	‘peer’ /pɪə/	aʊ	‘cow’ /kaʊ/
Consonants			
Symbols	**Example Words**	**Symbols**	**Example Words**
p	‘pea’ /piː/	b	‘bee’ /biː/
t	‘toe’ /təʊ/	d	‘doe’ /dəʊ/
k	‘cap’ /kæp/	g	‘gap’ /gæp/
f	‘fat’ /fæt/	v	‘vat’ /væt/
θ	‘thing’ /θɪŋ/	ð	‘that’ /ðæt/
s	‘sip’ /sɪp/	z	‘zip’ /zɪp/
ʃ	‘ship’ /ʃɪp/	ʒ	‘measure’ /meʒə/
h	‘hat’ /hæt/	l	‘led’ /led/
m	‘map’/mæp/	r	‘red’ /red/
n	‘nap’ /næp/	j	‘yet’ /jet/
ŋ	‘hang’/hæŋ/	w	‘wet’ /wet/
tʃ	‘chin’ /tʃɪn/	dʒ	‘gin’ /dʒɪn/

Chapter One

Preliminaries

1.1 Introduction

Speech production is a very complex process. It requires the involvement of the breathing, voicing and articulatory mechanisms, beside the need for harmonizing all these dimensions and their recognizing effects (Shuster & Cottrill, 2015:3). For all these aspects to work properly and coordinately, certain speech sounds are articulated with a greater articulatory effort than others. Particular sounds are, therefore, produced with more Ease of Articulation (henceforth EoA). The effect of EoA could also be found in cases when speakers usually prefer to communicate the intended message with the minimum possible vocalization energy (Ladefoged & Johnson, 2015:294). For example, English speakers, especially in casual speech, usually avert long consonant clusters; e.g. in clusters of three or two stops followed by a fricative, the second stop is usually omitted, as in ‘acts’ /æks/, ‘looked back’ /lʊk bæk/, ‘scripts’ /skrɪps/ (Roach, 2009: 114).

Vowels are produced within a small area in the oral cavity. Diphthongs, furthermore, involve the transition between different positions within this small space. It is natural, subsequently, to have easy and difficult diphthongs (Ashby, 2011: 88). This study is intended to investigate the phenomenon of EoA as experienced by Iraqi EFL learners in producing the English diphthongs. In other words, how do Iraqi learners, at the university level, feel when they produce the English

diphthongs, how much tension or strain in the lips, jaw and the tongue they experience. The present study, however, is not intended to be a contrastive or comparative one, and when it refers to the subjects' first language, this is merely intended to investigate whether or not the participants' mother tongue is influential.

1.2 The Problem of the Study

Pronunciation is one of the most difficult aspects of foreign language learning, for it requires using the vocal apparatus in ways and configurations different from those involved in the learners' mother tongue. Native speakers, therefore, invest EoA mechanisms automatically and subconsciously. Foreign language learners, however, may make more effort in articulating the foreign language speech sounds, since they may be not acquainted with the level of effort that is required in articulating each speech sound in that language. Thus, this study investigates the effort made by Iraqi EFL learners in producing English diphthongs.

1.3 The Research Questions

The study is intended to answer the following questions:

1- Do Iraqi EFL learners experience the phenomenon of EoA when articulating the English diphthongs?

2- Which diphthongs are easy and which are more difficult for Iraqi learners? And why?

3- Do the subjects experience the same level of effort both in articulating their mother tongue's diphthongs and the English diphthongs ?

1.4 The Objectives of the Study

The study aims to achieve the following objectives:

1- Investigating whether or not Iraqi EFL learners experience EoA in producing English diphthongs.

2- Identifying those diphthongs that are pronounced with more ease and those with difficulty.

3- Identifying the factors that lie behind the ease or difficulty that Iraqi EFL learners experience when articulating the English diphthongs.

1.5 The Hypotheses of the Study

Depending on reviewing the literature related to the topic of the study, it is hypothesized that:

1- Iraqi EFL learners do experience EoA, at least in the articulation of some English diphthongs.

2- Closing diphthongs are easier than centring diphthongs.

3- Diphthongs that are present in the learners' mother tongue are easier to articulate than the English diphthongs which have no counterparts in the learners' mother tongue.

1.6 The Procedure of the Study

1- The subjects are asked to articulate the whole range of the English diphthongs in order to exclude those students who have mistakes in their pronunciation.

2- The performance of the subjects is recorded by a microphone and saved on a computer for the purpose of documentation.

3- The subjects are asked to articulate each English diphthong and answer a number of questions about the effort they experience in the lips, jaw, throat, tongue, their general evaluation of the diphthong production as easy or difficult and the difference of effort between the English diphthongs and the subjects' mother tongue diphthongs.

4- The answers of the subjects are tabulated and calculated statistically in order to develop a scale of easiness of the English diphthongs articulation as experienced by Iraqi EFL learners at the postgraduate/MA level.

5- Investigating the correlation between the easiness scale and the factors that are responsible for the experienced easiness or difficulty.

1.7 The Limits of the Study

The present study is limited to examining the phenomenon of EoA as experienced by Iraqi EFL learners in articulating English diphthongs. Concerning the subjects, the study is limited to Iraqi MA students in linguistics studying at Misan University/College of Education and Basrah University/College of Education for Human Sciences, academic year 2019-2020. The subjects of the study have been recruited from two universities in order for the sample to be more representative of the university level students and to get more reliable and solid results.

1.8 The Significance of the Study

To the best of the present researcher's knowledge, this is the first study of its kind that deals with this topic. The study is expected to be of importance for both teachers and learners of English. It is also hoped that the study would raise teachers' and learners' awareness of the role of EoA, in general, and its role in producing English diphthongs in particular, so that much concentration is directed towards those diphthongs that require high levels of effort.

Chapter Two

Literature Review

2.1 Introduction

This chapter reviews the literature relevant to the topic of the present study. It begins with the studies that investigated the phenomena of EoA and articulatory effort, as applied to different speech sounds. Then it reviews the Iraqi, Arabic and foreign studies that investigated the production of English diphthongs by EFL learners. By this survey, it is intended to explain how the current study differs from the previous studies conducted on EoA and the production of the English diphthongs. It is also worth noting that not all the studies that are concerned with the English diphthongs production set their ultimate goal in examining English diphthongs production. The studies vary in their scope and goals, yet, the common characteristic is that all of them investigated the production of diphthongs, though for different purposes.

2.2 Studies on EoA and Articulatory Effort

Malécot's study (1955) examines the articulatory effort required to produce English consonants. He conducted two experiments. In the first one, the subjects are 125 students and members of the staff of the University of California. The subjects do not have any experience in phonetics. The stimuli of the study is a list of words beginning and ending with /ɑː/ and the intended consonant is in the medial position, e.g. *asa* and *aka*. The study excludes the consonants that pose orthographic challenges to the subjects, such as consonants that are spelled with more

than one letter (e.g. /tʃ/, /ʒ/ and /ŋ/). As a result, the total number of the consonants covered in the study is 12 consonants.

Concerning the methodology, Malécot uses what is known as '*the Method of Pair Comparison*'. The method requires the subjects to articulate a pair of words and to decide which one is more effortful. The results show the following descending sequence (the first is the most effortful) of the investigated consonants: /k/ - /g/ - /p/ - /t/ - /b/ - /d/ - /f/ - /v/ - /z/ - /s/ - /m/ - /n/. He categorizes the results in the following way: plosives are evaluated as the most difficult sounds, fricatives require intermediate effort and nasals are the easiest sounds to articulate. The results also underline the fact that, for each place of articulation, voiceless sounds are more effortful than their voiced counterparts (/s/ and /z/ is the only exception here).

Malécot also interprets the results according to the interaction between the place and manner of articulation. Concerning the place of articulation, the mass of the active articulator determines the required effort. The tip of the tongue is the smallest one, and the sounds that involve it are the easiest ones. Then come the two lips and there is the central part of the tongue, which is used in the articulation of the velars. Concerning the manner of articulation, the amount of effort that is required to maintain the degree of supraglottal pressure of each manner determines the ease or difficulty of articulation. Voiceless plosives, for example, require maintaining a complete closure of the airflow, against the pressure of the lungs. This process demands a great amount of effort. In producing voiceless fricatives, on the other hand, there is a narrow opening for the air to escape through. The resistance to the pulmonic air is, therefore, less rigid. For nasals, there is an almost free passage for the

airflow to escape through the nasal cavity. Nasals are, accordingly, judged to be the easiest sounds.

In the second experiment, Malécot attempts to measure the pressure of air associated with the 12 consonants examined in the first experiment. The subjects are Malécot himself, three of his colleagues and a student. For each subject, a catheter is put into his nostril, passing through the nasal cavity, the palate and the wall of the pharynx. The catheter is linked to a kymograph (a device that is used to produce pressure diagrams). The subjects read aloud a list of words containing the target consonant plus the /ɑː/ in different contexts; initially, intervocalically, finally and geminated intervocalically. The results of the different contexts reveal that there are three categories of sounds: voiceless plosives and fricatives score the highest pressure levels, voiced plosives and fricatives score relatively lower pressure, and nasals have the lowest pressure levels.

There is, however, a difference between the results of the two experiments. In the first one, the subjects put the fricatives between the plosives and nasals. In the second experiment, on the other hand, the voiceless plosives and fricatives are put in one category, the voiced plosives and fricatives in a different category, and nasal sounds in a third one. Malécot attributes this difference to the fact that the pressure of air associated with each manner of articulation is not the only factor that determines the articulatory effort.

Locke (1972) carried out a study to see whether EoA could account for the order of children's acquisition of their mother tongue's consonants. Locke tried to do this by asking adults to rate the ease of articulating English consonants and comparing the results with the results of previous studies done to investigate the order according to which three

years old children acquire consonants. The subjects of the study are 55 college students studying chemistry, basic speech and the German language. The study excludes the consonants that do not occur at the beginning of words, such as /ŋ/ and /ʒ/, and also those that have orthographic complexities, such as /θ/ and /ð/. The total number of the sounds covered in the study is, therefore, 20 consonants. The stimuli of the study are a group of pairs consisting of a CV pattern, the vowel used is /ʌ/ and the pattern is spelled as C+ u+h. Each consonant is paired with all the other consonants. The total number is 190 pairs. Locke carried out two experiments. In the first one, the subjects are asked to whisper the pairs and decide which one is more difficult and requires more muscular tension in the tongue, lips, jaw or throat. In the second experiment, the subjects are asked to estimate the effort involved in articulating each consonant by giving number 1 or 2 to the less effortful sounds and 8 or 9 to the more effortful ones.

The results show a close agreement between children's mastery of sounds and adults experienced ease. In other words, the earliest acquired sounds (by children) were the same ranked as easy ones (by adults), and the late acquired ones were the same judged to be difficult. The results prove the following hierarchy according to the degree of agreement between mastery and ease: fricatives – affricatives – glides – nasals – plosives. Concerning the voicing feature, voiceless consonants are acquired easily by three years old children and also judged to be easy to articulate by adults. Voiced consonants, however, are judged to be easier to produce by adults than by children. Locke doubts whether this inconsistency could be attributed to the limitations of the scale of rating, the adults' use of rating, the inadequacy of muscular facility to fully account for the sequence of consonants acquisition, or to other unknown

factors. Locke's primary conclusion, though, is that the order of phonemes acquisition could be explained, to a great degree, by the principle of EoA.

Parnell & Amerman (1977) conducted a study that aimed to investigate the articulatory effort associated with the English consonants in three different modes of speaking: ordinary conversational speaking, whispering and pantomimed speaking. In the whispering and pantomimed modes, voicing, the pressure of air and consequently the auditory feedback are different from normal speech. The purpose of examining the three conditions is to see the effect of the different levels of air pressure in the mouth on the experienced articulatory effort. The subjects of the study are 32 adults, their ages are between 20 and 32 years. The subjects are monolingual and speak the American accent.

The consonants covered in the study are /p, b, t, d, k, g, f, v, s, z, θ, ð, ʃ, ʒ, m, n/. The target consonants are inserted into a VCV pattern. The first vowel is /ə/ and the final vowel is /ʌ/. Each pattern is paired with all the remaining patterns. The total number is 120 pairs. The pairs are presented randomly. The subjects are taught how to utter the International Phonetic Alphabet. They are asked to read the lists of patterns in the three modes of speaking and underline the most difficult syllable of each pair.

The results reveal a high level of consistency in all of the speaking modes. The sample of the study judged the fricatives as the most effortful category, plosives occupied the intermediate status and nasals are considered as the easiest sounds. Looking at the results from the place of articulation dimension, dorsal palatals /ʃ , ʒ/ are rated to be the most effortful, succeeded by dentals /θ, ð/, labiodentals /f, v/, velars /k, g/, bilabials /p, b, m/ and alveolars /t, d, n, s, z/, respectively. Since there is a

striking consistency in all the speaking modes, Parnell & Amerman conclude that air pressure is not the only factor in estimating articulatory effort.

Gordon-Bouvier *et al.* (2015) carried out a study to investigate the vocal and articulatory efforts that are experienced by Swedish native speakers in producing consonants. The subjects of the study are 22 adults, 13 women and 9 men, their ages range between 21-50 years. All the subjects are Swedish native speakers.

The stimuli of the study are 220 pairs of syllables. The material covers nine consonants: /b, p, d, t, g, k, v, f, s/. Each consonant is combined with the /ɑː/ vowel in three contexts: pre-vocalic (CV), post-vocalic (VC) and intervocalic (VCV). There is also a fourth instance in which the target consonant is presented alone; non-vocalic (C). Each pair is presented twice, in the second time the items of the pair are reversed (e.g. in the first time, the pair is /ɑːb/ - /ɑːp/, in the second time it becomes /ɑːp/ - /ɑːb/). The experiment consists of two tests; one demands selecting the easier sounds and the other requires choosing the more difficult ones. Both tests use the same stimuli but they are randomized differently.

The results, gathered from both tests, reveal that the subjects consider voiced consonants as more effortful than their voiceless counterparts (57.8 % of the responses label voiced consonants as difficult). Concerning the non-vocalic (C) - intervocalic (VCV) contrast, 65.4 % of the responses select the non-vocalic item as demanding more effort to articulate.

To interpret the results, Gordon-Bouvier *et al.* argue that the articulation of stops involves a complete stricture of the vocal tract,

creating a concentration of pressure which is suddenly released when articulating the sound. When the stop is voiced, the vocal folds remain vibrating and thus increasing the subglottal pressure. Releasing this pressure increases the required effort. In voiceless stops, however, the vocal folds are open so that air can pass freely through them, and decreases the subglottal pressure and consequently decreases the demanded effort. In addition, when articulating a low vowel, the pressure generated by the lungs creates a running airflow which passes through the vocal folds, while vibrating. When a stop is articulated in an intervocalic position, the articulation of the stop makes use of the running airflow and so feels easier than the non-vocalic case. In other words, it does not have to start from the beginning and generate its own airflow, as in the non-vocalic state. Moreover, in a VCV pattern, the articulators move simultaneously (a phonetic phenomenon known as *coarticulation*). That is, in the mid of articulating the vowel, the articulators move carefully and gradually to ease the production of the following consonant. Furthermore, the occurrence of single consonants in daily speech is rare. So, their production is less automatic and familiar than the vowel-consonant combinations.

Robieux & Meunier (2015) presented a study which investigates the role of voicing in the articulatory effort as experienced by French speakers. The subjects are 96 French native speakers, divided into two gender groups (males and females) and then into four age groups on the basis of their birthdate (1960s, 1970s, 1980s and 1990s). The subjects are also divided into two groups with two different forms of tests; one test requires identifying the easier consonant and the other asking the subjects to select the more difficult sound.

The stimuli of the study are 12 French consonants, six pairs contrasting in the voicing feature: /p, b, f, v, s, z, t, d, ʃ, ʒ, k, g/. The sounds are presented into four different patterns: non-vocalic nonsyllabic (C), pre-vocalic monosyllabic (VC), post-vocalic monosyllabic (CV) and intervocalic disyllabic (VCV). Each pair is presented in two opposite ways; e.g. if item 1 is /k, g/, item 2 becomes /g, k/. The total number is 48 pairs, but they are mixed with other 188 pairs (which contrast in place and manner of articulation) in order to randomize the stimuli. The subjects are asked to read the pairs aloud and select their answers.

The results reveal that voicing has a remarkable effect on effort in producing the French consonants. The subjects rate 62% of the voiced consonants as more effortful than the voiceless consonants. The effect of voicing, however, is influenced by the manner of articulation. The subjects rate 65% of voiced plosives and 58% of voiced fricatives as effortful. The place of articulation also plays a role in the experienced effort of voiced consonants. The percentages of effortful responses for different places of articulation as judged by the subjects are as follows: the labial plosive /b/ has 62%, the dental fricative /v/ has 47%, the alveolar fricative/z/ has 59%, the alveolar plosive /d/ has 60%, the post-alveolar fricative /ʒ/ has 68% and the velar plosive /g/ has 73%.

The effect of voicing on articulatory effort has also been found to be influenced by the context in which the consonant occurs. The percentages of effortful responses for each pattern are as follows: fricatives and plosives score 48% and 61% respectively in the VCV pattern, 58% and 67% in the monosyllabic patterns (CV or VC) and 69% and 65% in the non-vocalic context (C). Thus, greater effort is experienced in producing voiced consonants in the less vocalic patterns.

2.3 Studies on the Production of the English Diphthongs

2.3.1 Iraqi Studies

Aziz (1974) conducted a study to discover the problems that Iraqi learners encounter in pronouncing British English diphthongs, with reference to the interference of the learners' mother tongue. He states that of the eight diphthongs of the accent mentioned (/eɪ/, /əʊ/, /aɪ/, /aʊ/, /ɔɪ/, /ɪə/, /eə/, and /ʊə/) five of them (/eɪ/, /əʊ/, /ɪə/, /eə/ and /ʊə/) are problematic for Iraqi learners, due to the influence of Arabic. He states that while the diphthongs /eɪ/ and /əʊ/ are present in Standard Arabic (e.g. /beɪt/ *house* and /məʊt/ *death*), they are usually monophthongized in Colloquial Iraqi Arabic, being changed to /ɜː/ and /ɔː/ respectively (/bɜːt/ and /mɔːt/). The same process occurs when Iraqi learners pronounce these diphthongs in English. So, /neɪm/ *name* is pronounced /nɜːm/, and there would be no difference between, for instance, /səʊ/ *so* and /sɔː/ *saw*.

Concerning the centring diphthongs /ɪə/, /eə/, and /ʊə/, Aziz notices that they are often articulated like the pure vowels /iː/, /ɜː/ and /uː/ respectively, and if there is a silent '*r*' after these diphthongs, it is usually uttered, e.g. /fiːr/ for /fɪə/ *fear*, /kɜːr/ for /keə/ *care* and /tuːr/ for /tʊə/ *tour*. Aziz attributes these errors to the inconsistency between the spelling and pronunciation of English, something which Iraqi learners are not familiar with, since the relationship between spelling and pronunciation in Arabic is more consistent.

Al-Bamerni (2004) presented a study about the pronunciation of Iraqi newsreaders of English news, who are considered to represent advanced level speakers of English. The study aims to examine the pronunciation errors made by the announcers, both at the segmental and suprasegmental levels. The material of the study is a collection of news scripts broadcast

on Iraq TV, Iraq Satellite Channel and Mosul TV. The texts are recorded and then transcribed and analyzed. The announcers are six women and two men.

Concerning the English diphthongs, the results reveal that errors in producing /ɔɪ/, /aɪ/**,** and /ɪə/ are not found. Some errors are made in the pronunciation of /eɪ/, /aʊ/, /eə/ and /ʊə/. Yet, errors made in the production of /əʊ/ were quite obvious. Errors take the form of monophthongizing a diphthong or replacing it by another diphthong:

- /ʊə/ is replaced by /u:/ (e.g. /dju:rɪŋg/ instead of /djʊərɪŋg/)

- /eə/ is produced as a long-mid-high pure vowel /e:/ in some instances (e.g. /e:r/ for /eə/) and as /eɪ/ in one occurrence (/feɪr/ for /feə/ *fare*)

- /eɪ/ is pronounced as a long-mid-high pure vowel /e:/ (e.g. /ske:l/ for /skeɪl/ *scale*)

- The first element of /aʊ/ is produced with a short duration (like the Arabic /aw/ *or*).

- The production of /əʊ/ exhibits different mispronunciations of this diphthong: /ɔ:/, /ɒ/, /ɑ:/ and /ə/.

Al-Bamerni attributes these results to the striking differences between English and Standard Arabic diphthong inventories. Standard Arabic has two diphthongs; /eɪ/ and /aʊ/. English, however, has eight diphthongs. Errors in the articulation of English diphthongs, therefore, are highly expected.

Al-Ka'abi's study (2005) viewes the matter from a different angle. The study aims to find out whether there is a relationship between good efficiency of English pronunciation and the command of the English

spelling system. The sample of the study is sixty students of the third year at the Department of English /College of Basic Education/ University of Basrah. The subjects are exposed to a pre-test of pronunciation (both at the level of perception and production), and accordingly divided into two groups: the efficient group and the less efficient group. The two groups are given a pre-spelling test. The less efficient group receives a training course in English pronunciation. After finishing the course, the same group takes the post-tests of pronunciation and spelling.

The pre-test of pronunciation, at the productive level, reveals that the percentages of mistakes in producing English diphthongs are obviously high, range between 35% and 80%:

- The centring diphthongs /ʊə/, /eə/ and /ɪə/ score 55%, 80% and 80% of mistakes respectively.

- The closing diphthongs ending with /ʊ/ (/aʊ/ and /əʊ/) score 50% and 75% of mistakes respectively.

- The closing diphthongs ending with /ɪ/ (/aɪ/ and /eɪ/) score 35% and 60% of mistakes respectively.

The results, therefore, show that the centring diphthongs are the most difficult sounds. In addition, the study concludes that there is a positive relationship between good performance in English pronunciation and the command of English spelling.

2.3.2 Arabic Studies

Almbark (2012) devoted his study to scrutinizing the perception and production of Standard Southern British English vowels by speakers of Syrian Arabic. In one part of the study, the researcher examines the

difficulties that Syrian speakers of English encounter when producing English vowels. The subjects of the study are postgraduate students in the UK, speaking the Damascene dialect and have similar levels in English language skills. The subjects are asked to articulate words that contain the English vowels, each vowel is repeated three times in three words. The best recording, which has no noise, hesitations or errors in pronunciation, is extracted for each vowel. The performance of the subjects is then analyzed acoustically and compared with that of native speakers. The study, however, is limited to those diphthongs that are auditorily problematic for Syrian speakers; /eɪ/, /eə/, /əʊ/ and /ɪə/. The results of the study could be summarized as follows:

1- The articulation of the /eɪ/ diphthong is shorter than that of the native speakers', but the subjects give it more length than the Syrian Arabic /ɜː/. Moreover, while native speakers' production of this diphthong shows a clear glide from a front-mid position /e/ to a front-close position /ɪ/, the subjects' articulation does not show such a clear glide. Their production is more segmented, which sounds like a monophthongized vowel, as in their mother tongue's vowel /e/.

