UNIVERSITI PUTRA MALAYSIA

ACOUSTIC SIMILARITY AND PERCEPTUAL SIMILARITY BETWEEN TRIPOLITANIA-LIBYAN ARABIC VOWELS AND ENGLISH VOWELS PRODUCED BY LIBYAN EFL LEARNERS

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By

KALTHOUM RAMADAN M. SAID.

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

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DEDICATION

To soul of my father "*Ramadan Mohammad*" who used to motivate me to be a PhD holder.

To my mother " *Mayam Abo-AlQasim*" who keeps praying for me to be back home with PhD certificate.

To my lovely husband "*Abdo Alwahab Qidida*" who was supporting me during this long journey.

To my beautiful children *Abdo-Allah, Mohammad, Rayan, Hamza, Leith, and Yamin*, the symbols of love and giving. They have been my best cheerleaders.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Chairman : Associate Professor Yap Ngee Thai, PhD