2- The subjects' production of the /eə/ diphthong moves towards a mid-central position. The glide, however, is modified in accordance with their mother tongue's vowel space.

3- The subjects produce the /əʊ/ diphthong with a clearly short and low accent. In addition, the diphthong sounds more back than that of the native speakers. The production of this diphthong, consequently, carries some acoustic features of the subjects' first language vowel /ɔː/, such as length, altitude and the place of the end position of the vowel. The first language vowel system is seen responsible for this phenomenon.

4- The articulation of the /ɪə/ diphthong is shorter than that of the native speakers, but longer than the subjects' first language /iː/ vowel. However, there is a striking similarity between the subjects' and the native speaker' gliding movement from a close-front vowel /ɪ/ to a mid-central /ə/.

As-Sammer (2014) carried out a study that investigates the production of RP English vowels by Omani adults. The study aims to identify the problematic vowels for Omani learners. The researcher formulates the following hypotheses:

1- English vowels not found in Omani Arabic (i.e. /eɪ/ , /ɪə/, /eə/, /ʊə/ and /əʊ/) are the most difficult ones.

2- Difficulty in the articulation of vowels is closely associated with the movement of the tongue in the vowel space. In other words, diphthongs are thought to be more difficult than pure vowels.

The subjects of the study are twenty female university students, who come to study different fields but all have already taken the same one-year general foundation programme. All of them have the same dialectal background, Batina Omani Arabic. None of the subjects has ever been to a country where English is the native language, nor has any of them taken private tuition in English. None of the subjects suffers from any speech impairments. The material of the experiment is a list of forty tokens representing RP English pure vowels and diphthongs. The token words are divided into three categories: short vowels, long vowels and diphthongs. Each category begins with four dummy words, which are intended to reduce the tension and anxiety of the subjects, but not calculated in the results. Each vowel is represented twice in order to ensure more sophisticated results. The performance of the subjects is

recorded and analyzed, giving correctly pronounced items one point and zero point for incorrect ones, and finally finding out the percentages.

The results of the study show that the highest percentage of errors is found in the articulation of the English diphthongs that are absent in Omani Arabic (93%-100%), succeeded by the non-existing short vowels (90.62% - 93.75%), succeeded by the long vowels that are not found in Omani Arabic (9.73% - 18.75%). In connection with the diphthongs that are most problematic, the closing diphthong /eɪ/ and the centring diphthong /eə/ get the highest ranks. They have 100% each. The centring diphthong /ɪə/ scores 96.87%, while the closing diphthong /əʊ/ scores 93.75%. The closing diphthongs /aʊ/, /aɪ/ and /ɔɪ/ scores 50%, 28.12% and 18.75%, respectively. Obviously, these results confirm both of the hypotheses made by As-Sammer.

Al-Shangiti (2015) conducted a study to examine the articulation and perception of English (Standard Southern British accent) consonants and vowels by Saudi Arabic speakers. The subjects of the study are a group of 26 Saudi speakers, residents of Riyadh and Hijaz. The subjects have different levels of proficiency in English, their ages range between 18-35 years. Concerning the experiment of producing vowels, the subjects are asked to record 17 vowel sounds, both in single words and in a passage of connected speech. The recordings of Saudi speakers are then presented to British native speakers to listen to in order to measure their intelligibility of the non-natives' performance.

The results show that highly proficient speakers are more intelligible than their less proficient partners. Concerning the specific diphthongs that are produced with difficulty, the experiment reveals that low proficient speakers confuse the diphthong /eɪ/ with /aɪ/, and the diphthong /əʊ/ is

mispronounced as the monophthong /ʊ/, and the diphthong /eə/ as /ɜː/. Highly proficient speakers, on the other hand, produced /eə/ as /ɜː/ and /əʊ/ as /ɔɪ/. Al-Shangiti interprets the last confusion as a result of orthographic interference, because the two diphthongs are distinguished acoustically. He concludes that the phonemes that do not exist in Arabic are the most problematic ones.

2.3.3 Foreign Studies

Bayraktaroğlu (1979) examined the difficulties that Turkish adult learners encounter in pronouncing English (RP accent). The study is based on an error analysis of the performance of the subjects as they pronounce different units of language; fifteen minutes of free speaking in an interview, reading a passage, producing single sentences and finally articulating isolated words. The recorded performance is then transcribed in detail (narrow transcription) and analyzed according to a contrastive analysis between English phonetics and Turkish phonetics, in order to explain the reasons behind the problems. The subjects of the study are 14 Turkish male and female speakers of English. They are either research students or visiting academics at the University of Cambridge.

In regard with diphthongs, the results can be summarized as follows:

- Turkish speakers replace the diphthong /eɪ/ by /ej/ or /e/. Thus, they do not give a sufficient length to the first element, something which leads to a clear foreign accent, though does not cause misunderstanding.

- The first element of the diphthong /aɪ/ is replaced by the Turkish variants of /ɑː/, while the second element by /j/. In addition, the whole diphthong is shortened.

- The first element of the diphthong /ɔɪ/ is shortened. The second element is replaced by /j/. Besides, the whole diphthong is articulated with lip rounding.

- The whole diphthong /əʊ/ is replaced by an allophone of the Turkish phoneme /ɔ/, and consequently is articulated with lip rounding.

- The first element of the diphthong /aʊ/ is replaced by some Turkish allophones, such as [a] and [ɑ] and the variants between them. The second element is either omitted or replaced by [ʊ] or [β] occasionally.

- The subjects insert /j/ + a for the second element of the diphthong /ɪə/ in final position of words. In the middle of words, they either use [ɯ] or [i] for /ə/ or repeat the first element /ɪ/.

- The diphthong /eə/ is replaced by the allophones of the Turkish /e/. Sometimes, the subjects use /j/ for the second element.

- The subjects replace the diphthong /ʊə/ by the Turkish [u] and its variants, such as [u:] and other allophones.

The researcher explains the results in the light of a contrastive analysis between English and Turkish. He states that Turkish has no diphthongs in the way English has. That is, most vowels can be followed by /j/ resulting in a sound much like the English diphthong /eɪ/, as in the Turkish word ‘rey’ (vote) /rej/. If a vowel comes after /j/, however, it will be assigned to the second syllable, as in ‘reye’ (to vote) /reje/ which has two syllables: /re/ and /je/. English diphthongs, however, are independent phonemes that involve a glide from one position to another within the same syllable. That is why Turkish speakers insert the /j/ sound when they produce English diphthongs, and that is why they sometimes use their Turkish monophthongs.

Enli (2014) investigated the articulation of English consonants, monophthongs and diphthongs of Mandarin Chinese learners. The study aims to identify the particular sounds that cause problems for the sample of the study. The subjects are 50 undergraduates who hold the same proficiency level in English (Grade 4). The material of the test is a passage taken from an English course. The words of the passage are those used in daily interactions and represent the different English consonants, monophthongs and diphthongs. The subjects are given 10 minutes to have a look at the passage with the aid of a dictionary before they were asked to read the passage aloud. The performance of the subjects are transcribed to be compared with the correct pronunciation.

Enli's study reveal that the subjects mispronounced /aʊ/ and /eə/ as /ɒ/ and /ɪə/, respectively, two times. It is also found that there is a striking rate of producing /iː/ and /ɪ/ as /eɪ/. The researcher attributes this phenomenon to the influence of the learners' Chinese dialect which has the diphthong /eɪ/. The researcher concludes that although Chinese learners' mispronunciation of English vowels and diphthongs does not exhibit a crucial pattern, the results show that the learners have problems in the articulation of /iː/, /ɪ/, /e/, /aʊ/ and /eə/.

2.4 Conclusion

From the survey that is presented in this chapter, it is clear that almost all the studies that examine the concepts of EoA and articulatory effort apply them to consonants. In addition, these studies depend on native speakers as subjects and neglect foreign language learners. Studies that investigate English diphthongs, on the other hand, focus on the problems and difficulties that EFL learners encounter in articulating English diphthongs, often with reference to the influence of the mother tongue.

These studies, however, do not shed light on the role of the intrinsic ease of the production of the speech sounds themselves. That is, the ease that results from the physiological and motor systems of producing speech. Therefore, the present study is intended to fill these gaps in the literature; applying the notions of EoA and articulatory effort to English diphthongs as experienced by EFL learners.

Chapter Three

The Theoretical Background

3.1 Introduction

This chapter presents the theoretical background that the present study draws on. The chapter begins with examining the principle of EoA; its definitions, its relationship with the least effort principle and its reflections in the different aspects of language. Then, the chapter moves on to discuss the nature of articulatory effort and the factors that govern it. The chapter also outlines the model of Articulatory Phonology. In the light of all the information presented in these three sections, the last section describes the English and Iraqi Arabic pure vowels and diphthongs.

3.2 EoA

EoA can be defined as the muscular effort or strain that a speaker experiences in the labial, mandibular, lingual and laryngeal muscles when articulating a particular speech sound (Locke, 1972:195). This notion implies that there are easy sounds, requiring less effort, as well as difficult ones, requiring relatively much effort. Since speech production can be conceived of as a series of muscular actions, it is obvious that particular speech sounds require more muscular effort than others. For example, the production of aspirated plosives demand more articulatory effort than the production of the unaspirated ones, due to the fact that an aspirated plosive requires an additional articulatory gesture (Kul, 2007:54). In this sense of the term, EoA is an intrinsic attribute of

individual speech sounds; there are easy as well as difficult sounds as such.

There is, however, another viewpoint that sees EoA as a phonetic drive that influences languages' sound patterns so that easier combinations occur more than the difficult ones (Ladefoged & Johnson, 2015:314). The phenomenon of assimilation, where the articulation of a sound is changed to resemble an adjacent sound (which either occurs before or after the sound in question), could be attributed to the influence of EoA mechanisms (Lindblom, 1983:234). For example, in casual speech, a phrase like '*green paper*' is usually pronounced /griːmpeɪpə/; the /n/ adapts the 'bilabial' feature of the adjacent /p/ in order to ensure an easy articulation. In this sense, EoA is a principle that, among other factors, impacts or shapes the phonological structure of languages. The presence of the EoA principle could be seen in the phonemes attested in languages, the arrangement and distribution of phonemes in the syllable and the morphophonology of languages (Shariatmadari, 2006:207). Generally speaking, EoA is a human inclination to reduce the effort required to produce speech (Carr, 2008:48).

3.2.1 EoA and the Least Effort Principle

The Least Effort Principle (henceforth LEP), suggested by the American linguist George Kingsley Zipf in 1949, states that human beings adopt the path that requires the least possible effort when doing actions (Zipf, 1949:543). As an instance of speech economy, when people talk they usually choose single words that cover an idea or meaning that could be otherwise expressed by many words (ibid:20). For example, if there are two people in a room, thus sharing the same physical context, one of them might say "give me *the book*" instead of "give me *the book*

that you are holding in your hands". Moreover, LEP is seen as an underlying drive that systemizes the human behaviour and the way it can be studied (ibid:543). Since its initiation, the significance and relevance of the concept of LEP has been cited and researched in forty disciplines of study, including linguistics (Chang, 2016:1124).

The relationship between the two concepts of EoA and LEP is obvious. The phonological structures of languages do not work independently; they are shaped, at least partially, by the physical and physiological constraints in which they operate. In other words, the structures of languages are the result of the motor mechanisms responsible for speech production (Lindblom, 1983:219,243). More specifically, the organs of speech resemble and work in line with the movement system of humans and they are governed by the same principles; one of these principles is the LEP (Nelson, 1983:135). As a result, the mechanisms of speech production push towards preserving energy and balancing forces. It can be concluded that EoA is the application of LEP in linguistics.

3.2.2 Representations of EoA

Linguists have identified a wide array of phenomena that have been explained as a result of the influence of EoA mechanisms. These domains include (but are not restricted to) phonetics and phonology, language change, first language acquisition and morphophonology. This section is devoted to exploring these areas. The section also aims to underline the presence, significance and relevance of EoA as a well-established concept with a good explanatory power, and to emphasize the idea of 'difficult versus easy sounds' (to see how difficult sounds are often replaced by easy ones).

3.2.2.1 Phonemic Inventories of Languages

Each language has its own phonemic inventory, a list of the smallest abstract contrastive units that distinguish one word from another. These units are called 'phonemes' (Roach, 2011:65). Comparing inventories of different languages has shown that the principle of EoA plays a role in shaping the phonemic inventories of the world's languages.

For instance, plosives are judged to be easier to articulate than fricatives. In the articulation of fricatives, a narrow passage is formed in order to constrict the airflow, a process which requires a precise control of the muscles of the tongue in order to form an obstruction sufficient for producing a friction noise (Boersma, 1990:4). Plosives, on the other hand, do not demand such a precision. They are produced with a complete closure of the airflow; so it is easier to right away strike a wall than to suddenly stop at one inch distance from it, as the metaphor says (Kul, 2007:57-58). This fact is reflected crosslinguistically in the phonemic inventories of languages. Of the 451 languages surveyed, it has been found that all of them have plosive phonemes in their inventories (Maddieson, 1984:39). According to the University of California Phonological Segment Inventory Database (henceforth UPSID), out of 451 languages there are 436 (96.67%) that have four or more plosives. In contrast, there are 240 (53.22%) that have four or less fricatives (Maddieson & Precoda, UPSID). The number of languages containing sounds articulated at extreme points in the vocal tract, on the other hand, is extremely small. Only 5.32% of languages have uvular sounds and 1.33% have pharyngeal sounds (ibid).

Another example comes from the distribution of voiced plosives in world's languages. The level of articulatory ease in pronouncing voiced

plosives depends, to a large extent, on the place of articulation of the plosive consonant in question. Voicing occurs when the air pressure of the subglottal area is lower than the air pressure of the supraglottal area. Without this process, air cannot pass across the glottis. The air pressure of the supraglottal area increases when an obstruction is created in the vocal tract. If this obstruction is made in the front area, it demands a longer time to equalize the pressure because the volume of the air that has to be enclosed will be greater. Therefore, voiced plosives that are pronounced at velar or uvular places of articulation are more difficult than, for example, voiced plosives with a labial place; more difficult because they require an extra effort in order to distend the vocal tract to the degree that it will be able to render voicing (Shariatmadari, 2006:209).

These facts, that are closely related to articulatory effort, are demonstrated in the phonemic inventories of languages. Where there are gaps in the plosive phonemes in languages, the voiced dorsals are usually omitted. According to the UPSID, the voiced plosive /g/, which is comparatively more difficult than its voiceless counterpart /k/, occurs in 253 languages (56.10% of the languages in the UPSID database) while /k/ occurs in 403 languages (89.36% of the languages in the UPSID database) (Maddieson & Precoda, UPSID).

3.2.2.2 Language Change

All languages change in a constant way. The causes of change constitute a complex network of physiological, social and psychological influences. EoA has long been identified as a principal cause of language change. Languages might change due to the physiological structures of speech production systems. Languages tend to change in a way that makes the production of speech more natural and more comfortable

through achieving an equilibrium among the opposing forces in the vocal tract and other related parts of the body (Aitchison, 2004:153-154).

EoA can render language change in different ways. One effect is the deletion of sounds. In some languages final consonants are dropped. In French, for example, the final consonant /n/ has been lost gradually. The vowel that precedes /n/ is nasalized, pronounced with a lowered velum due to the influence of /n/. Since the effect of nasalization makes the word distinguishable, the pronunciation of /n/ seemed an unnecessary effort. French, therefore, began losing final /n/ after vowels (ibid: 154-155).

Other instances of deleting sounds in order to ease the articulation could be found in the English language. Non-rhotic accents (such as some British and Australian accents) ceased articulating the /r/ sound in final position and before consonants, e.g. '*doctor*' and '*certain*' are pronounced /dɒktə/ and /sɜːtən/ respectively. Before consonants and in final position where the following word also begins with a consonant, the presence of /r/ causes an overlap among the articulatory gestures of itself and the following consonant, which increases the required effort, as in the word '*girl*' (McMahon & Foulkes, 1994:10). English speakers also abandoned pronouncing the voiced plosive /b/ when it occurs after nasal sounds in final position, as in *comb, thumb* and *limb* (Hudson, 2000:412).

Another striking example of the role of EoA in language change is the case of the velar nasal /ŋ/ in the English language. Fundamentally, /ŋ/ is an allophone of /n/ when it is followed by /g/ or /k/, as in '*sing*' /sɪŋg/ and '*sink*' /sɪŋk/; /ŋ/ was not an independent phoneme (Roach, 2009:53-54). English speakers, however, dropped the final /g/ for the purpose of effort

economy (Hudson, 2000:412). This process have resulted in merging two phonemes /n/ and /g/ into a single phoneme in this context.

It is worth mentioning, however, that EoA cannot always render language changes in the same way in all languages. It is just one of many forces that are competing to reshape the structure of languages. One of the factors that could prevent EoA from influencing languages is the *functional load* of the phoneme. The functional load of a phoneme is the range of contrasts in meaning that are caused by its occurrence or absence. In other words, functional load means how many words are distinguishable due to the presence of a particular phoneme. For example, there are 612 minimal pairs that are contrasted by /b/ and /p/ phonemes. /ð/ and /θ/, on the other hand, only contrast 8 minimal pairs. Losing /b/ and /p/ phonemes or merging one of them into the other (by changing the voicing feature which is the only feature that distinguishes them) would result in a very large number of homophones, something which affects the communication process (Shariatmadari, 2006:217).

Another factor that works against EoA mechanisms is connected with the social consequences that are associated with the change. The spread of the uvular /r/ in some European languages (such as German, French, Danish, some variations of Norwegian, Swedish and Dutch) could be attributed to the social variable. These languages, before the seventeenth century, did not have a uvular /r/ phoneme. Instead, they had a flap, trilled or an apical kind of /r/. The adoption of the uvular /r/ was initiated by Parisians, and then spread to the other cities of Northern and Western Europe. Because the European cities formed strong links at that time, they gradually began adopting the uvular /r/ (Wardhaugh & Fuller, 2015:200); inspite of the fact that the uvular /r/ is more difficult than the

original variations of /r/ found in the European languages (see section 3.2.2.1). It can be concluded, therefore, that "minimum effort can never be given free vein –the result would be silence. But where it can, it makes its influence felt" (Shariatmadari, 2006:209).

3.2.2.3 Connected Speech Processes

When people speak in their casual conversations, they do not utter careful individual words (in their citation form); instead, they pronounce whole phrases and sentences with high rapidity and comfort. Their pronunciation, therefore, exhibits a number of adaptations in the shape of sounds (Ladefoged & Johnson, 2015:115).

One of these adaptations is the process of assimilation, where a sound adopts the feature of voicing, place or manner of articulation of an adjacent sound in the same word or in the following word (Roach, 2009:110). For example, /n/ in '*input*' adopts the bilabial feature of /p/ and is pronounced like /m/ in order to preserve the effort required to the transition from an alveolar to a bilabial place of articulation, /t/ in '*let them*' is pronounced with a dental place of articulation resembling /ð/, /t/ in '*that sand*' is pronounced with a fricative manner of articulation resembling /s/, and /z/ in '*has to*' adopts the voicelessness feature of the following /t/.

Another case of connected speech is elision. Elision is a state in which a speech sound is omitted and not pronounced (Carr, 2008:49). In English, for instance, unstressed vowels (especially schwa) are often omitted when occurring in a medial position (Roach, 2009:114). For example, in '*potato*' and '*tomato',* the schwa of the first syllable is often elided. Concerning consonants, some varieties of English (such as Cockney dialect) drop /h/ in the initial position of words; '*happy*' is

pronounced /æpi/ (Carr, 2008:49). In addition, the /v/ sound in '*of*' /əv/ is omitted in very informal speech when it is followed by a consonant in the next word, as in '*waste of time*' /weɪst ə taɪm/. Similarly, in three-consonant clusters or sequences, the second consonant is usually dropped, as in '*acts*' /aks/ and '*looked back*' /luk bæk/ (Roach, 2009:114).

Elision, however, is different from the deletion of sounds that has been described in language change. Elision is a characteristic of casual speech and the elided sound is pronounced in careful speech and keeps appearing in the phonemic transcription of the word. Sound deletion, on the other hand, is a gradual historical process in which a sound disappears from the basic phonemic transcription of words, regardless of the tempo of speaking.

Another articulation facilitator is the process of linking. Linking is the process of adding a particular speech sound between two words in order to make the pronunciation more flexible. In English, there are two instances of linking related to /r/ sound. Linking 'r' is inserted when a word ends with a vowel followed by a silent 'r', in non-rhotic accents, and the next word begins with a vowel. Intrusive 'r', on the other hand, is inserted between two words even if there is no 'r' letter in the spelling (Bieswanger & Becker, 2017:70), e.g. '*near it*' /nɪər ɪt/ (linking 'r') and '*law and order*' /lɔːr ən ɔːdə/ (intrusive 'r').

3.2.2.4 First Language Phonemes Acquisition

Research in first language acquisition has shown that children acquire their mother tongue's phonemes in a particular order. One source of this regularity has been the intrinsic EoA associated with the phoneme in question. The earliest phonemes acquired are /m/, /p/, /b/, /t/ and /d/, phonemes judged to be easier to articulate, since they are made at the

front part of the vocal tract. Concerning vowels, phonemes that are pronounced near the normal position of the tongue are acquired earlier, such as /ɑː/, whereas vowels whose articulation requires a high muscular control, such as /iː/ are acquired later (Steinberg & Sciarini, 2006:5-6).

3.2.2.5 Morphophonemic Rules

Morphophonemics (which is also called morphophonology) is a subfield of linguistics which investigates the influence of phonological variables on the forms of morphemes (Crystal, 2008:315). In other words, some morphemes have different phonological realizations in the different environments in which they occur. These variants are called allomorphs (Carstairs-McCarthy, 2002:21-22). For example, the regular plural morpheme, spelled either -s or -es, has three allomorphs depending on the context. It is pronounced /s/ when it is attached to a noun ending with a voiceless consonant, e.g. '*cats*' /kæts/. After words ending with a voiced consonant, the plural morpheme is pronounced /z/, e.g. '*eggs*' /egz/. After words ending with a sibilant sound /s, z, ʃ, ʒ, tʃ, dʒ/, it is pronounced /ɪz/, e.g. '*watches*' /wɒtʃɪz/. EoA is clearly the principal reason behind this variety. After a voiceless sound, it is easier and less effortful to produce another voiceless one, in order for the vocal folds to remain in the same setting and do not have to vibrate suddenly. The same principle is applicable to the remaining cases in the voiced position (McMahon, 2002:61).

3.3 Articulatory Effort

The notion of easy versus difficult speech sounds entails that some sounds require less effort on the part of the speaker. But two significant questions could be posed here; what is the nature of articulatory effort and what is its make-up? The first question is concerned with defining the

essence of articulatory effort and how it can be examined. The second question addresses the factors that influence articulatory effort. The following subsections attempt to answer these questions.

3.3.1 Effort as a Neuromuscular Action

One approach to identifying the essence of effort sees it as a neuromuscular action. Effort, in this perspective, is understood as a result of the interaction between the nervous apparatus and the muscular apparatus, which constitutes motor units. A motor unit is composed of one motor neuron along with the spontaneous muscular fibers which the neuron supports. Normally, one motor neuron motivates a number of muscular fibers. Once the neuron fires the muscular fibers, an electrical pulse, which is known as an *action potential*, generates a mechanical movement. When we contract one muscle, we are in fact activating a group of motor units at the same time. To sum up, the nervous system stimulates a group of muscles that interact to generate movements in the vocal tract and other speech-related organs to produce recognizable changes in air pressure (Raphael et al. 2011:54-55).

When the activity of a group of motor units in the vocal tract is higher than the opposite activity of the other motor units, contraction in muscles takes place, leading to some movements in the articulators. Effort is, accordingly, the intensity of this contraction; the aggregation of the action potentials of a motor unit, distributed to each active motor unit, for all the muscles in the vocal apparatus. From a neurochemical perspective, effort is the amount of adenosine triphosphate (abbreviated as ATP) that is used by the muscles (Kirchner, 1998:37).

Though the neuromuscular explanation of articulatory effort is a reasonable one, it has some weak points and serious problems. The main

point here is that calculating the amount of effort made in producing a particular sound or utterance cannot be gained in a concrete and empirical way. The available techniques require the insertion of a large number of devices into all the muscles that are engaged in the process of articulation; something which is impossible in practice (ibid: 38-39).

3.3.2 Effort as a Biomechanical Action

Due to the inadequacies associated with viewing effort as a neuromuscular activity, phoneticians have adopted a biomechanical perspective, which attempts to account for the role of the physiological and mechanical factors and movements in shaping articulatory effort.

One of the attempts to define articulatory effort biomechanically sees effort as work, in the physical sense of the term. Effort, therefore, could be represented by the mathematical equation *work= force X displacement* in a unit of time. This equation, however, encounters the problem that it assumes that no work (effort) could be done without displacement; i.e. there must be some movement, because the result of multiplying any value by zero will be zero (Lindblom, 1990; cited in Kirchner, 1998:39). Concrete evidence, though, shows that one may make a great effort without movement or displacement, e.g. pushing a wall and holding heavy stuff. Applying the same idea to speech production, in articulating a plosive consonant an active articulator presses against a passive one; thus, making effort without any displacement. There is another perspective which views effort as *energy*, which is defined as the ability to perform work. But since it is based on the notion of work, the concept of energy encounters the same problem found in the notion of work (Kirchner, 1998:36).

Another way of conceptualizing articulatory effort, also in the biomechanical domain, defines it as an equivalent to the notion of *force*. In physics terminology, force means merely the application of effort to objects, whether there is displacement or not (Nelson, 1980; cited in Kirchner, 1998:40). The force involved in an articulation could be calculated according to the following equation (Kirchner, 1998:40):

$$F(t) = m \times \frac{dv}{dt}$$

m represents the mass

dv/dt represents the change in speed (or velocity) over time

The idea of effort as force is the most reasonable one, since it does not require actual displacement, though it acknowledges the role of displacement (ibid: 42).

3.3.3 Parameters of Articulatory Effort

If we accept the viewpoint that articulatory effort is essentially a biomechanical action, the next issue is to set the parameters that affect it. One of these parameters is *energy*. Energy could be defined as the whole exertion that is made by the muscles to move from the neutral to the target state (Kul, 2007:65). The energy that is used in articulating a particular sound or utterance is related to some other factors: time (the longer the sound or utterance, the more effortful), displacement of the muscle (the distance that has to be covered by the articulators; the longer the distance, the more energy needed), the speed of moving the muscles at a unit of time; the more rapid the movement, the more energy exerted), the mass of the active articulator (larger masses require more energy to move) (Boersma, 1998:149). Applying these variables to vowels, for

instance, it could be concluded that there is a positive correlation between the duration of the vowel and the articulatory effort required; the longer the vowel, the more effort has to be made in its articulation. In addition, high vowels are more effortful than the low ones, because higher vowels require longer displacement and subsequently more articulatory effort (Kul, 2007:78). For example, the /iː/ vowel is more effortful than /ɪ/ for two reasons. Firstly, /iː/ is longer than /ɪ/; it has a longer duration. Secondly, /iː/ is higher than /ɪ/; it demands covering a greater displacement.

The second parameter is the *number of articulatory gestures* that are involved in producing a particular sound or utterance. *Gesture* here means "a structured movement of the vocal organs which is directed towards a specific articulatory goal: e.g. any pattern of movement that achieves closure of the lips" (Mathews, 2007:158). The more articulatory gestures a sound involves, the more articulatory effort it demands. Comparing the /t/ and /d/ sounds (the two sounds are articulated at the same place and with the same manner of articulation), /d/ requires an additional articulatory gesture, which is the voicing of the vocal folds. The /d/ sound is, therefore, more effortful than its voiceless counterpart /t/ (Kul, 2007:66).

Another factor which has been found to be influential in articulatory effort is the *synchronization* of articulatory gestures. Synchronization is connected with the dimension of timing in articulating a particular sound. That is, setting two or more articulatory gestures into action simultaneously. The more articulatory gestures being produced synchronically, the more articulatory effort is made (Boersma, 1998:154). For example, in the production of the affricative consonants /tʃ/ and /dʒ/,

the airstream is blocked completely at first as in the articulation of any other plosive, but then the sounds are released with a friction noise just like in /ʃ/ and /ʒ/ (O'Connor, 1980:47).

Precision is the fourth parameter of articulatory effort. Precision could be defined as the degree of control needed to maintain the articulators and the airflow during the production of a particular sound. The more precise an articulatory gesture, the more effort it requires. Plosives are judged to be easier than fricatives due to the principle of precision, because fricatives require maintaining a narrow closure of airflow throughout the articulation process (Kul, 2007:66). Accurate actions usually demand much effort because we have to control our muscles and nerves on a delicate scale and a huge number of possibilities, something which everyone experiences when threading a needle or trying to write in a tiny handwriting (Napoli et al. 2014:426). High levels of precision in articulation result in a boost to the whole neuromuscular tension, and thus increasing the whole force required (Kirchner, 1998:52).

Up to this point, we have been discussing the parameters of articulatory effort separately, one parameter at a time. Yet, these parameters also have to be considered in their wholeness. That is, a key question could be posed: are all these parameters have the same degree of contribution to the experienced articulatory effort, or each parameter has its own value of influence? This is still an open question in articulatory phonetics, due to the fact that effort is essentially an intuitive variable (Kul, 2007:68). It is hoped that the results of the present study reveal something about this very important point, at least as far as it is related to the English diphthongs production.

3.4 Articulatory Phonology

Articulatory Phonology (henceforth AP) is a phonological model proposed by the American linguists Catherine P. Browman and Louis M. Goldstein in 1986. To fully understand the basic tenets, deep motives and the explanatory efficiency of the framework, it is necessary to illustrate the context in which AP occurs. That is, AP, like any other framework or theory, represents a reaction against the status quo; i.e. the phonological theory and its insufficiency in explaining some phonetic/phonological cases before its initiation.

3.4.1 The Distinctive Features Theory

Phonological theory, before AP, made a clear separation between the phonetic realities and their phonological representation. This tradition in phonology was heavily influenced by Chomsky and Halle's (1968) *The Sound Pattern of English*, which is a development of the ideas of the Russian linguists Roman Jakobson (1896-1982) and Nikolai Trubetzkoy (1890-1938), the leading pioneers of the Prague School. The cornerstone of the Prague School centres around the idea that language structure is essentially functional, in the sense that linguistic structures are not attested per se. Yet, each structure serves a particular functional role in the overall system of language. In other words, the Prague School scholars view language like a motor, where each component performs an assigned function and its nature is determined by and limited to the functions of the other components. The task of linguistics in this tradition is, therefore, to move from describing to explaining; from *what* to *why* (Sampson, 1980:103-104).

Applying these functional perspectives to phonology, the Prague School's scholars, Jakobson and Trubetzkoy in particular, proposed the

Distinctive Features theory. The theory argues that the phonological systems of languages are regulated in a way so that the most abstract and distinctive units of speech are the smallest functional units (which are called *phonemes*). That is, under the seemingly chaotic appearance of speech noise, there is an underlying system which constitutes a set of non-concrete and contrastive units where substituting one for another results in a change in the meaning of the word in question (ibid: 107-110)

These units (phonemes) are not concerned with the contextual or individual variations in the articulation of a particular segment; instead they narrow down speech from a disorganized phenomenon to its basic *functional* units (ibid). For example, the /p/ phoneme, in English, has two actual allophonic realizations: [p] and [pʰ]. The first is called *unaspirated* and the second is called *aspirated*. In the first case, there is no audible puff of air after the release of the /p/ (as in '*speak*' /spiːk/). In the second case, there is an audible puff of air following the release of the /p/; this case occurs when the /p/ comes at the beginning of the word and followed by a vowel (as in '*pain*' /pʰeɪn/). In spite of these facts, however, these two phonetically different variations of the /p/ are not reflected in the phonemic system of English. That is, this variation does not have any contrastive function; i.e. substituting one by the other does not produce a new different word.

Though phonemes are considered as abstract units, their nature is also established on an articulatory basis. That is, each phoneme is given a set of articulatory characteristics that distinguish it from the other phonemes. Consonants, for example, are classified according to three distinctive features: voicing (whether the vocal folds vibrate or do not), place of articulation (the point in the vocal tract at which the airstream is

constricted) and manner of articulation (the way or degree of constriction). Yet, what makes phonemes abstract is their psychological reality; that is, their representation in the speaker's mind as having these physical distinctive features after leaving out the individual subtleties (ibid: 122, 124).

The Distinctive Features theory was adopted and modified by Chomsky, who incorporated its basic principles into his account of phonology. The roots of this adoption lie in the fact that the theory goes hand in hand with Chomsky's competence/performance dichotomy and his general premise of what the linguistic theory should be. Chomsky drew a distinction between the speaker's abstract/mentalistic knowledge of his/her mother tongue (competence) and the actual/concrete demonstration of this knowledge in everyday communication (performance). He believes that the central concern of the linguistic theory should be investigating the competence of an ideal user of language who operates in an idealized speech community. For Chomsky, the actual performance of speakers is heterogeneous and characterized by false beginnings, rules breaking, sudden changes of ideas and so on. The investigation of performance is, therefore, more difficult and elusive (Chomsky, 1965:3-5).

The relationship between the Distinctive Features theory and Chomsky's dichotomy is obvious. The Distinctive Features theory neglects the individual and contextual (i.e. actual) differences in the production of speech segments and focuses on the mental and abstract units (phonemes) as represented in the speaker's mind. In other words, the abstract features of phonemes represent one part of the competence of the speakers knowledge (Anderson & Jones, 1974:1). Chomsky,

therefore, borrowed and built on the principles of the Distinctive Features theory and expanded the features covered to a great deal (Chomsky & Halle, 1968:299-300). For example, fricatives have the continuant feature in that they can be produced constantly without the need to stop and take a breath; so they are represented as [+continuant]. Stops, on the other hand, are non-continuant in that they cannot be produced repeatedly without stopping and taking a breath since they involve a complete closure of the airflow; so they are represented as [-continuant] (ibid:317-318).

Although the Distinctive Features theory, especially in its Chomskyan version, has developed the phonological theory and its basic principles are still relevant and useful both in phonological analysis and description, yet it is not sufficient by itself to fully describe the phonetic/phonological facts in their entirety. Since the theory focuses only on the features of speech that have a contrastive function, the logical implication is that it excludes all the other phonetic events that do not have such a function. The ultimate result is that the abstract phonological description is separated from the actual phonetic events. In addition, the theory presents the features in a discrete and non-overlapping way. That is, there is no room for the dimension of timing. Each segmental unit has its own fixed configurations in the vocal tract and the nature of continuous speech was regarded as a series of transitions between these configurations which are governed by indefinite physiological and linguistic mechanisms (Browman & Goldstein, 1986:219).

There are, therefore, many phonetic facts that are inexplicable in the light of the Distinctive Features theory, because not all actual phonetic phenomena have a contrastive function. For example, languages differ as

to whether plosives have an audible release effect or do not in the final position of words in consonant clusters. Yet, there is no language that employs the released/unreleased plosives contrastively. Another example could be found in the vowels duration when they precede voiced or voiceless plosives. While vowels before a voiceless plosive tend to be shorter than vowels occurring before a voiced plosive, the effect is obvious in particular languages than others. These facts have been, therefore, omitted from the phonological accounts of languages. A solution to these problems could be the formulation of two new features: [± release] and [± long]. There is, however, another problem with this solution. That is, considering the huge variety of phonetic phenomena across world's languages, the resulting variety of the formulated features would produce a fragmentary phonological theory, since each language imposes its own set of features (ibid: 221).

3.4.2 AP as an Alternative Model

All the discussion that is presented in the previous section represents the context from which the model of AP came out. That is, the initiation of the model was an attempt to fill the gaps and transcend the dilemmas of the Chomskyan framework in phonology. The proponents of the AP model tries to incorporate the components of dynamicity, timing and interactivity in their account of what phonology should be. In addition, one of the ultimate goals of AP is to close the apparent gap between the real phonetic actions and the phonological representation, which is a result of viewing speech as a series of isolated features associated with particular speech sounds.

3.4.3 Gestures as Contrastive Units

The basic and most revolutionary innovation of AP is the notion of *gesture*. To avoid the problems that are caused by the concept of isolated *features*, gestures are seen as the basic units of contrast in phonology. Articulatory gestures are concrete events that occur during the articulation process. The consequences of the articulatory gestures could be noticed in the activity of the articulators. Gestures consist of the generation and release of the obstruction in the vocal apparatus (Browman & Goldstein, 1992:156). For example, /p/ has a bilabial closing gesture and a glottis opening gesture. In other words, a gesture could be viewed as a task that has to be done or as a final destination that has to be reached, and to describe this task or destination we have to incorporate any organ (articulator) that contributes to achieving this task and reaching the required destination (Hall, 2018:530).

By conceiving speech production as a sequence of articulatory gestures, AP proponents believe that the units of producing speech are essentially dynamic activities, and not stable states. In addition, since AP centres its framework of description around actual articulatory events, it then sees the primary phonological units (articulatory gestures) as being constrained by the articulatory mechanisms rather than by psychological or acoustic constraints. Moreover, because the actions that are involved in speech production are achieved by different parts of the vocal tract, articulatory gestures overlap in different degrees (Browman & Goldstein, 1995:181).

Each gesture is described according to two dimensions: a temporal and a spatial dimension. Both of the dimensions could be represented in various ways. One way is to represent a gesture in the shape of a curve or

an angled line (see Figure 3.1), which has different *gestural landmarks*. The first landmark is the *onset*, which marks the beginning of the gesture. Then comes the *target*, which refers to the constriction of the gesture that is reached. The third component of a gesture is the *centre*, which represents the duration between the target and the phase in which the central phase ends (this phase is called the *release*). The last phase of a gesture is the *offset*, in which the control of the active articulator diminishes (Hall, 2010:819-820).

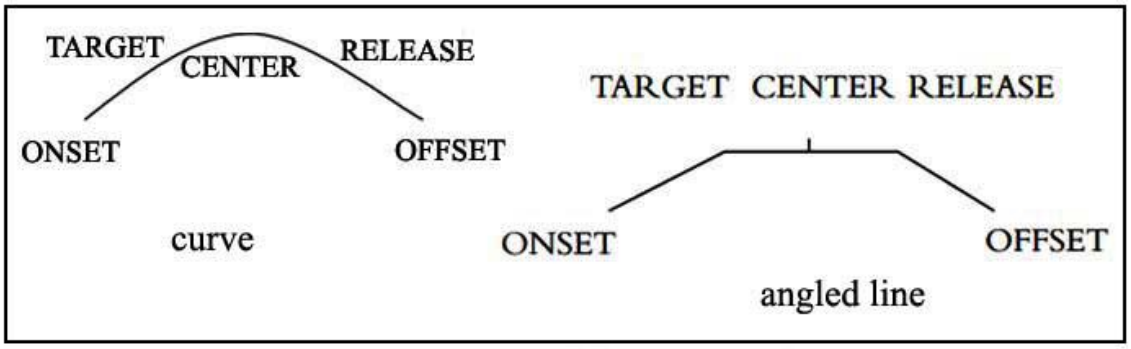

Figure 3.1
Ways of Representing Gestures
Adopted from (Hall, 2010:820)

To explicitly describe the particular articulatory gestures that are involved in the production of a speech sound or an utterance, the gestures are modelled according to *task dynamics*. Task dynamics represent frameworks that are used to systemize the coordinated movements of the multi-articulator speech actions. Task dynamics account for both the organs that are responsible for reaching and those that are responsible for speaking. For example, in the production of the velar plosive /g/, the tongue root is not directly responsible for producing the sound; yet, it moves towards the front in order to enable the back part of the tongue to reach the velum more easily (Browman & Goldstein, 1992:156).

Task dynamics describe the movement of *tract variables* instead of the movement of isolated articulators. A tract variable describes a dimension of vocal tract obstruction; the organs of speech that contribute to the constitution and release of this obstruction are ordered into a coordinated structure. For example, lip aperture as a tract variable is influenced by the movements of three organs of speech: the jaw, the lower lip and the upper lip. A single tract variable is described according to the group of articulators that are used to make a constriction. A gesture is, therefore, described in terms of the movement of a group of coordinated tract variables. (Browman & Goldstein, 1992:156). In Figure 3.2 below, tract variables (and their abbreviations) are listed along with the related articulators:

	tract variable	articulators involved
LP	lip protrusion	upper & lower lips, jaw
LA	lip aperture	upper & lower lips, jaw
TTCL	tongue tip constrict location	tongue tip, body, jaw
TTCD	tongue tip constrict degree	tongue tip, body, jaw
TBCL	tongue body constrict location	tongue body, jaw
TBCD	tongue body constrict degree	tongue body, jaw
VEL	velic aperture	velum
GLO	glottal aperture	glottis

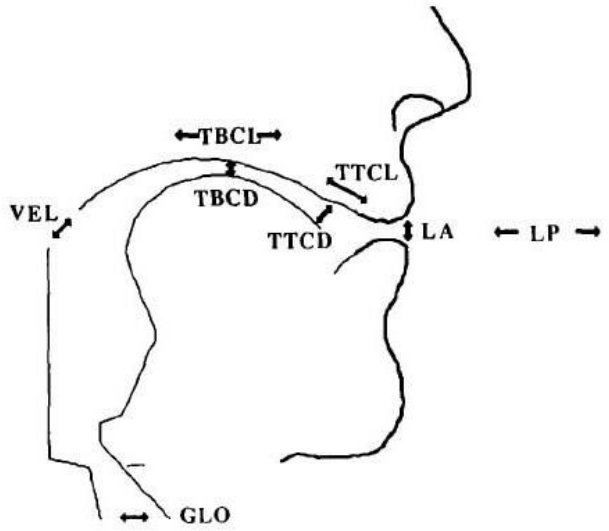

Figure 3.2
Tract Variables and the Related Articulators
Adopted from (Browman & Goldstein, 1989:207)

To illustrate how the tract variables of the gestures associated with a particular speech sound or utterance interact and operate in place and time, a gestural score is produced, usually by a special computer software designed for speech-related research such as Task Dynamics Application and Vocal Tract Lab. A gestural score (see Figure 3.3) portrays the tract variables of a gesture or a set of gestures across the time dimension, showing the overlaps, onsets and offsets of the gestures (Browman & Golstein, 1992:157-159).

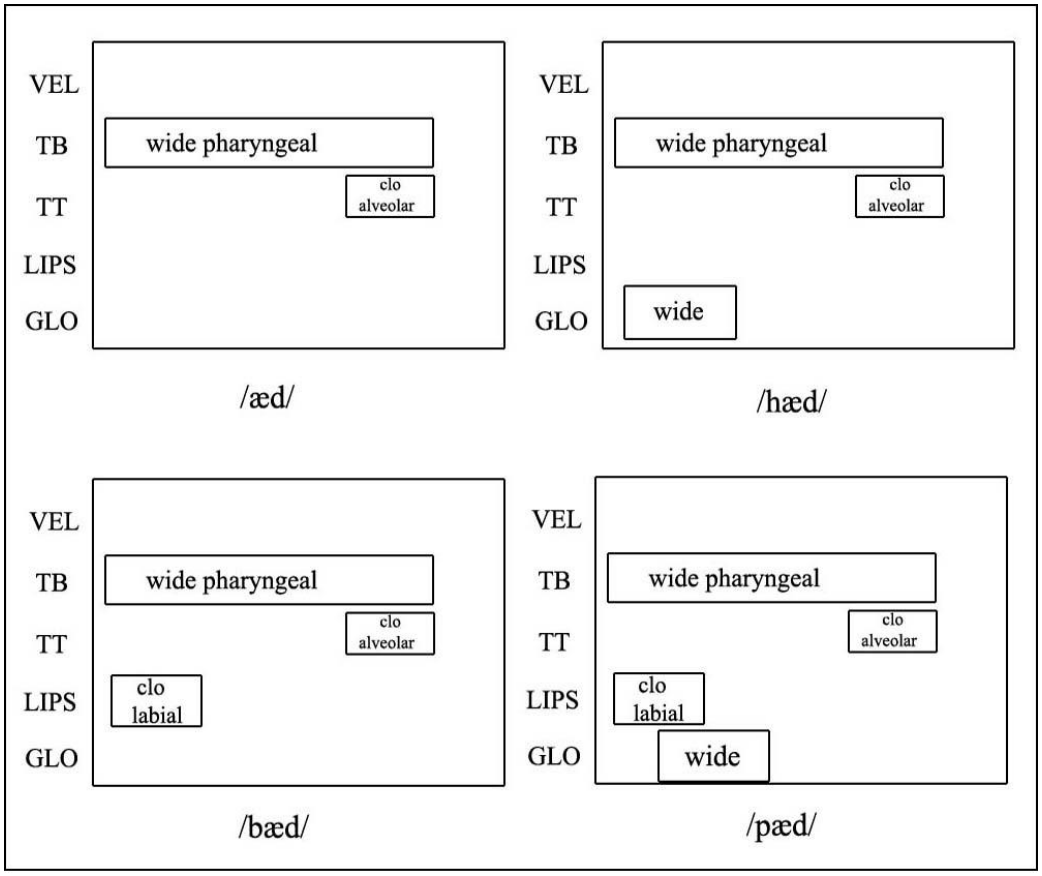

Figure 3.3
Gestural Scores of Two Contrasted Pairs
Adopted from (Browman & Goldstein, 1992:158)

The notion of gesture, however, does not necessarily have a one-to-one relationship neither with the concept of segment nor with features in traditional phonological theory. English voiced plosives, for example, could be described as having one gesture of velar, alveolar or bilabial closure (according to their place of articulation); but other sounds, like the voiceless plosives, have more than a single articulatory gesture. In the articulation of both /p/ and /b/, for instance, there is a bilabial closing gesture. Yet, for /p/ there is an additional gesture which is the opening and then narrowing of the glottis. One speech segment, therefore, could have two or more articulatory gestures. Concerning the relationship between gestures and features, one gesture could be associated with a bundle of features. For example, one bilabial closing gesture could be associated with the following features: [-vocalic], [+consonantal], [-coronal], [+anterior] and [-continuant]. Gestures, thus, represent coordinated movements in the laryngeal, oral and nasal systems (Browman & Goldstein, 1986: 224-225).

3.4.4 AP, EoA and Articulatory Effort

Since AP describes speech in a dynamic and interactive way, and tries to track the actual physical movements that unfold in the vocal tract rather than reduce the complexity of speech to a set of abstract and isolated segments and features, AP is the most appropriate framework to account for explaining EoA and articulatory effort mechanisms. EoA and articulatory effort, after all, are a result of the interaction and coordination of the different parts of the vocal apparatus. In addition, AP incorporates the spatio-temporal dimensions in its description, something which further contributes to the more comprehensive explanations offered by the model. More specifically, the parameters of articulatory effort (i.e.

time, displacement, the number of articulatory gestures, synchronization and precision) cannot be captured and fully explained, along with their demonstrations in speech (such as phonological processes like elision, assimilation, linking and the articulatory effort associated with particular sounds) unless they are put under the framework of AP (Kul, 2007:68-70).

One concrete evidence of the inevitable relationship between AP, EoA and articulatory effort could be clearly discerned in connected, casual speech. It is well-known that there is a noticeable difference between slow, careful and rapid, casual pronunciation of words and utterances. Sounds are usually omitted, affected by the adjacent sounds or added to ease the flow of speech. AP sees these processes as a result of the need to reduce the number of articulatory gestures or the overlap involved in producing the gestures. In other words, AP explains these phenomena in the light of its own perspective and framework (Browman & Goldstein, 1990:16).

The previously common viewpoint is that in phenomena like consonant dropping in three or more consonant clusters (e.g. dropping the /d/ in *'sounds '*) or consonant sequences of two adjacent words (e.g. dropping the /d/ in *'nabbed most'*) the sound in question is totally deleted to ease the pronunciation. Acoustic evidence was also presented as an additional proof that these sounds are totally absent; there was no acoustic representation of them in the spectrogram. These phonetic phenomena were formalized as the following phonological rule: d → Ø/C___C (where Ø means the sound is deleted, / means in the context and C___C means between two consonants) (Hall, 2010:825).

X-ray experiments motivated by the insights of the gestural approach to speech proposed by AP, however, reveals that, in the articulation of such utterances, the seemingly deleted sounds are not actually so. In the example words, the tip of the tongue is clearly raised for the /d/. The main reason why the sound is inaudible in such cases is that it is absolutely covered by the alveolar closing gestures demanded for the /n/ and /d/ in the first example and by the bilabial closing gestures required for the /m/ and /b/ in the second example; that is why the /d/ is inaudible, for its gestures are not freely released. Furthermore, what made specialists unable to explain this phenomenon effectively, before AP, was the omission of the time dimension in speech. That is, fast speech exhibits different processes (Browman & Goldstein, 1990:16-17).

Concerning assimilation in fast speech, superficially it seems that in particular contexts a sound adopts a particular feature of an adjacent sound. For example, the phrase '*seven plus seven*' typically sounds like /sevəmplʌs sevən/; the first /n/ adopts the bilabial feature of the adjacent /p/ and thus alternates to /m/. X-ray examinations of speakers pronouncing such phrases, however, reveal that the tongue is raised against the alveolar ridge as its typical position for the /n/ during the closing of the lips for the /m/. The conclusion is, therefore, that the alveolar closing gesture of the /n/ is not completely omitted, rather it is coincided by the bilabial closing gesture of the /m/, and so it is not released. Assimilation is, therefore, a result of the synchronization and overlap between articulatory gestures rather than a result of feature replacement (ibid: 18-19).

The omission of the schwa between two consonants in some languages, including English, also has been investigated by AP

researchers. Words like '*potato*', '*tomato*', '*canary*', '*perhaps*', '*today*', '*tonight*', '*police*', '*correct*' are usually pronounced without schwa in their first syllable (Roach, 2009:114). This phenomenon is explained as a kind of sound deletion for the purpose of facilitating pronunciation. AP oriented research, however, proves that the gestures of schwa (moving the tongue's centre towards the mid area of the vowel space) remain present in the vocal tract even when the schwa sound is omitted to the hearer. Schwa deletion, therefore, stems from the fact that the schwa gesture is greatly overlapped by the adjacent consonants and so it does not have any acoustic effects (ibid: 24). Figure 3.4 below shows the different states of schwa, where the dotted line represents the schwa gesture and the other angled lines represent the adjacent consonants gestures:

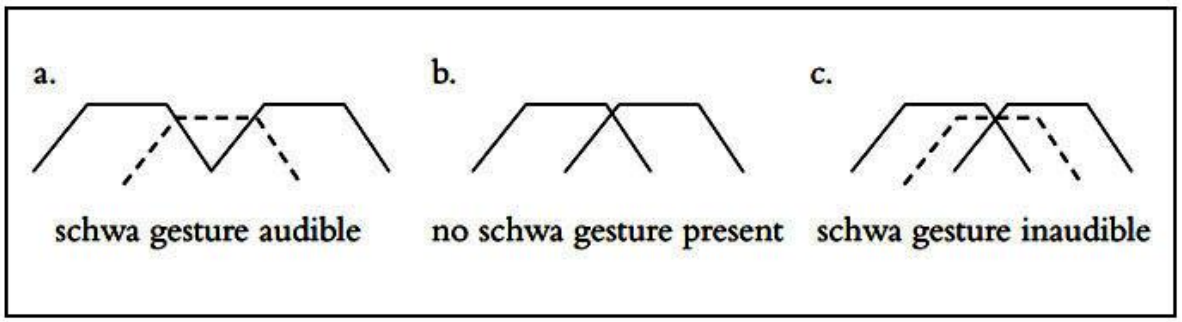

Figure 3.4
The Various States of Schwa
Adopted from (Hall, 2018:826)

3.4.5 AP and the English Diphthongs

Though describing English diphthongs is the business of the next section, it is necessary here to shed some light on the role of the AP model in describing English diphthongs. Diphthongs involve the transition or glide from one vowel position to another in the vocal tract. For example, the /aʊ/ diphthong involves the glide from a low-back to a

high-front position. If we follow this static description, then we would consider diphthongs to be merely a combination of two vowels. In reality, however, the /aʊ/ diphthong starts with a relatively central position and ends with a position lower than that of the /ʊ/ (Roach, 2009:18). Without such a dynamic description, we end up considering diphthongs as sequences of two separated vowels without any intrinsic diphthongal identity (Ladefoged & Johnson, 2015:97). Understanding the dynamic nature of articulating diphthongs will inevitably influence our understanding of the factors of time, displacement, synchronization, precision, etc. which determine the articulatory effort made in producing each diphthong (Kul, 2007:68-69).

3.5 The English Pure Vowels and Diphthongs

Since diphthongs represent a kind of vowels, it is necessary to understand the nature of vowels in general and then move on to describe the English diphthongs; for after all, diphthongs operate in the vowel space. In addition, a diphthong is essentially a glide from one vowel position to another, and to fully understand diphthongs it is necessary to understand these positions of vowels and their parameters (Roach, 2009:17-18).

3.5.1 The Nature of Vowels

Generally speaking, speech sounds are divided into two categories: consonants and vowels. The distinction between the two can be established either on phonetic or phonological grounds. Phonetically speaking, consonants are those speech sounds whose production involves an obstruction of the airstream at some point in the vocal tract. Vowels, on the other hand, are produced with an open mouth; that is, they involve a free passage of air with the least degree of obstruction of the airflow

(ibid: 10-11). If we consider the /t/ consonant, for example, it is clear that there is a complete obstruction of air at the alveolar ridge. In producing a vowel like /ɑː/, for instance, there is no such an obstruction, as air passes freely in the vocal tract (ibid).

Looking at the matter from a phonological perspective (that is, considering the distribution of phonemes in language), consonants are those sounds that occupy the *onset* and *coda* components of the syllable; which are the marginal and optional elements. Vowels, on the other hand, occupy the *peak* part of the syllable; which is the obligatory and central element (Abercrombie, 1967:38-40). For example, in the word 'ten' /ten/, which is a monosyllabic word, the /t/ is the onset, the /e/ is the peak (also called *nucleus*) and the /n/ occupies the coda.

3.5.2 The Vowel Space

Since vowels are produced in a way different from that of consonants, it is impossible to describe vowels according to the same parameters used to describe and classify consonants. All vowels are voiced, in contrary to consonants which can be voiced or voiceless. Furthermore, since there is no considerable constriction of the airstream, place and manner of articulation are also useless in describing vowels. Vowels, therefore, require a different system of classification and description (Collins & Mees, 2013:62).

Vowels are produced by the movement of the tongue in the vowel space. The vowel space can be visualized in a quadrilateral shape (also called the vowel chart, see Figure 3.5). The horizontal line represents the frontness of the tongue; the left direction represents the front part of the vowel space, and the right direction represents the back part of the vowel space. The vertical line represents the height; the top part represents a

high position of the tongue, and the bottom part represents a low position of the tongue. Looking carefully at the vowel chart, it is clear that the left part is becoming more sloping as it approaches the bottom part. This indicates the fact that as the tongue moves down, it becomes less and less able to move forwards. In other words, when the tongue is high it can go further than when it is in a low position (Knight, 2012:70). The boundaries of the vowel space in the oral cavity (see Figure 3.6) begin from the left end of the hard palate and end in the right limit of the soft palate (Ashby, 2011:87-88).

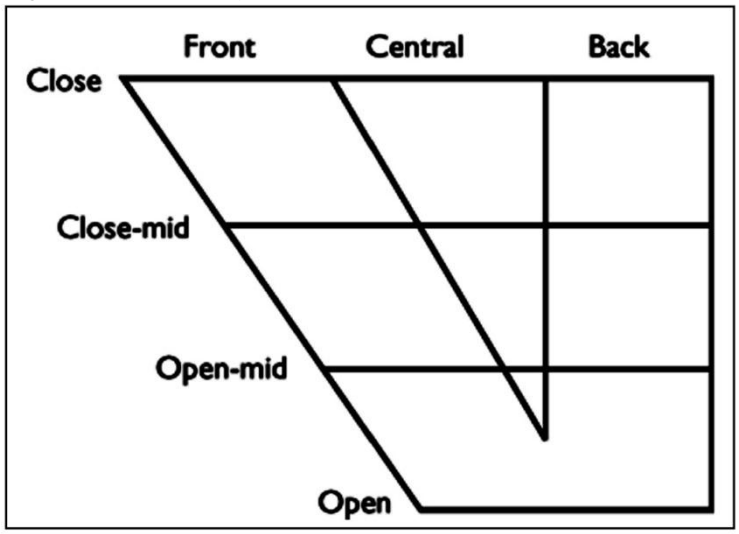

Figure 3.5
The Vowel Quadrilateral
Adopted from (Cruttenden, 2014:39)

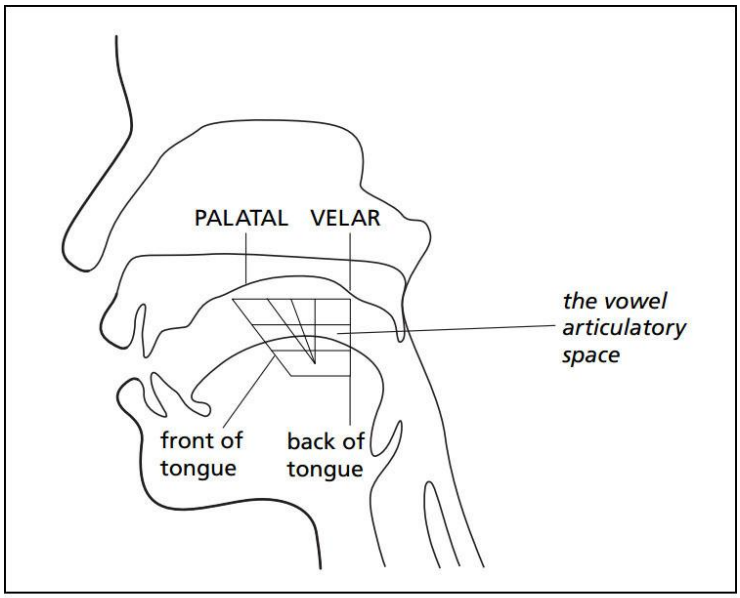

Figure 3.6
The Vowel Space Boundaries in the Oral Cavity
Adopted from (Ashby, 2011:88)

3.5.3 The Cardinal Vowels

As it is clear from looking at the vowel chart and considering the mechanisms of producing vowels, the vowel space offers a very large number of possibilities in which the tongue could be manipulated to produce different potential vowel qualities. To systemize the vowel space and, subsequently, limit the huge number of possibilities in it, the British phonetician Daniel Jones (1881-1967) devised a system of reference points that represents a set of vowel sounds that are produced in the most extreme points in the vowel space. These vowels are called the *cardinal vowels* and they are not the vowels of any language. Instead, they represent the vowels that can be produced with the least possibility to make a friction noise. In addition, cardinal vowels are used to set the vowels of a particular language by comparing its vowels points with the cardinal vowels (Abercrombie, 1967:151-155).

The cardinal vowels are 18 in total, divided into two subgroups: primary and secondary cardinal vowels (8 primary and 10 secondary). The primary set is given the numbers 1-8 and the secondary one is given the numbers 9-18. The primary group is considered more important and basic because the secondary set differs from the primary one only in the posture of the lips. For example, the cardinal vowel 1 could be described as high, front and unrounded. Vowel 9, on the other hand, could be described as close, front and rounded. The primary cardinal vowels are given the symbols [i e ɛ a ɑ ɔ o u], and the secondary ones are given the symbols [y ø œ Œ ɒ ʌ ɣ ɯ ɨ ʉ] (Zsiga, 2013:57-59).

Primary cardinal vowels, therefore, could be described in the following way: cardinal vowel 1 [i] is articulated with the lips in a spread position and the tongue is fully close and fully front, with the least

possibility to cause a friction effect. Cardinal vowel 2 [e] is pronounced with the lips in a spread position and the tongue is in the half-close region and front. Cardinal vowel 3 [ɛ] is produced in the half-open region and as front as it can be in this position and with unrounded lips. Cardinal vowel 4 [a] is fully open and fully front with unrounded lips. Cardinal vowel 5 [ɑ] is articulated with a fully back and fully low tongue and without lip rounding. Cardinal vowel 6 [ɔ] is produced in the open-mid area and as back as it can be with rounded lips. Cardinal vowel 7 [o] is pronounced in the close-mid region and with a fully back tongue and rounded lips. Cardinal vowel 8 [u] is articulated in an extremely back and close tongue position and with rounded lips. Cardinal vowels 1 and 5 are considered to be the original points upon which the vowel space quadrilateral is organized because cardinal vowel 1 represents the furthest front and close point and cardinal vowel 5 represents the furthest back and low point in the vowel space (Carr & Montreuil, 2013:8-9).

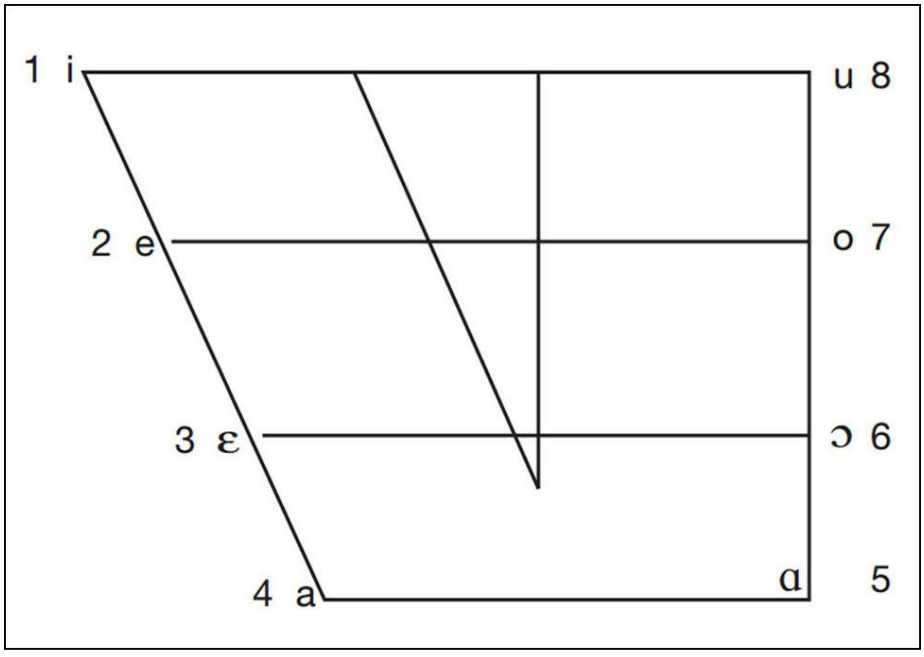

Figure 3.7
The Primary Cardinal Vowels
Adopted from (Knight, 2012:77)

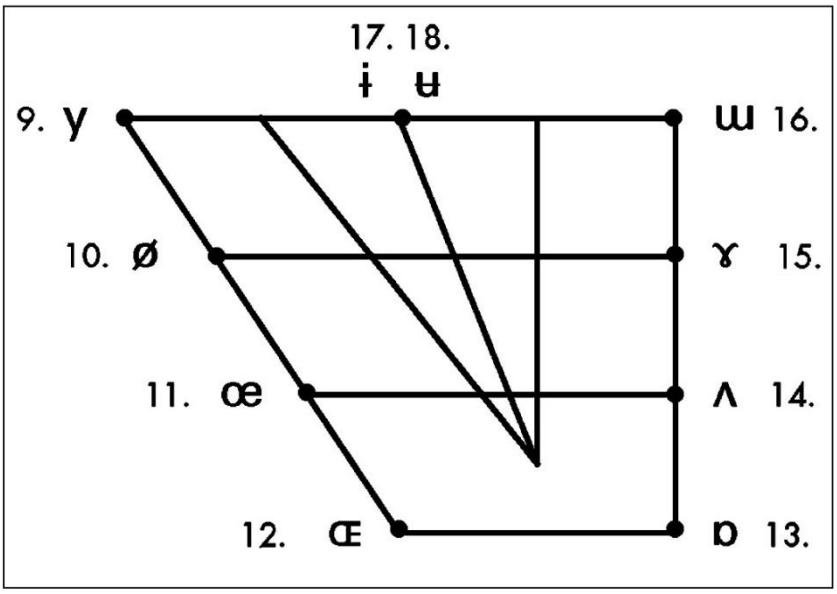

Figure 3.8
The Secondary Cardinal Vowels
Adopted from (Ball & Rahilly, 2013:96)

Cardinal vowels, in conclusion, represent a map according to which the actually attested vowels of the world's languages could be identified and located; cardinal vowels act as a map that can be used to navigate the various vowels of languages. A particular vowel of a certain language could be accurately located on the vowel chart by comparing it to the nearest cardinal vowel (Ashby, 2011:85). For example the /i/ vowel in German is more front and higher than that of English; in German, it is nearer to the Cardinal vowel 1 (see Figure 3.9).

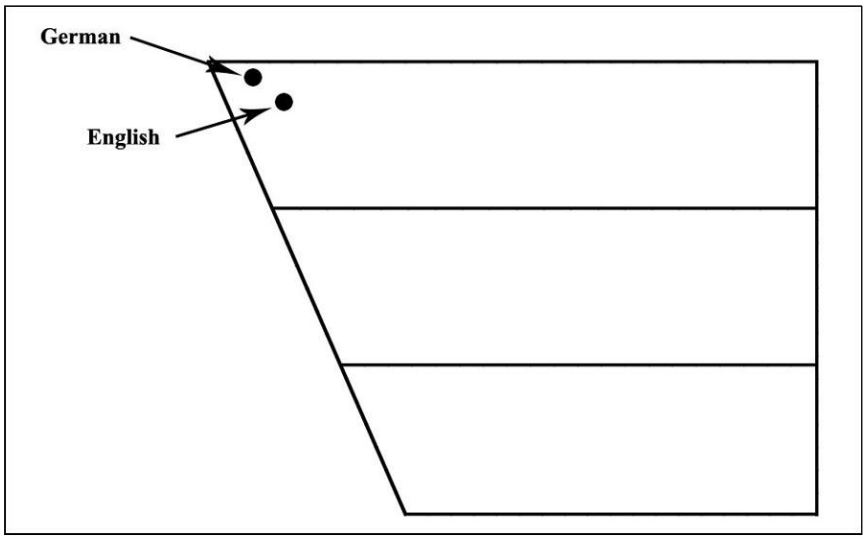

Figure 3.9
Positions of [i] in German and English
Adopted from (Davenport & Hannahs, 2010:42)

3.5.4 Vowels Description Parameters

Vowels are described in terms of three basic parameters: height, the tongue part and lip posture. The height factor refers to the movement of the tongue across the vertical dimension of the vowel space. In other words, it means to which degree the concerned tongue part is raised in the mouth. For the purpose of accounting for the height parameter, the vowel chart is divided into four divisions (see Figure 3.10): close (also called *high*), close-mid, open-mid and open (also called *low*). The English vowel /ʊ/ is produced by raising the back part of the tongue a great deal, so it is described as a close (or high) vowel. The tongue part refers to the section of the tongue which is raised higher than the other sections during the production of the diphthong in question; whether it is produced with raising the front, central or back part of the tongue. For example, the English vowel /ʊ/ is produced by raising the back part of the tongue (Knight, 2012:66-67).

The third parameter is concerned with the state of the two lips during the articulation of the diphthong; whether they are rounded or unrounded. The English short vowel /ʊ/ is produced with the lips in a rounded position. According to the three parameters that are used to describe vowels this vowel is labeled as *back – close – rounded*. It is also worth mentioning that these parameters are not absolute values. In other words, each parameter represents a continuum. For example, both of the vowels /ɪ/ and /iː/ are classified as high vowels; yet, the latter is noticeably higher than the former. (ibid: 67).

3.5.5 The English Monophthongs

Generally speaking, English vowels are divided into three kinds: pure vowels (or monophthongs), diphthongs and triphthongs (consist of a

diphthong followed by a schwa and not considered as part of the vowel inventory). Monophthongs are those vowels that do not change their direction during their whole duration; the tongue does not change its position and glide to another one (Roach, 2009:17-19). Monophthongs are described only according to the three just mentioned parameters of frontness, height and lip posture (Odgen, 2009:59). The RP English accent has twelve monophthongs: /ɪ , e , æ , ʌ , ɒ , ʊ , ə , iː , ɜː , ɑː , ɔː , uː/. Figure 3.10 illustrates their positions on the vowel chart.

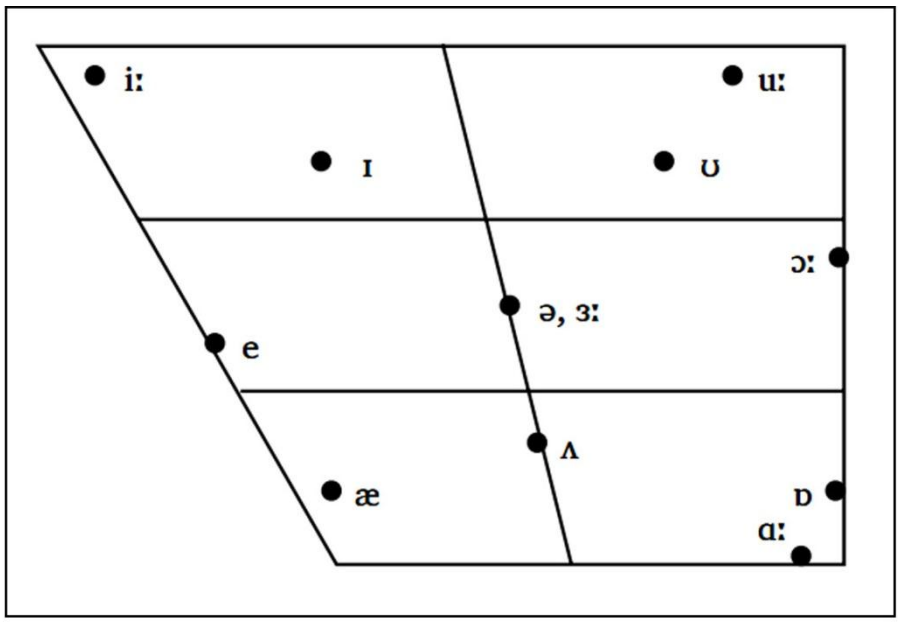

Figure 3.10
RP English Monophthongs
Adopted from (Ogden, 2009:69)

The vowel chart, however, does not account for the lip posture. In English, only the four vowels /ɒ , ʊ , ɔː , uː/ are articulated with rounded lips (Roach, 2009:14,17).

3.5.6 The English Diphthongs

Diphthongs are those vowels that involve a substantial change or glide from one vowel position to another. In other words, a diphthong

relatively represents a rough combination of two monophthongs (Reetz & Jognman, 2009:21). There are, however, two very interesting points that have to be made about diphthongs. First, the first element of a diphthong is longer in duration and, consequently, more prominent. More specifically, the second element of a diphthong occupies only one quarter of the whole duration (Roach, 2009:17). The second point is that the starting and ending points (the positions of the tongue in the vowel space) of a diphthong are different (although in different degrees) from the positions of the pure vowels that constitute it (see Figures 3.11 & 3.12). For example, the diphthong /aɪ/ starts with a vowel quality that lies almost between the front and the back parts of the tongue and then ends in the front area (Ladefoged & Johnson, 2015: 97-98).

English diphthongs are divided into two groups, according to the second part of the diphthong: closing diphthongs, ending with /ɪ/ or /ʊ/ and centring diphthongs (ending with a schwa) (Odgen, 2009:59). Diphthongs can be represented on the same vowel chart (see Figures 3.11 & 3.12). In the articulation of a closing diphthong, the second element is weak and usually does not reach a really close position. The quality of the resulting diphthong is a transition from a lower position to a closer position. Centring diphthongs glide towards the schwa vowel, which is a central one. As a result, centring diphthongs end with a tongue position which is nearer to the centre (higher in the case of /eə/ and lower in the cases of /ɪə/ and /ʊə/) (Roach, 2009:18). The English vowel inventory contains eight diphthongs:

1- Closing diphthongs: either ending with /ɪ/ (/eɪ , aɪ , ɔɪ/) or with /ʊ/ (/əʊ, aʊ/),

2- Centring diphthongs: /ɪə , ʊə , eə/ (Knight, 2012: 74).

The English diphthongs, accordingly, could be described as follows:

1- The /eɪ/ diphthong starts with a vowel position that is slightly less front than the position of the monophthong /e/ in the close-mid front area, and then moves towards the position of the pure vowel /ɪ/ with a slight movement of the lower jaw. The lips are in a spread position (Cruttenden, 2014:141).

2- The /aɪ/ diphthong starts with a position that lies in the front-open region and then moves towards the position of the pure vowel /ɪ/, with the lower jaw undergoing an obvious closing movement. The lips are neutral in the first element and slightly spread in the second element of the diphthong (ibid, 2014:143).

3- The /ɔɪ/ diphthong begins with a back-mid vowel position and then moves towards the pure vowel /ɪ/. The movement of the jaw is considerable, but it is less obvious than that of the /aɪ/ diphthong. The lips are rounded in the first element and neutral in the second (ibid: 144-145).

4- The /əʊ/ diphthong starts with a central position between the open-mid and close-mid (much similar to the position of the /ɜː/ vowel), and then moves towards the position of the monophthong /ʊ/. There is also a slight movement of the jaw. The lips move from a neutral to a rounded position (ibid: 146).

5- The /aʊ/ diphthong starts with a vowel quality between the back and front-open position (more front than the pure vowel /ɑː/), and then moves towards the position of the /ʊ/ monophthong. The tongue, however, is not raised closer than the close-mid region. The lips move from a neutral to a slackly rounded position (ibid: 149).

6- The /ɪə/ diphthong begins with a vowel quality that is approximately similar to that is associated with the pure vowel /ɪ/ and then moves towards a more open realization of the schwa. The lips remain neutral throughout the articulation of this diphthong (ibid: 154).

7- The /ʊə/ diphthong starts with a tongue position that is close to the position of the pure vowel /ʊ/ and then moves towards a more open and closer realization of the schwa. The lips are rounded at the beginning and then become spread (ibid: 155).

8- The /eə/ diphthong starts with a vowel position that is just below the open-mid area (clearly lower than that of the pure vowel /e/) and then moves towards a vowel position that is approximately similar to the position of the schwa. The lips remain neutral (Roach, 2009:18).

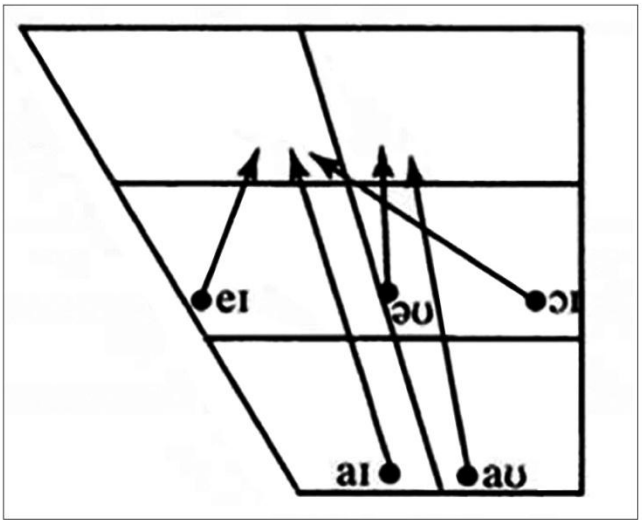

Figure 3.11
The RP English Closing Diphthongs
Adopted from (Roach, 2009:18)

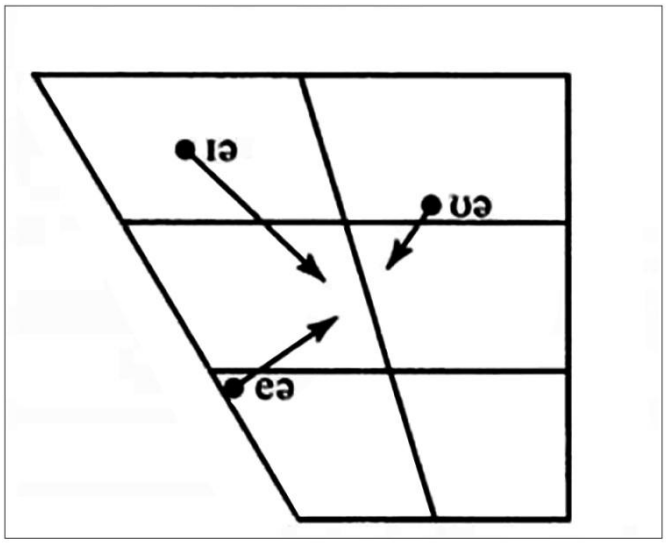

Figure 3.12
The RP English Centring Diphthongs
Adopted from (Roach, 2009:18)

3.6 The Iraqi Arabic Pure Vowels and Diphthongs

This section explores the Iraqi Arabic (henceforth IA) pure vowels and diphthongs. Since there is a possibility that the diphthongs of IA can influence the experienced easiness or difficulty in articulating the English diphthongs such a description of the IA vowels is necessary. In addition to the description, this section also presents a comparison between the English and Arabic monophthongs and diphthongs.

Before explaining the IA pure vowels and diphthongs, however, it is necessary to present a brief statement of what is meant by the Arabic language and the IA dialect. From a philological point of view, Arabic is classified as a Semitic language (it descends from the same origin of Assyrian, Hebrew and Aramaic languages). Arabic was not of interest to Western scholars until the 19th century as a by-product of orientalism and colonialism. Geographically speaking, Arabic-speaking people mainly inhabit the Middle East (Fathi & Qassim, 2019:693).

Contemporary Arabic is used in two broad forms: Modern Standard Arabic (henceforth MSA) and Colloquial Arabic (henceforth CA). MSA is the variation that is used in education, newspapers, magazines, governmental documents and news broadcasting. MSA, therefore, does not show any dialectal variations, for it is not the dialect of a particular region. CA, on the other hand, is used in managing the daily life affairs, and because of its local nature it has a wide array of variation. The differences between MSA and CA are found at the levels of phonological system, morphology, syntactic structure and lexis (Aljomaely, 2018:68)

The CA can be divided into five dialectal groups: The Arabian peninsula dialects, Mesopotamian dialects, Syro-Lebanese dialects, Egyptian dialects and Maghreb dialects (Versteegh, 2014:189).

Mesopotamian Arabic (IA) is, of course, not a totally homogeneous dialect that has no variations. Indeed, it represents a continuum of local dialects which differ from each other in different degrees. In addition, Mesopotamian Arabic is not spoken exclusively in Iraq. It also stretches to some areas in neighbouring countries such as Kuwait, Iran, Syria and Turkey (Ahmed, 2018:17).

Mesopotamian Arabic, in its current state, is influenced by various sources: the Classical Arabic, the Persian language, the Turkish language, the ancient Aramaic language, and finally some loanwords from the English language (Albuarabi, 2018:1373). Broadly speaking, the IA dialects could be classified into three categories: Baghdadi dialect (spoken in the Capital city of Baghdad and some central provinces such as Babylon), the Southern dialect (spoken in the south-eastern area, in Basrah, Thi-Qar, Misan and other provinces) and the Northern dialect (which is spoken in Mosul, Tikrit and other areas near them). There are some areas that combine different dialects. Al-Anbar, for examples, has a mixture of Baghdadi dialect and Bedouin dialects. The differences among these dialects can be phonological, syntactic or lexical (ibid:1377). For example, some of the southern dialects frequently have an /i:/ vowel in words like /biːt/ ‘house’and /liːʃ/ ‘why’. Baghdadi dialect speakers, on the other hand, use the long vowel /e:/ in such words..

Within these broad categories, there are also other regional and social sub-dialects; e.g. Muslim versus Christian dialects, urban dialects, rural dialects and marshlands dialects. In spite of this rich variety, though, the speakers of the different Iraqi dialects demonstrate a high degree of mutual intelligibility, regardless of some occasional cases. That is why

we can talk about the Iraqi dialect as a distinct one from other Arabic dialects (Ahmed, 2018:33).

3.6.1 The IA Pure Vowels

The IA dialect has nine pure vowels; four short and five long (Al-Bazi, 2006:6-10). IA, therefore, contains more pure vowels than MSA, which has six pure vowels; three vowels in each category (Ryding, 2005:25). An interesting point that could be noticed concerning the IA monophthongs is that the difference between the short and long vowels is primarily a matter of duration. That is, the long vowels are longer versions of their short counterparts. There may be, however, a contextual, but not phonemic, difference in quality. In other words, an adjacent consonant may affect the quality of the vowel and alter it, but the resulting vowel is not an independent phoneme. For example, in the Arabic word /ṭʌn/ (ton), the vowel /ʌ/ is an allophone of the vowel /e/; they are both represented by the diacritic 'fatha' (ً) in the Arabic orthography. The /ʌ/ vowel, however, is not an independent phoneme of the IA dialect; it is just a contextual adaptation (Erwin, 2004:3-5).

The monophthongs of the IA dialect are listed and described below (Ridha, 2015:22):

Short Vowels

/i/ front – close – unrounded as in /dʒibit/ (I brought)

/e/ front – mid – unrounded as in /dem/ (blood)

/a/ central – open – unrounded as in /nas/ (people)

/u/ back – close – rounded as in /mu̲na:/ (a female proper noun)

Long Vowels

/i:/ front – close – unrounded as in /ti:n/ (fig)

/e:/ front – mid – unrounded as in /ṭe:r/ (bird)

/a:/ central – open – unrounded as in /na:r/ (fire)

/u:/ back – close – rounded as in /ru:ħ/ (go)

/o:/ back – mid – rounded as in /ho:r/ (marsh)

In spite of the obvious differences in quality and length, the IA pure vowels can be roughly compared to the English monophthongs in the following way (Al-Bazi, 2006:8):

/i/ resembles /ɪ/ as in 'sit' /sɪt/ /e/ resembles /e/ as in 'bet' /bet/

/a/ resembles /æ/ as in 'man' /mæn/ /u/ resembles /ʊ/ as in 'book' /bʊk/

/i:/ resembles /i:/ as in 'feet' /fi:t/ /a:/ resembles /ɑ:/ as in 'heart' /hɑ:t/
/u:/ resembles /u:/ as in 'food' /fu:d/ /o:/ resembles /ɔ:/ as in 'for' /fɔ:/

In conclusion, some interesting statements could be drawn concerning the differences and similarities between the English and IA vowel systems. The RP vowel system has twelve pure vowels, while the IA has only nine monophthongs. This fact, however, means that there are only three RP vowels that are absent in IA. All other RP monophthongs have comparative IA equivalents. This matter is considered as an added advantage for Iraqi EFL learners, since the majority of RP pure vowels have counterparts in their mother tongue. This similarity enables the learners to be more sensitive to the differences among the RP vowels (Al Abdely & Thai, 2016:4).

3.6.2 The IA Diphthongs

The diphthongs of the IA dialect consist of one short or long vowel followed by a semi-vowel (either /j/or /w/). All IA diphthongs, therefore, start with a vowel sound and end with a rapid smooth glide to a vowel quality that roughly resembles the English close-back-rounded monophthong /u:/ or the close-front-unrounded pure vowel /i:/. The IA dialect basically contains four diphthongs (Erwin, 2004:26-27, 38). These diphthongs can be described in the following way:

1- The diphthong /a:w/ begins with the long vowel /a:/ and ends with a glide towards a vowel quality which resembles the English /u:/. This diphthong is quite close to the English /aʊ/ but it differs in two points: first, the first element of the IA diphthong is longer in duration, and second, the second element is tenser and involves a more rounding movement in the lips (ibid: 26).

e.g. 'Faw' /fa:w/ (an Iraqi town) /wa:w/ (an alphabetical letter)

2- The diphthong /aw/ starts with the short vowel /a/ and ends in the same way of the /a:w/ diphthong. This diphthong is somewhat similar to the English diphthong /əʊ/, but it is articulated without the drawling effect that is found in the English diphthong, and the second element is tenser and involves a more rounding movement in the lips (ibid).

e.g. /dʒaw/ (weather) /mawdʒu:d/ (existing)

3- The diphthong /a:j/ consists of the long vowel /a:/ as its first element followed by a glide towards a vowel which resembles the English monophthong /i:/. This diphthong is roughly similar to the English diphthong /aɪ/, but it differs in that its two elements are longer in duration than their English counterparts (ibid: 38).

e.g. /tʃa:j/ (tea) /ha:j/ (this 'female')

4- The diphthong /ay/ consists of the short vowel /a/ as its first element followed by a glide which is similar to that which is found in the /a:j/ diphthong. This diphthong can be thought of as similar to the English diphthong /eɪ/, but its second element is more like the /i:/ monophthong (ibid: 38-39).

e.g. /faj/ (shade) /ajman/ (right-handed)

In addition to these diphthongs, some loanwords in IA contain the English diphthong /ɔɪ/, such as /sɔɪja:/ 'soya', /bɔɪja/ 'a painting brand', /bɔɪ/ 'waiter' and the interjection that is produced to express pain (/ɔɪ/). Concerning the centring diphthongs, the IA dialect does not contain diphthongs that glide towards a central vowel. There are, however, some IA words that include certain combinations of vowels that are approximate to the English centring diphthongs. For example, some IA sub-dialects replace the pure vowel in words like /ze:n/ 'good', /we:n/ 'where' and /dʒe:b/ 'pocket' with a diphthong which roughly resembles the English centring diphthong /ɪə/; /zɪən/, /wɪən/ and /dʒɪəb/ (Ahmed, 2018:27).

The English diphthong /eə/ has no close equivalent in the IA dialect, except some rare cases such as the female proper nouns /heə/ and /reə/. Some other words contain vowel combinations that can be thought of as rough equivalents to the English diphthong /ʊə/. These combinations could be found in words like /qu:wa/ 'force', /hu:wa/ 'he' and /duwa/ 'medicine'. It is worth noting, however, that the combinations which resemble the English centring diphthongs are not as frequent as the closing diphthongs in IA (Aziz, 1974:70-71).

At this point, it is seems necessary to infer some predictions about the potential relevance of the differences and similarities between RP English and IA to the experienced articulatory effort of Iraqi EFL learners. RP English contains eight diphthongs. IA, on the other hand, contains four vowels (/a:w/, /aw/, /a:j/ and /aj/). Four English diphthongs, therefore, are not attested in IA, or rather occur in very occasional cases. Accordingly, there is a possibility that Iraqi EFL learners find these diphthongs more difficult than the others. Non-native speakers, usually find peculiar foreign language sounds more difficult due to cognitive and mechanical reasons. In other words, they do not have mental constructs for these phonemes and, thus, their organs of speech are not familiar with these sounds' unusual articulatory movements (Al Abdely & Thai, 2016:2).

Chapter Four

Methodology and Results Analysis

4.1 Introduction

This chapter deals with the practical part of the study. It begins with giving full information about the subjects that have participated in the study. Then, the chapter presents the stimuli, the procedure and method of the study and the rationale behind them. After that, the chapter moves to explaining the statistical part of the study and how it has been implemented. Finally, the chapter analyzes the results of the study and presents the easiness scale of English diphthongs and the influential factors behind it.

4.2 The Subjects

The subjects of the study are 30 (8 males and 22 females) MA students of linguistics of the academic year 2019-2020. The subjects are recruited from the University of Misan/College of Education/Department of English (18 students) and the University of Basrah/College of Education for Human Sciences/Department of English (12 students). Nineteen of the subjects are in their first year (modules year) and 11 of them are in their second year (research year). The ages of the subjects range between 23 and 43. All the subjects are Iraqi Arabic native speakers. The subjects also descend from different Iraqi provinces: 15 from Misan, 11 from Basrah, 1 from Mosul, 1 from Thi Qar, and 2 from Al-Muthanna. None of the subjects reported any hearing or speech defects.

The study is carried out on postgraduate students in order to get more reliable results. Due to their advanced training in phonetics, postgraduate students are supposed to have a good command of the English speech sounds production and their phonetic symbols. MA students also have a good awareness of their organs of speech and their movements. In addition, postgraduate students are also expected to be careful in their answers and sensitive to the precision and delicacy of the research process and the results that will be gained from their answers, since the subjects are either current researchers or would-be researchers.

Table 4.1: The Subjects of the Study

No.	Age	Gender	Modules/Research Year	Province	University
1	27	Male	Research Year	Al-Muthanna	Basrah
2	23	Female	Modules Year	Al-Muthanna	Basrah
3	25	Female	Modules Year	Basrah	Basrah
4	23	Female	Research Year	Basrah	Basrah
5	27	Male	Modules Year	Basrah	Basrah
6	23	Female	Modules Year	Basrah	Basrah
7	31	Female	Modules Year	Basrah	Basrah
8	30	Female	Research Year	Basrah	Basrah
9	41	Male	Modules Year	Basrah	Basrah
10	43	Male	Research Year	Basrah	Basrah
11	25	Female	Research Year	Basrah	Basrah
12	41	Male	Research Year	Basrah	Basrah
13	39	Male	Modules Year	Basrah	Misan
14	25	Female	Research Year	Misan	Misan
15	26	Female	Modules Year	Misan	Misan
16	24	Female	Modules Year	Misan	Misan

17	28	Female	Modules Year	Misan	Misan
18	38	Female	Modules Year	Misan	Misan
19	27	Female	Research Year	Misan	Misan
20	24	Female	Modules Year	Misan	Misan
21	26	Male	Research Year	Misan	Misan
22	23	Female	Modules Year	Misan	Misan
23	29	Female	Modules Year	Misan	Misan
24	30	Female	Modules Year	Misan	Misan
25	26	Female	Modules Year	Misan	Misan
26	30	Female	Modules Year	Misan	Misan
27	29	Female	Research Year	Misan	Misan
28	34	Female	Research Year	Misan	Misan
29	32	Male	Modules Year	Al-Mosul	Misan
30	27	Female	Modules Year	Thi Qar	Misan

4.3 The Stimuli

The stimuli of the study are presented in the form of a group of questions that have to be answered by the subjects. There are three reasons for choosing the method of directly questioning the subjects about the articulatory effort they experience in articulating the English diphthongs. Firstly, there is no other way in which we can investigate the articulatory effort; that is effort is essentially an intuitive attribute. Secondly, this method was employed in many previous studies, such as Malécot (1955), Locke (1972), Parnell & Amerman (1977), Gordon-Bouvier *et al.* (2015) and Robieux & Meunier (2015). The third reason is that it has been proved that the articulatory effort required for producing speech sounds could be felt and judged properly by the speakers

(Malécot, 1955:36). Moreover, using questionnaires usually implies asking the subjects to answer some questions on the basis of their personal opinions about some points or issues. Using questions to investigate the articulatory effort, however, examines what the subjects actually feel when producing a speech sound.

The questions cover the organs that are involved in the articulation of the diphthongs: the jaw, the lips, the throat and the tongue. There are also two additional questions: one is about the easiness of the diphthong in question in general (in order to know which factors, parameters and organs determine the overall level of articulatory effort, because we do not know for certain what is the weight of each parameter in shaping the experienced effort) and the other question asks the subjects to compare the English diphthongs with the nearest ones found in IA (the IA diphthong is represented by Arabic example words which contain those diphthongs) and to say whether or not they both have the same degree of easiness. The question about easiness is deliberately delayed so that the subjects will not be confined by its answer when they answer the questions about the jaw, lips, tongue and throat.

The subjects are asked to repeat the sound for each question in order to focus their attention only on the intended organ and then underline or circle their answer. Each diphthong is put in a /Diphthong + h/ pattern. The subjects are told that the /h/ is not intended to be pronounced as a sound, but it is just intended to make an aspirational effect in order to let the diphthong take its full duration and give the speaker an opportunity to let his/her breath out and go on to pronounce the next diphthong. At the bottom of the questionnaire sheet, there is a blank space for the subjects

to write their own notes or clarifications of their answers. The questions are formulated as follows:

1- Do you feel any tension in your jaw ? **Yes** **No**

2- Is there any contraction in your lips ? **Yes** **No**

3- Do you experience any strain in your throat ? **Yes** **No**

4- Is there any tension in your tongue ? **Yes** **No**

5- Do you find the production of this diphthong easy, or difficult ? **Easy** **Difficult**

6- Is this diphthong as easy as your mother tongue's (as in …….) ? **Yes** **No**

Concerning the Arabic example words, they are carefully chosen to be simple and very frequent ones. The IA diphthongs are presented in whole words, not in isolation, in order to keep their intrinsic features of quality and duration in their natural context. In other words, if they are presented separately, the subjects might subconsciously produce them like their English matches. In addition, the many and different Iraqi accents are also taken in consideration; the words are carefully selected so that their diphthongs have the same pronunciation in almost all the Iraqi accents, so that there would be no difference in the pronunciation of the words, which will lead to a difference in the experienced articulatory effort; since the variation in vowels represents an important aspect of the differences among Iraqi Arabic accents:

əʊ /mawdʒu:d/ (existing) ɔɪ /bɔɪ/ (waiter)

aɪ /tʃa:j/ (tea) eɪ /ajmen/ (right-handed)

aʊ /fa:w/ (Al-Faw district) eə /heə/ (a proper noun)

ʊə /hʊə/ (he) ɪə /hɪə/ (she)

For the Arabic word that stands for the /eə/ diphthong, the subjects have been asked to pronounce the (ـِـْ) without much stress in order for it to become closer to the English diphthong. In addition, for the Arabic word that is intended to represent the /əʊ/ diphthong (/mawdʒu:d/), the subjects were asked to focus on the first syllable and base their answers on it, because the second syllable has a different vowel, which comparatively resembles the English pure vowel /uː/.

The order of presenting the diphthongs is also randomized in two different ways. Firstly, no two successive diphthongs begin or end with the same element are allowed, so that there will be no confusion of the IPA symbols. Secondly, no two successive diphthongs belong to the same category are allowed. Concerning the closing diphthongs, no two successive diphthongs ending with the same element (/ʊ/ or /ɪ/) are given. The diphthongs, therefore, are presented in the following order:

A closing diphthong beginning with /ə/ and ending with /ʊ/ əʊ

A closing diphthong beginning with /e/ and ending with /ɪ/ eɪ

A centring diphthong beginning with /ʊ/ and ending with /ə/ ʊə

A closing diphthong beginning with /ɔ/ and ending with /ɪ/ ɔɪ

A closing diphthong beginning with /a/ and ending with /ʊ/ aʊ

A centring diphthong beginning with /ɪ/ and ending with /ə/ ɪə

A closing diphthong beginning with /a/ and ending with /ɪ/ aɪ

A centring diphthong beginning with /e/ and ending with /ə/ eə

4.4 The Procedure and Method

In order to answer the research questions and achieve the aims of the study, a number of steps are taken. The subjects were informed about the purpose of the study and what is expected from them to do. They also received a brief instruction about the notion of articulatory effort with some illustrative examples both from their mother tongue (IA) and from English. The example sounds are not vowels or diphthongs, so that the subjects' answers would not be affected by the researcher's judgment.

To ensure that the subjects pronounce the English diphthongs correctly, they were asked to pronounce them before the researcher. Their performance was recorded for the purpose of documentation. The recording device is a microphone of the SENNHEISER brand (made in Germany) and of the e945 model. The microphone was connected to a laptop; TOSHIBA, Intel Core i3-2310M CPU, 4 Gigabytes RAM, and the operation system is Windows 7 (32 bit). The programme used for sound recording was Absolute Sounds Recorder Version 4.8.0 2014, which is an award-winning recording software and powered by IAudio Soft Company. The recording format is MP3 44100 Hz, 128 kbps. The recording quality is 1024 bit. The recording process was conducted in the supervisor's quiet office at the University of Basrah/College of Education for Human Sciences/English Department and, for students studying at Misan University, the recording has been done in the postgraduate students' room.

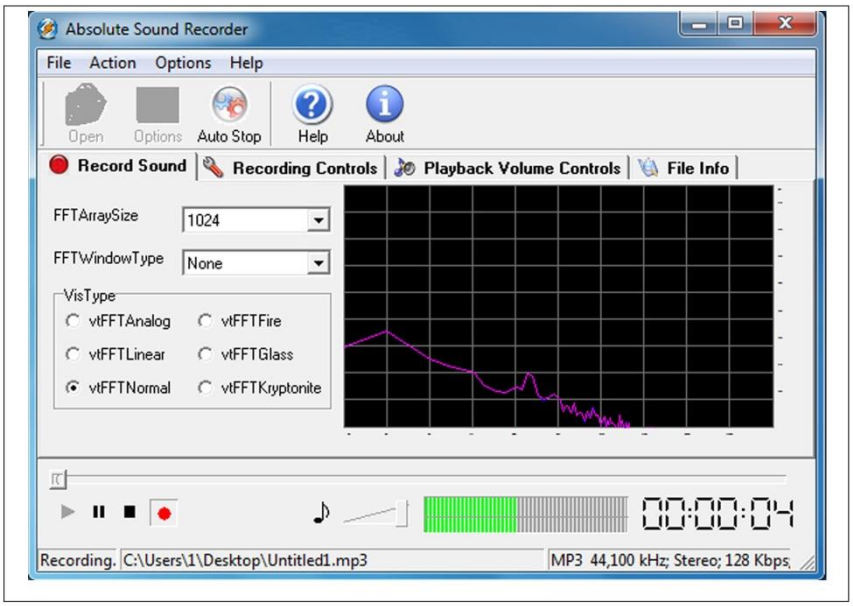

Figure 4.1: Absolute Sound Recorder Window

The subjects were given a sheet of paper which contains the English diphthongs written in IPA symbols. The diphthongs are also attached to the /h/ sound as in the stimuli. For each diphthong, there is also an example word which is not pronounced, but just intended to give the subjects a clue about the diphthong if he/she get confused about the phonetic symbols. The words are deliberately selected to be simple ones in terms of their orthography (none of them contains unusual spelling-pronunciation associations), phonological complexity (all of them are monosyllabic) and frequency (all of them are on the *Longman Dictionary of Contemporary English 6th Edition* list of the 1000 most frequent words in English):

əʊh	*no*	ɔɪh	*boy*	aɪh	*die*
eɪh	*may*	aʊh	*now*	eəh	*air*
ʊəh	*poor*	ɪəh	*ear*		

After finishing the recording process, the subjects were given the questionnaire sheet. The first page requires the subjects to fill in a form of personal information: name, age, gender, academic year (whether the participant is in the modules year or the thesis year) and residence. Then, they were asked to articulate each diphthong and answer the related questions.

4.5 Statistical Tests Used

Since the present study aims to find out which diphthongs are easy to articulate and which are difficult, the implication is that one of the outputs of the study would be a scale or continuum whose first extreme begins from the easiest diphthong and its other extreme ends with the most difficult diphthong. To obtain such a scale of easiness, the percentages of the subjects' responses are calculated. The diphthongs are then ranked from the easiest to the most difficult one depending on the percentages of easiness.

To investigate the factors that determine the easiness and difficulty experienced in articulating the English diphthongs, the easiness values are correlated with values of the tension the subjects experience in the jaw, lips, tongue, throat and the values of the easiness they experience in their first language diphthongs. The values are then compared in order to find out which factors are more influential than others.

The correlation coefficient is counted by the use of Pearson Correlation Coefficient formula (*r* test), which is a mathematical formula, that is used to investigate the relationship between two related variables (correlation coefficient). The formula is:

$$r = \frac{\Sigma xy - \frac{(\Sigma x)(\Sigma y)}{N}}{\sqrt{\left(\Sigma x^2 - \frac{(\Sigma x)^2}{N}\right)\left(\Sigma y^2 - \frac{(\Sigma y)^2}{N}\right)}}$$

Where:

Σx= sum of scores in x distribution

Σy= sum of scores in y distribution

Σx^2= sum of the squared scores in x distribution

Σy^2= sum of the squared scores in y distribution

Σxy= sum of the products of paired x and y scores

N= number of paired x and y scores

(Riazi, 2016:235)

Once the values are replaced in the formula and the ultimate result is obtained, then, the result will be between the two numbers -1 and +1. If the result is a negative number, then the relationship between the variables is reversal (one of the variables increases as the other decreases). A positive number, however, reveals a positive relationship between the variables (the two variables increase or decrease together). The magnitude of the *r* value indicates the degree of the relationship. If the value is 1, it is considered as an indication of perfect correlation. If the resulting number is 0, then there is no relationship between the variables. Another important point in extracting the correlation coefficient is connected with the *significance* of the value. That is, not any positive value indicates a significant relationship between the

variables in question. The minimum significance level is 0.05. Any value which equals or is higher than 0.05 is considered as *statistically significant*, or otherwise it is not significant; it indicates a casual rather than a systematic relationship (ibid).

4.6 The Easiness Scale

Tables (4.2-4.9) below report the responses of the subjects for the eight English diphthongs. In the columns of jaw, lips, throat and tongue, a (✓) mark indicates that the participant experiences tension or strain in the concerned area. A (×) mark, however indicates that there is no such tension. In the column of easiness, a (✓) indicates that the concerned diphthong is judged to be easy, a (×) mark indicates that the diphthong is judged to be difficult. In the column of L1 diphthong (first language diphthong), a (✓) mark indicates that the participant experiences the same level of easiness that is found in his/her first language diphthong. A (×) mark, on the other hand, means that the English diphthong is not as easy as the subject's mother tongue diphthong.

Table 4.2: The Subjects' Responses for the Articulation of the English Diphthong /əʊ/

No.	Jaw	Lips	Throat	Tongue	Easines	L1 Diph.	No.	Jaw	Lips	Throat	Tongue	Easines	L1 Diph.
1	×	✓	✓	×	×	×	16	×	✓	✓	×	✓	✓
2	✓	×	✓	×	×	×	17	×	×	×	×	✓	×
3	✓	✓	×	×	✓	✓	18	✓	×	×	×	✓	✓
4	×	×	×	×	✓	×	19	✓	×	×	×	✓	✓

5	✓	✓	✓	×	×	✓	**20**	×	×	✓	×	×	✓
6	✓	×	✓	✓	✓	✓	**21**	✓	×	✓	×	✓	✓
7	×	×	×	✓	✓	×	**22**	✓	✓	✓	✓	×	×
8	✓	✓	✓	×	×	×	**23**	✓	✓	✓	✓	×	×
9	×	✓	×	×	×	✓	**24**	✓	✓	✓	✓	×	×
10	✓	×	×	×	✓	✓	**25**	×	×	×	×	✓	✓
11	✓	✓	×	×	✓	✓	**26**	×	✓	✓	×	×	✓
12	×	✓	×	✓	✓	✓	**27**	×	×	✓	×	×	✓
13	×	×	✓	×	✓	×	**28**	✓	✓	✓	✓	×	×
14	✓	×	✓	×	×	×	**29**	✓	✓	✓	✓	×	×
15	×	✓	✓	✓	×	×	**30**	×	×	×	×	✓	✓

Table 4.3: The Subjects' Responses for the Articulation of the English Diphthong /eɪ/

No.	**Jaw**	**Lips**	**Throat**	**Tongue**	**Easines**	**L1 Diph.**	**No.**	**Jaw**	**Lips**	**Throat**	**Tongue**	**Easines**	**L1 Diph.**
1	×	×	✓	×	✓	✓	**16**	✓	×	✓	✓	✓	✓
2	✓	×	×	×	✓	✓	**17**	×	×	×	×	✓	✓
3	✓	×	×	✓	✓	✓	**18**	✓	×	×	×	✓	✓
4	×	×	✓	×	✓	✓	**19**	×	×	✓	×	✓	✓
5	✓	×	✓	✓	✓	✓	**20**	✓	×	✓	×	×	×
6	×	×	✓	×	✓	✓	**21**	✓	×	✓	×	×	✓
7	×	×	✓	✓	✓	✓	**22**	×	×	×	✓	✓	×
8	×	×	✓	×	✓	✓	**23**	×	×	×	×	✓	✓
9	×	×	✓	×	✓	✓	**24**	×	×	×	×	✓	×
10	✓	×	×	×	✓	✓	**25**	×	×	×	×	✓	✓
11	✓	×	✓	×	✓	✓	**26**	×	×	×	✓	×	×

12	✓	✓	×	×	✓	✓	**27**	×	×	×	✓	×	×
13	×	×	✓	×	✓	✓	**28**	×	×	×	×	✓	✓
14	✓	×	×	×	✓	✓	**29**	×	×	×	×	✓	✓
15	✓	×	✓	×	✓	✓	**30**	×	×	×	✓	×	×

Table 4.4: The Subjects' Responses for the Articulation of the English Diphthong /ʊə/

No.	**Jaw**	**Lips**	**Throat**	**Tongue**	**Easines**	**L1 Diph.**	**No.**	**Jaw**	**Lips**	**Throat**	**Tongue**	**Easines**	**L1 Diph.**
1	×	✓	✓	×	×	✓	**16**	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	×	×	**17**	×	✓	✓	✓	✓	×
3	✓	✓	×	×	✓	✓	**18**	✓	×	✓	×	✓	×
4	✓	✓	×	✓	×	✓	**19**	✓	×	×	×	✓	✓
5	×	×	✓	×	×	✓	**20**	×	✓	×	×	✓	✓
6	✓	✓	×	✓	✓	✓	**21**	✓	×	✓	×	×	×
7	×	✓	×	×	✓	×	**22**	×	×	✓	✓	×	×
8	✓	✓	✓	×	×	×	**23**	×	✓	✓	✓	×	×
9	×	×	×	×	✓	✓	**24**	×	✓	✓	×	×	×
10	✓	✓	×	✓	✓	✓	**25**	×	✓	×	×	✓	×
11	✓	✓	✓	×	×	✓	**26**	×	✓	✓	✓	×	×
12	✓	✓	✓	✓	×	×	**27**	×	✓	✓	✓	×	×
13	✓	✓	×	✓	×	✓	**28**	×	✓	✓	×	✓	×
14	✓	✓	✓	×	×	×	**29**	×	✓	✓	✓	×	×
15	✓	✓	✓	✓	×	×	**30**	×	✓	✓	✓	×	×

Table 4.5: The Subjects' Responses for the Articulation of the English Diphthong /ɔɪ/

No.	Jaw	Lips	Throat	Tongue	Easines	L1 Diph.	No.	Jaw	Lips	Throat	Tongue	Easines	L1 Diph.
1	×	✓	×	×	×	✓	16	✓	✓	✓	✓	✓	✓
2	✓	✓	×	✓	✓	✓	17	×	×	×	×	✓	✓
3	✓	✓	×	✓	✓	✓	18	✓	✓	✓	×	✓	✓
4	✓	×	×	×	✓	✓	19	×	×	×	×	✓	✓
5	×	×	✓	✓	✓	✓	20	✓	✓	✓	×	✓	✓
6	✓	×	✓	✓	✓	✓	21	✓	✓	✓	×	×	✓
7	✓	✓	×	×	✓	✓	22	✓	×	×	✓	×	✓
8	×	✓	×	×	✓	✓	23	×	✓	✓	✓	×	×
9	✓	×	✓	×	✓	✓	24	×	✓	✓	×	×	×
10	✓	✓	×	×	✓	✓	25	×	✓	×	×	✓	×
11	×	×	×	✓	✓	✓	26	×	✓	✓	×	×	×
12	✓	✓	✓	✓	×	×	27	×	✓	✓	×	✓	×
13	×	×	✓	×	✓	✓	28	×	✓	✓	×	×	×
14	✓	✓	×	×	×	×	29	×	✓	✓	×	×	×
15	✓	×	✓	×	✓	×	30	×	✓	✓	×	✓	×

Table 4.6: The Subjects' Responses for the Articulation of the English Diphthong /aʊ/

No.	Jaw	Lips	Throat	Tongue	Easines	L1 Diph.	No.	Jaw	Lips	Throat	Tongue	Easines	L1 Diph.
1	✓	✓	×	×	✓	✓	16	✓	✓	✓	✓	✓	✓
2	×	✓	×	✓	✓	✓	17	×	×	×	×	✓	✓

3	×	✓	×	×	✓	✓	**18**	×	×	×	×	×	×
4	×	✓	×	×	✓	✓	**19**	✓	×	✓	✓	×	✓
5	✓	✓	✓	×	×	✓	**20**	×	✓	✓	×	✓	✓
6	✓	×	×	×	✓	✓	**21**	✓	×	✓	×	×	✓
7	✓	✓	✓	×	×	✓	**22**	×	✓	×	×	✓	×
8	✓	✓	✓	×	×	×	**23**	×	✓	✓	✓	✓	✓
9	✓	×	×	×	×	×	**24**	×	✓	×	✓	✓	✓
10	✓	✓	×	×	✓	✓	**25**	×	×	×	×	✓	✓
11	×	×	×	×	✓	×	**26**	×	×	×	✓	✓	✓
12	✓	×	✓	×	×	×	**27**	×	×	×	×	✓	✓
13	×	×	×	×	✓	✓	**28**	×	✓	×	✓	✓	✓
14	✓	✓	×	×	×	×	**29**	×	✓	✓	✓	✓	✓
15	✓	✓	×	×	✓	✓	**30**	×	×	×	×	✓	✓

Table 4.7: The Subjects' Responses for the Articulation of the English Diphthong /ɪə/

No.	**Jaw**	**Lips**	**Throat**	**Tongue**	**Easines**	**L1 Diph.**	**No.**	**Jaw**	**Lips**	**Throat**	**Tongue**	**Easines**	**L1 Diph.**
1	×	×	×	×	✓	✓	**16**	✓	×	✓	✓	✓	✓
2	✓	×	✓	✓	×	✓	**17**	✓	×	✓	×	✓	✓
3	×	×	×	×	✓	✓	**18**	×	×	✓	×	×	×
4	✓	×	✓	×	×	✓	**19**	✓	×	✓	✓	×	×
5	×	×	✓	✓	✓	✓	**20**	×	×	✓	×	×	✓
6	✓	×	×	✓	✓	✓	**21**	✓	×	✓	×	✓	✓
7	×	×	×	✓	✓	✓	**22**	✓	×	×	✓	×	×
8	✓	×	✓	×	×	×	**23**	✓	×	✓	✓	×	×
9	✓	×	✓	×	×	×	**24**	×	×	✓	✓	×	×

10	✓	×	×	×	✓	✓	**25**	×	×	×	✓	×	×
11	✓	×	✓	×	✓	✓	**26**	×	×	✓	✓	×	×
12	✓	✓	✓	✓	×	×	**27**	×	×	×	✓	×	×
13	✓	×	✓	×	×	✓	**28**	×	×	✓	✓	×	×
14	×	×	✓	×	×	×	**29**	✓	×	✓	✓	×	×
15	×	×	✓	✓	×	×	**30**	×	×	×	✓	×	×

Table 4.8: The Subjects' Responses for the Articulation of the English Diphthong /aɪ/

No.	**Jaw**	**Lips**	**Throat**	**Tongue**	**Easines**	**L1 Diph.**	**No.**	**Jaw**	**Lips**	**Throat**	**Tongue**	**Easines**	**L1 Diph.**
1	✓	×	×	×	✓	✓	**16**	✓	×	✓	×	✓	✓
2	✓	×	×	✓	✓	✓	**17**	×	×	✓	×	✓	✓
3	✓	×	×	×	✓	✓	**18**	×	×	✓	✓	✓	✓
4	✓	×	×	×	✓	✓	**19**	×	×	×	×	✓	✓
5	✓	×	✓	✓	✓	✓	**20**	✓	×	✓	✓	✓	✓
6	✓	×	×	✓	✓	✓	**21**	✓	×	×	✓	✓	✓
7	✓	×	✓	×	✓	×	**22**	×	×	✓	✓	✓	×
8	×	×	✓	×	✓	✓	**23**	×	×	×	×	✓	✓
9	✓	✓	✓	×	×	✓	**24**	×	×	×	×	✓	✓
10	✓	×	×	×	✓	✓	**25**	×	×	×	×	×	✓
11	×	×	×	×	✓	✓	**26**	×	×	×	×	✓	✓
12	×	×	×	×	×	×	**27**	×	×	×	×	✓	✓
13	×	×	×	×	✓	✓	**28**	×	×	×	×	✓	✓
14	✓	×	✓	×	✓	✓	**29**	×	×	×	×	✓	✓
15	✓	×	×	×	✓	×	**30**	×	×	×	×	✓	✓

Table 4.9: The Subjects' Responses for the Articulation of the English Diphthong /eə/

No.	Jaw	Lips	Throat	Tongue	Easines	L1 Diph.	No.	Jaw	Lips	Throat	Tongue	Easines	L1 Diph.
1	×	×	×	×	✓	✓	16	✓	×	✓	✓	✓	✓
2	✓	✓	✓	×	×	×	17	×	×	✓	×	×	×
3	×	×	×	✓	✓	✓	18	×	×	✓	✓	×	✓
4	×	×	×	×	×	✓	19	×	×	✓	✓	×	×
5	✓	×	✓	✓	×	×	20	✓	×	✓	×	✓	✓
6	×	×	×	×	✓	✓	21	×	×	×	×	×	×
7	✓	×	✓	✓	×	×	22	×	×	×	✓	×	×
8	✓	×	✓	×	×	×	23	✓	×	✓	✓	✓	×
9	✓	×	✓	✓	✓	×	24	✓	×	✓	✓	×	×
10	✓	✓	×	✓	×	✓	25	✓	×	✓	✓	×	×
11	×	×	×	×	✓	×	26	✓	×	✓	✓	×	×
12	✓	✓	✓	✓	×	×	27	✓	×	✓	✓	×	×
13	×	×	✓	×	×	✓	28	✓	×	✓	✓	×	×
14	×	×	✓	×	✓	✓	29	✓	×	✓	✓	✓	×
15	×	×	✓	✓	×	×	30	✓	×	✓	✓	×	×

Table (4.10) below summarizes the subjects' responses for the articulation of all the English diphthongs. For each column, the left sub-column shows the number of subjects that experience tension in the concerned area (except the easiness column which indicates the number of subjects that find the diphthongs easy and the L1 diphthong column which indicates the number of subjects that find the diphthongs as easy as their mother tongue diphthongs). The right, shaded sub-column, on the

other hand, shows the percentage of the subjects' responses out of the whole sample.

Table 4.10: The Percentages of the Subjects' Responses

Diphthongs	**Jaw**		**Lips**		**Throat**		**Tongue**		**Easiness**		**L1 Diphthong**	
ɪə	16	53.33	2	6.66	21	70	17	56.66	10	33.33	15	50
ʊə	15	50	24	80	19	63.33	15	50	12	40	12	40
eə	17	56.66	3	10	22	73.33	19	63.33	9	30	11	36.66
eɪ	11	36.66	1	3.33	13	43.33	9	30	25	83.33	24	80
aɪ	14	46.66	1	3.33	10	33.33	7	23.33	27	90	26	86.66
ɔɪ	14	46.66	22	73.33	16	53.33	9	30	20	66.66	19	63.33
əʊ	16	53.33	15	50	18	60	10	33.33	15	50	16	53.33
aʊ	13	43.33	16	53.33	10	33.33	8	26.66	21	70	21	70

Diagram 4.1 below illustrates a scale of the easiness of articulating English diphthongs as experienced by Iraqi EFL learners. The diagram is based on the easiness percentages of the subjects' responses. The diagram begins at its left extreme with the easiest diphthong /aɪ/ and ends at its right extreme with the most difficult diphthong /eə/. The other diphthongs vary between these two extremes.

At this point, the easiness scale allows for several interesting points to be made. One obvious point is that the diphthongs do not spread randomly across the scale. Instead, the characteristic of categorization is clear; that is, the scale begins with the closing diphthongs and ends with the centring diphthong. Closing diphthongs are, therefore, easier than

centring diphthongs. Another important point is that the diphthongs that involve an additional articulatory gesture of lip-rounding (i.e. /ɔɪ/, /əʊ/, /aʊ/ and /ʊə/) do not occupy the difficult extreme of the scale. This fact reveals that the number of articulatory gestures is not the only determining parameter of articulatory effort (see section 3.3.3).

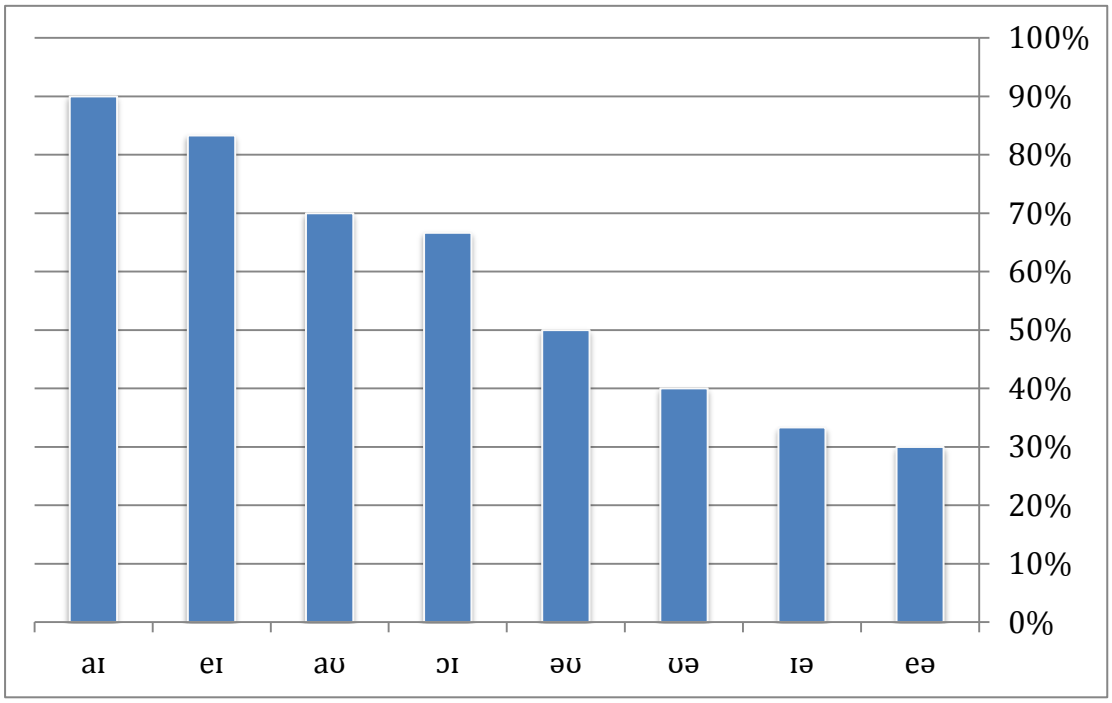

Diagram 4.1: The Easiness Scale of the English Diphthongs

4.7 Factors of Easiness and Difficulty

In order to find out the correlation between the easiness and the effort experienced in the different organs of speech, the subjects' responses for the jaw, lips, throat and tongue (which are tabulated in Table 4.10) are reversed (in Table 4.11) in order to represent the easiness or comfort rather than effort or tension that the subjects experience. For example, if 20 of the subjects find effort or tension in the jaw then, in Table 4.11, 10 of the subjects find ease or comfort. This change is necessary in order for

the correlation values to show the relationship between the general easiness and the comfort in a particular organ. The values of the first language diphthongs, however, are not reversed since the question already asks the subjects about the easiness.

Table 4.11: The Percentages of the Subjects' Easiness Responses

Diphthongs	**Jaw**		**Lips**		**Throat**		**Tongue**		**Easiness**		**L1 Diphthong**	
ɪə	14	46.66	28	93.33	9	30	13	43.33	10	33.33	15	50
ʊə	15	50	6	20	11	36.66	15	50	12	40	12	40
eə	13	43.33	27	90	8	26.66	11	36.66	9	30	11	36.66
eɪ	19	63.33	29	96.66	17	56.66	21	70	25	83.33	24	80
aɪ	16	53.33	29	96.66	20	66.66	23	76.66	27	90	26	86.66
ɔɪ	16	53.33	8	26.66	14	46.66	21	70	20	66.66	19	63.33
əʊ	14	46.66	15	50	12	40	20	66.66	15	50	16	53.33
aʊ	17	56.66	14	46.66	20	66.66	22	73.33	21	70	21	70

Table 4.12 shows the correlation coefficients of the different organs/factors that are involved in the articulation of the English diphthongs as elicited from the subjects' responses. The *r* value of each variable is tested to see to what extent it correlates with the easiness experienced by the subjects.

Table 4.12: The Correlation Coefficients (*r* values)

Organ/ Factor	**Correlation Coefficient**
L1 Diphthong	0.99
Tongue	0.98
Throat	0.98
Jaw	0.95
Lips	0.83

The correlation values reveal a very interesting point; that is, the articulatory effort that Iraqi EFL learners experience when articulating the English diphthongs is a result of a combination of various organs of speech and factors rather than one determining factor. At the top, there is the resemblance between the English diphthongs and those of the learners' mother tongue (0.99). Then come the tongue and the throat (0.98). The third organ is the jaw (0.95), followed by the lips (0.83). The *r* values of L1 diphthong, the tongue, the throat and the jaw are indeed very approximate to the perfect value of correlation (i.e. 1). However, since the correlation coefficients may influence each other, the following sections analyze each factor separately in order to gain more accurate and specific judgments.

4.7.1 L1 Diphthongs Influence

In the light of these results and those summarized in Tables 4.10 and 4.11, we can identify and explain the factors and mechanisms that lie behind the easiness scale of the English diphthongs. First of all, there is a strong relationship between the easiness of a diphthong and its resemblance with the diphthong in the subjects' mother tongue. In other words, the subjects labelled those diphthongs that are similar to their

mother tongue's as easy and vice versa. More specifically, as Diagram 4.2 illustrates, the subjects considered the closing diphthongs as closer to their mother tongue's, and accordingly, they rated them as easier than centring diphthongs, which are in turn rated as more difficult. Learners, of course, are more familiar with their first language sounds and the levels of effort associated with them due to the intensive practice and use. Foreign language learners, therefore, find familiar and similar sounds less effortful.

In addition, the closing diphthongs are far more frequent than the centring diphthongs in IA. In other words, there are very few Iraqi Arabic words that contain centring diphthongs (see section 3.6.2). This factor, indeed, further contributes to the unfamiliarity of the centring diphthongs for the Iraqi EFL learners.

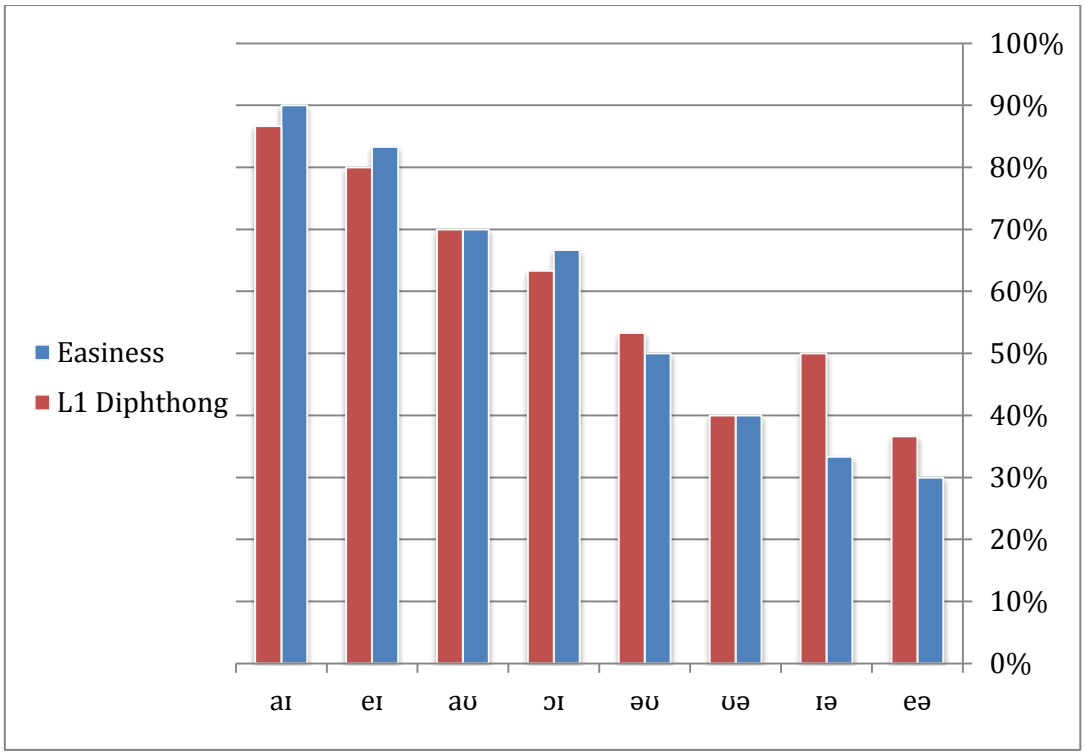

Diagram 4.2: The Relationship Between Easiness and L1 Diphthongs Influence

4.7.2 The Tongue Relax

Concerning the role of the tongue, the results reveal that the subjects exert more effort in moving the tongue in the articulation of difficult diphthongs and vice versa (see Diagram 4.3). This tension can be explained in the light of the precision parameter (see section 3.3.3). Centring diphthongs have short distances or displacements (see Figure 11), in that the tongue has to move within a very small space. This process of precise movement requires a high level of control of the muscles of the tongue. In spite of the fact that the /əʊ/ diphthong has a shorter distance (within which the gliding movement happens) than the three centring diphthongs (see Figure 11), yet it is rated as easier than them. This matter can be attributed to the fact that the tongue in the /əʊ/ diphthong moves vertically more than horizontally. On the horizontal dimension, the tongue moves from a central position to a front position that is relatively close to the centre. The distance is, therefore, almost one-dimensional.

Centring diphthongs, though, combine the short distance with gliding across the two dimensions. The /eə/ diphthong is the clearest case, for it glides from a front position to a central position in the same open-mid area, which is a very precise movement. In addition, /eə/ has the least resemblance to the first language diphthong. Although the /ɪə/ and /ʊə/ have almost the same distance, yet the former is rated as more difficult because it has less resemblance to the first language diphthong.

The closing diphthongs, on the other hand, have longer distances in comparison with the centring ones (except for the /əʊ/ diphthong). In the articulation of the closing diphthongs, the effort made by the tongue is distributed across a long distance, something which reduces the level of

precision. The /aɪ/ diphthong has almost the longest distance; a relatively vertical movement and the highest approximation to the first language diphthong, so it is the easiest one. Although the /eɪ/ diphthong is shorter in distance than the /aʊ/ diphthongs, yet it is rated as easier because it has more resemblance to the subjects' first language diphthong. The /ɔɪ/ and /aʊ/ diphthongs have an almost equal distance, yet the former is considered as more difficult than the latter for two reasons. Firstly, the /aʊ/ is closer than /ɔɪ/ to the first language diphthong. Secondly, the /ɔɪ/ involves an acutely diagonal movement; it moves from a central back position to a front close position.

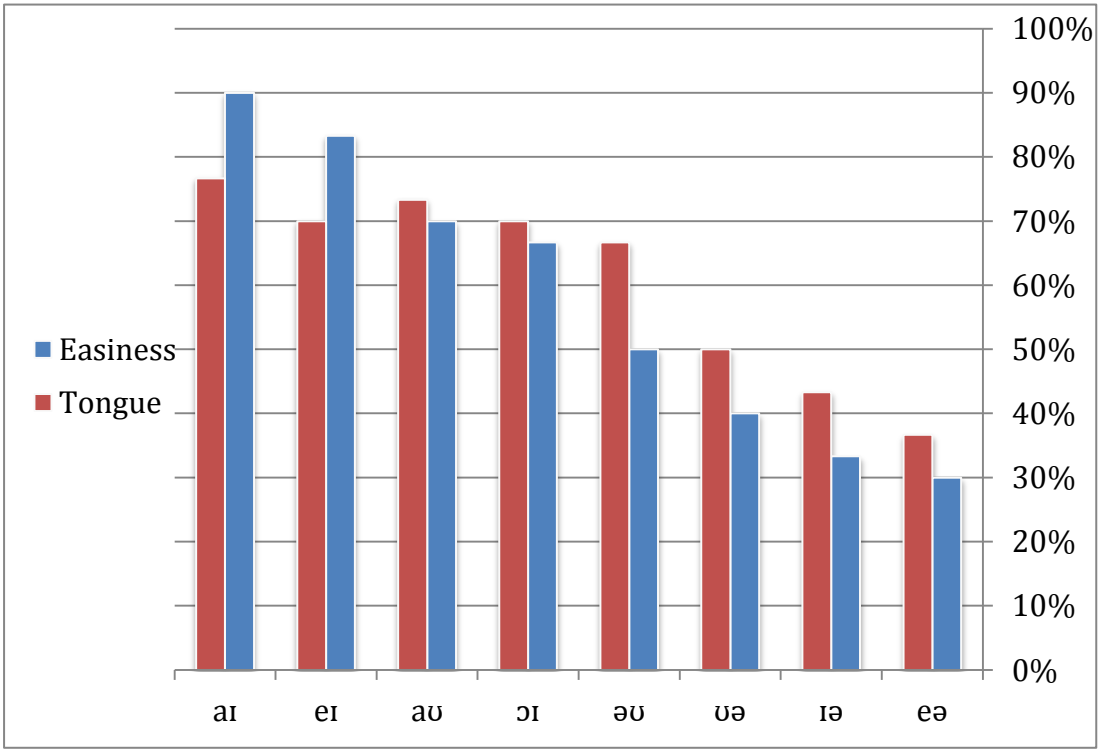

Diagram 4.3: The Relationship Between Easiness and the Tongue Relax

4.7.3 The Throat Relax

Since all pure vowels and diphthongs are voiced, the tension in the throat is a result of the vocal folds vibration. The striking fact, however, is that there is an obvious correlation between the effort made in the throat and the first language diphthongs. That is to say, the subjects experience less effort in the throat when articulating the English diphthongs that have a remarkable similarity to their mother tongue's sounds. In other words, the subjects are accustomed to the vocal folds frequency averages of their mother tongue's diphthongs. When they produce foreign language sounds, they find the same ease of articulation.

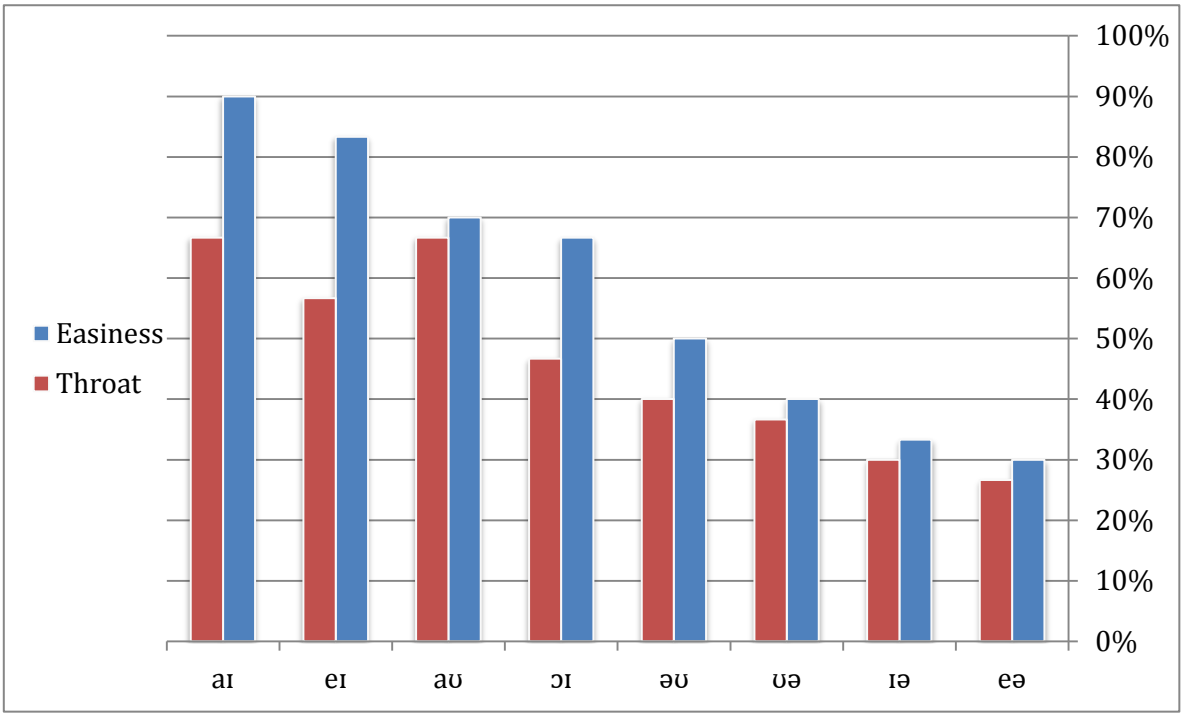

Diagram 4.4: The Relationship Between Easiness and The Throat Relax

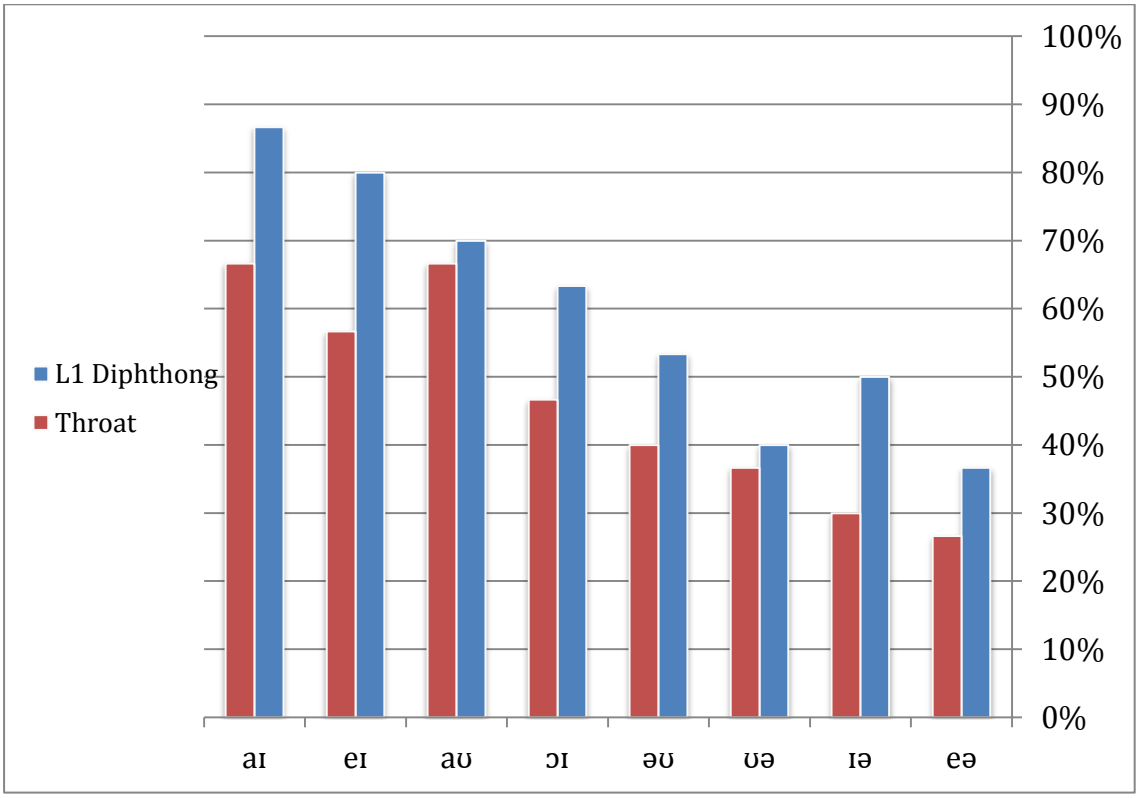

Diagram 4.5: The Relationship between L1 Diphthong and Throat Relax

4.7.4 The Jaw Relax

Though the jaw is directly involved in the production of English diphthongs, yet it is not as determinant as L1 diphthongs and the tongue (as Diagram 4.6 shows). The limited impact of the jaw on articulatory effort can be explained depending on the fact that English pure vowels and diphthongs are produced within a very small area, and therefore they do not require an exaggerated movement of the jaw (O'Connor, 1980:21).

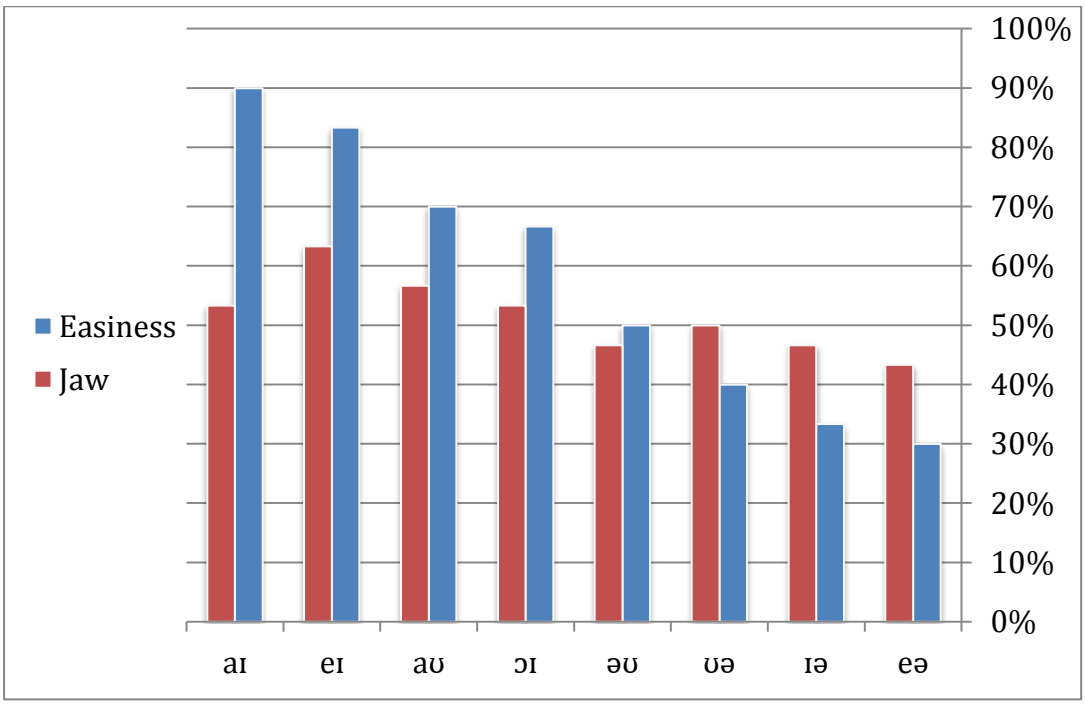

Diagram 4.6: The Relationship Between Easiness and the Jaw Relax

4.7.5 The Lips Relax

The lips contribution to the overall articulatory effort is less important than the other factors/organs. As Diagram 4.7 shows, although the diphthongs /eə/ and /ɪə/ have high levels of relax in the lips, yet they are the two most effortful diphthongs. The easiness of the articulation of the diphthongs /aɪ/ and /eɪ/ is explained on the basis of the subjects' L1 diphthongs and the tongue positions. The marginal role of the lips is understandable since four diphthongs (/eə/, /ɪə/, /aɪ/ and /eɪ/) have a neutral lip posture.

Concerning the other diphthongs that involve a lip-rounding position, it is noticeable that the diphthongs /əʊ/ and /aʊ/ have less tension in the lips than the diphthongs /ʊə/ and /ɔɪ/. This can be attributed to the fact that in the /ʊə/ and /ɔɪ/ diphthongs the lips are rounded in the first element

of the sound; which is the longer and more prominent element (see section 3.5.6).

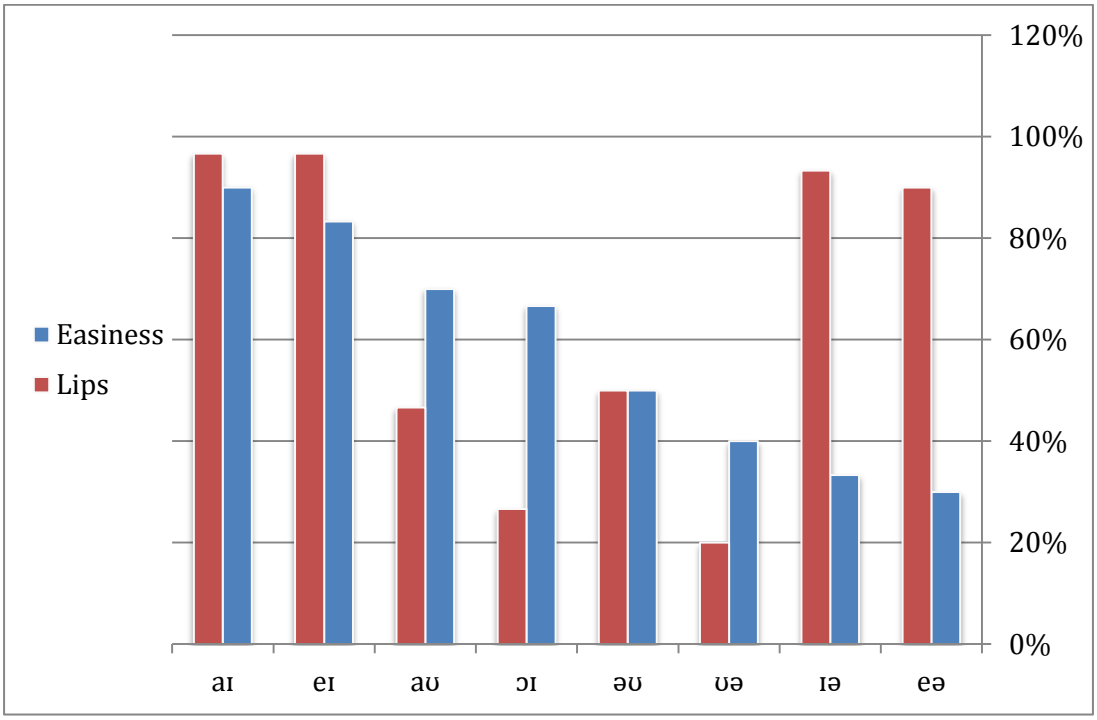

Diagram 4.7: The Relationship Between Easiness and the Lips Relax

Chapter Five

Conclusions, Recommendations and Suggestions

5.1 Conclusions

Depending on the results of the analysis and discussion, that are presented in the previous chapter, we can arrive at the following conclusions:

1- Generally speaking, Iraqi EFL learners at the postgraduate/MA level do experience the phenomenon of EoA, when articulating the English diphthongs, but in different degrees and with particular diphthongs.

2- Closing diphthongs are articulated with less effort than centring diphthongs.

3- Closing diphthongs are produced with relatively the same levels of easiness experienced in their IA counterparts, and so there is a high degree of quality resemblance between them.

4- The centring diphthongs are produced with higher levels of difficulty than that experienced in articulating their IA counterparts; there is, therefore, a crucial difference of quality between them.

5- There is a remarkable correlation between the mother tongue-English diphthongs resemblance and the experienced ease.

6- The number of articulatory gestures that are involved in the articulation of a diphthong is not a particularly influential parameter in raising the articulatory effort. The diphthongs that are produced with an additional gesture of lip rounding are, therefore, not more difficult than other diphthongs.

7- The precision and displacement of the tongue movement are determining parameters of the articulatory effort that Iraqi EFL learners at the postgraduate/MA level experience in articulating the English diphthongs. The less precise the diphthong, the easier it is. The diphthongs that have short displacements are more precise and, generally, therefore more difficult than those that have long ones.

8- The direction of the tongue movement is also an important factor. The diphthongs that require a vertical movement are easier than those which involve a diagonal movement because moving across the horizontal axis is more precise.

9- There is a significant association between the effort experienced in the throat and the mother tongue-English diphthongs resemblance. The English diphthongs that resemble the learners' first language diphthongs require less effort in the throat and vice versa.

10- The jaw is not an influential organ in determining the articulatory effort that Iraqi EFL learners at the postgraduate level/MA experience in articulating the English diphthongs.

11- The results of the study verify all the three hypotheses that are proposed by the researcher.

5.2 Recommendations

In the light of the conclusions, the following points are recommended:

1- Since the centring diphthongs are more difficult, they require intensive practice in English language teaching classrooms so that the learners become familiar with them. Developing a perfect command of articulating the centring diphthongs could, therefore, take place more lately than the closing diphthongs. Teachers and learners, accordingly, have to keep in mind that this is a natural and expected phenomenon.

2- Teachers are advised to make the learners more aware of the easiness/difficulty dichotomy of the English diphthongs and the difference between them and the learners' mother tongue counterparts.

3- Since closing diphthongs are close to the learners' mother tongue diphthongs, this point could be exploited by drawing the learners'

attention to this fact in order to accelerate the acquisition of the closing diphthongs.

5.3 Suggestions

1- Further research could be directed to the phenomenon of EoA as experienced in producing the English pure vowels, since they are larger in number than the Arabic ones.

2- The present study focuses on the phenomenon of EoA in producing the English diphthongs by Iraqi EFL learners, further research could be conducted to investigate the same phenomenon in articulating the English triphthongs.

3- Another research project could be carried out to investigate the articulatory effort that Iraqi EFL learners experience in the articulation of English consonants, especially those that are not present in the Arabic language.

4- Further studies could be conducted to compare the articulatory effort experienced by Iraqi EFL learners and that is experienced by English native speakers in producing the different categories of English speech sounds.

5- Another interesting topic to tackle is to investigate the Iraqi EFL learners employment of the aspects of connected speech that are related to the concept of EoA, such as assimilation, elision and linking.

Bibliography

Abercrombie, D. (1967) **Elements of General Phonetics**. Edinburgh: Edinburgh University Press.

Ahmed, A.Y. (2018) **Phonological Variation and Change in Mesopotamia: A Study of Accent Levelling in the Arabic Dialect of Mosul**. Unpublished PhD Thesis, Newcastle University.

Aitchison, J. (2004) **Language Change: Progress or Decay?** 3rd edition. Cambridge: Cambridge University Press.

Al Abdely, A. A. & Thai (2016) **Learning English Vowels by Iraqi EFL Learners: Perceived Difficulty Versus Actual Performance**, *3L: The Southeast Asian Journal of English Language Studies, 22(1):1-18.*

Al-Bamerni, A.A.H. (2004) **A Study of the Pronunciation of Iraqi Announcers of News in English**. Unpublished Ph.D. Thesis, University of Mosul, College of Arts.

Al-Bazi, M.P.K. (2006) **Iraqi Dialect Versus Standard Arabic**. California: Medius Corporation.

Albuarabi, S. (2018) **A Linguistic History of Iraqi Arabic (Mesopotamian Arabic)**, *Journal of Advances in Linguistics, 9, 1371-1380.*

Ali, A. Y. (1989) **The Holy Qur'an Text Translation and Commentary**. Al-Murgab: That Es-Salasil Publishing.

Aljomaely, R. (2018) **The Pronunciation of Diphthongs by Iraqi Learners of English**. *Professional Communication and Translation Studies*, (11), 67-72.

Al-Ka'abi, S.N.S. (2005) **The Relationship between Good Pronunciation and the Mastery of Spelling of English as a Foreign Language**. Unpublished M.A. Thesis, University of Al-Mustansiriyah, College of Basic Education.

Almbark, R.A. (2012) **The Perception and Production of SSBE Vowels by Syrian Arabic Learners: The Foreign Language Model**. Unpublished Ph.D. Thesis, University of York, Department of Language and Linguistic Science.

Al-Shangiti, W. (2015) **Speech Production and Perception in Adult Arabic Learners of English: A Comparative Study of the Role of Production and Perception Training in the Acquisition of British English Vowels**. Unpublished Ph.D. Thesis, University College London, Department of Speech, Hearing and Phonetic Sciences.

Anderson, J. & Jones, C. (1974) **Three Theses Concerning Phonological Representations**. *Journal of Linguistics, 10*(1), 1-26.

Ashby, P. (2011) **Understanding Phonetics**. London: Hodder Education.

As-Sammer, M.A.A. (2014) **The Production of RP English Vowels by Native Omani Adults: A Quantitative Analysis**. *The Arab Gulf, 42 (1-2)*, 39-94.

Aziz, Y.Y. (1974) **Some Problems of the English Diphthongs for the Iraqi Learner**. *ELT Journal, 29*(1), 68-71.

Ball, M.J. & Rahilly, J. (2013) **Phonetics: The Science of Speech**. London and New York: Routledge.

Bayraktaroğlu, S.(1979) **Sources of Pronunciation Difficulties of Turkish Adults in Speaking English, with Some Pedagogical Recommendations**. Unpublished Ph.D. Thesis, University of London, Institute of Education.

Becker, A. & Bieswanger, M. (2017) **Introduction to English Linguistics**. Stuttgart: UTB.

Boersma, P. (1990) **Modelling the Distribution of Consonant Inventories**. *Proceedings Linguistics & Phonetics 90*.

_____ (1998) **Functional Phonology: Formalizing the Interactions between Articulatory and Perceptual Drives**. Den Haag: Holland Academic Graphics/IFOTT.

Browman, C.P. & Goldstein, L.M. (1986) **Towards an Articulatory Phonology**. *Phonology, 3*, 219-252.

_____ (1989) **Articulatory Gestures as Phonological Units**. *Phonology, 6*(2), 201-251.

_____ (1990) **Tiers in Articulatory Phonology, with Some Implications for Casual Speech**. *Papers in Laboratory Phonology I: Between the Grammar and Physics of Speech,* 341-376.

_____ (1992) **Articulatory Phonology: An Overview**. *Phonetica, 49*(3-4), 155-180.

_____ (1995) **Dynamics and Articulatory Phonology**. *Mind as Motion*, 175-193.

Carr, P. (2008) **A Glossary of Phonology**. Edinburgh: Edinburgh University Press.

Carr, P. & Montreuil, J. (2013) **Phonology**, 2nd edition. Palgrave Macmillan.

Carstairs-McCarthy, A. (2002) **An Introduction to English Morphology**. Edinburgh: Edinburgh University Press.

Chang, Y.W. (2016) **Influence of the Principle of Least Effort Across Disciplines**. *Scientometrics*, *106*(3), 1117-1133.

Chomsky, N.(1965) **Aspects of the Theory of Syntax**. Cambridge: MIT.

Chomsky, N. & Halle, M. (1968) **The Sound Pattern of English**. New York: Harper & Row.

Collins, B. & Mees, I.M. (2013) **Practical Phonetics and Phonology: A Resource Book for Students**, 3rd edition. London & New York: Routledge.

Cruttenden, A. (2014) **Gimson's Pronunciation of English**, 8th edition. Routledge.

Crystal, D. (2008) **A Dictionary of Linguistics and Phonetics**, 6th edition. Singapore: Blackwell.

Davenport, M. & Hannahs, S.J. (2010) **Introducing Phonetics and Phonology**, 3rd edition. London: Hodder Education.

Enli, L. (2014) **Pronunciation of English Consonants, Vowels and Diphthongs of Mandarin-Chinese Speakers**. *Studies in Literature and Language, 8*(1), 62-65.

Erwin, W.M. (2004) **A Basic Course in Iraqi Arabic**. Washington, D.C.: Gerogetown University Press.

Fathi, H.M. & Qassim, Z.R. (2020) **An Acoustic Study of the Production of Iraqi Arabic Vowels**. *Journal of Al-Frahedis Arts, 12*(40), 692-704.

Gordon-Bouvier, I., Kyhle, J., McAlister, A., Norman, H., Paues, S., Robieux, C., & Strömbergsson, S. (2015) **Self-Perception of Vocal and**

Articulatory Effort in Consonant Production by Native Swedish Speakers. *Working Papers 55. 2015 Linguistics Lund University,* 41.

Hall, N. (2010) **Articulatory Phonology**. *Language and Linguistics Compass, 4*(9), 818-830.

_____ (2018) **Articulatory Phonology**, in Hannahs, S.J. & Bosch, A.R.K. (eds.) *The Routledge Handbook of Phonological Theory*, pp. 530-550. Routledge.

Hudson, G. (2000) **Essential Introductory Linguistics**. Great Britain: Blackwell.

Kirchner, R.M. (1998) **An Effort-Based Approach to Consonant Lenition**. Unpublished Ph.D. Thesis, University of California.

Knight, R. (2012) **Phonetics: A Coursebook**. Cambridge: Cambridge University Press.

Kul, M. (2007) **The Principle of Least Effort within the Hierarchy of Linguistic Preferences: External Evidence from English**. Unpublished Ph.D. Thesis, University of Poznan.

Ladefoged, P. and Johnson, K. (2015) **A Course in Phonetics**, 7th edition. United States of America: Nelson Education.

Lindblom, B. (1983) **Economy of Speech Gestures**, in *The Production of Speech* (pp. 217-245). Springer: New York.

_____ (1990) **Explaining Phonetic Variation: A Sketch of the H&H Theory**, in W. Hardcastle and A. Marchal (eds.) *Speech Production and Speech Modelling*, 403-439.

Locke, J. L. (1972) **Ease of Articulation**. *Journal of speech and hearing research*, 15(1), 194-200.

Longman Dictionary of Contemporary English (2009), 5th edition. Pearson Education Limited.

Maddieson, I. & Precoda, K. **the UCLA Phonological Segment Inventory Database (UPSID)**. http://web.phonetik.uni-frankfurt.de/upsid.html

Maddieson, I. (1984) **Patterns of Sounds**. Cambridge: Cambridge University Press.

Malécot, A. (1955) **An Experimental Study of Force of Articulation**. *Studia Linguistica*, *9*(1-2), 35-44.

Matthews, P.H. (2007) **Oxford Concise Dictionary of Linguistics**, 2nd edition. Oxford: Oxford University Press.

McMahon, A. & Foulkes, P. (1994) **Sound Change, Phonological Rules, and Articulatory Phonology**. *Belgian Journal of Linguistics*, *9*(1), 1-20.

McMahon, A. (2002) **An Introduction to English Phonology**. Edinburgh: Edinburgh University Press.

Napoli, D.J., Sanders, N., & Wright, R. (2014) **On the Linguistic Effects of Articulatory Ease, with a Focus on Sign Languages**. *Language*, *90*(2), 424-456.

Nelson, W.L. (1983) **Physical Principles for Economies of Skilled Movements**. *Biological Cybernetics*, *46*(2), 135-147.

O'Connor, J.D. (1980) **Better English Pronunciation**. Cambridge: Cambridge University Press.

Ogden, R. (2009) **An Introduction to English Phonetics**. Edinburgh: Edinburgh University Press.

Parnell, M. & Amerman, J.D. (1977) **Subjective Evaluation of Articulatory Effort**. *Journal of Speech and Hearing Research*, *20*(4), 644-652.

Raphael, L.J., Borden, G.J. and Harris, K.S. (2011) **Speech Science Primer: Physiology, Acoustics, and Perception of Speech**, 6th edition. United States of America: Lippincott Williams & Wilkins.

Reetz, H. & Jongman, A. (2009) **Phonetics: Transcription, Production, Acoustics, and Perception**. Singapore: Wiley-Blackwell.

Ridha, M. (2015) **Crosslinguistic Influence in the Arabic of Iraqi Arabic-Swedish Bilingual Children (5-7) in Sweden**. Unpublished MA Thesis, Uppsala University.

Riazi, A.M. (2016) **The Routledge Encyclopedia of Research Methods in Applied Linguistics: Quantitative, Qualitative, and Mixed-Methods Research**. London and New York: Routledge.

Roach, P. (2009) **English Phonetics and Phonology: A Practical Course**, 4th edition. Cambridge: Cambridge University Press.

_____ (2011) **Glossary: A Little Encyclopedia of Phonetics**. A PDF file available at:https://www.peterroach.net/uploads/3/6/5/8/3658625/english-phonetics-and-phonology4-glossary.pdf

Robieux, C. & Meunier, C. (2015) **Effect of Voicing on the Self-Perception of Effort in French Consonants Production**. *Methods, 1,* 32s.

Ryding, K.C. (2005) **A Reference Grammar of Modern Standard Arabic**. Cambridge: Cambridge University Press.

Sampson, G. (1980) **Schools of Linguistics: Competition and Evolution**. London: Hutchinson.

Shariatmadari, D. (2006) **Sounds Difficult? Why Phonological Theory Needs 'Ease of Articulation**'. *School of Oriental and African Studies, Working Papers in Linguistics, 14,* 207-226.

Shuster, L. I., & Cottrill, C. (2015). **Ease of articulation: A Replication**. *Journal of communication disorders*, *56*, 1-7.

Steinberg, D.D. & Sciarini (2006) **An Introduction to Psycholinguistics**, 2nd edition. Great Britain: Longman.

Thelwall, R., & Sa'Adeddin, M. (1990). **Arabic**. *Journal of the International Phonetic Association*, *20*(2), 37-39.

Versteegh, K. (2014) **The Arabic Language**, 2nd edition. Edinburgh: Edinburgh University Press.

Wardhaugh, R. & Fuller, J.M. (2015) **An Introduction to Sociolinguistics**, 7th edition. Wiley-Blackwell.

Zipf, G.K. (1949) **Human Behaviour and the Principle of Least Effort: An Introduction to Human Ecology**. Massachusetts: Addison-Wesley Press.

Zsiga, E.C. (2013) **The Sounds of Language: An Introduction to Phonetics and Phonology**. Oxford: Wiley-Blackwell.

Appendices

Appendix I

The Subjects Information Sheet

Name:

Age:

Gender: Male / Female

Academic Year: Year 1 (Courses Year) / Year 2 (Research Year)

Residence : Province ..... Town .....
Village .....

Appendix II

The Questions Sheet

eɪ

Do you feel any tension in your jaw ? **Yes** **No**

Is there any contraction in your lips ? **Yes** **No**

Do you experience any strain in your throat ? **Yes** **No**

Is there any tension in your tongue ? **Yes** **No**

Do you find the production of this diphthong easy, or difficult ? **Easy** **Difficult**

Is this diphthong as easy as your mother tongue's (as in أيمن) **Yes** **No**

المستخلص

تقوم الدراسة الحالية باستقصاء ظاهرة سهولة اللفظ التي من الممكن أن يختبرها متعلمو اللغة الإنجليزية (كلغة أجنبية) العراقيين على المستوى الجامعي(الدراسات العليا- الماجستير) عند نطق اصوات اللين الإنجليزية المركبة. تقع الدراسة في خمسة فصول. يتناول الفصل الأول مقدمات الدراسة و التي تتكون من: مشكلة الدراسة, أسئلة الدراسة, فرضيات الدراسة, اجراءات الدراسة, أهداف الدراسة و حدود و أهمية الدراسة.

و قد كُرس الفصل الثاني لمراجعة الأدبيات المتعلقة بموضوع الدراسة. و يراجع الفصل الدراسات العراقية و العربية و الأجنبية التي تتناول مواضيع جهد النطق و أصوات اللين الإنجليزية المركبة.

أما الفصل الثالث فقد خُصص لاستعراض الجانب النظري للدراسة. يبدأ الفصل بشرح مفهوم سهولة اللفظ مع مناقشة تعريفاته و تمثلاته في ظواهر لغوية متنوعة. ثم يعالج الفصل مفهوم جهد النطق: كيف يمكن صياغته في مفهوم معين و ما هي المعايير التي يمكن توظيفها لتنظيمه. ثم يلخص الفصل نموذج النظام الصوتي المبني على النطق. و أخيرا يقدم الفصل وصفا لأصوات اللين البسيطة و المركبة في اللغة الإنجليزية و اللهجة العراقية.

و يعنى الفصل الرابع بالجزء العملي من الدراسة. إذ أنه يقدم تفاصيل عن عينة الدراسة, مادة الدراسة , الإجراءات و الطريقة و الاختبارات الإحصائية. و يتضمن الفصل أيضا مقياسا مدرجا لسهولة لفظ أصوات اللين الإنجليزية المركبة كما اختبرتها عينة الدراسة, و العوامل المسؤولة عن السهولة و الصعوبة.

أما الفصل الأخير فيتضمن الاستنتاجات و التوصيات و مقترحات لمزيد من الأبحاث. نتائج الدراسة تثبت الفرضيات الثلاث التي وضعتها الدراسة. و استنتجت الدراسة أيضا أن أصوات اللين المركبة العالية هي أسهل لفظا من أصوات اللين المركبة المركزية, و أن عوامل التشابه بين أصوات اللغة الأجنبية و اللغة الأم و دقة و اتجاه ازاحة اللسان هي العوامل الحاسمة في تحديد جهد النطق المبذول.

جـمهوريـة الـعـراق
وزارة الـتـعـليم العـالي
و الـبحــث العـــلمي

جـامعـة مـيســان
كـلـيــة الــتربــية
قسم اللغة الإنكليزية

استقصاء سهولة لفظ أصوات اللين الإنجليزية المركبة عند الطلبة العراقيين متعلمي اللغة الإنجليزية كلغة أجنبية في المستوى الجامعي

رسالة مقدمة إلى مجلس كلية التربية - جامعة ميسان

و هي جزء من متطلبات نيل شهادة الماجستير آداب في اللغة الإنجليزية و علم اللغة

تقدم بها الباحث

علي عبد الحسين إجياد

بإشراف

أ.د. بلقيس عيسى كاطع الراشد

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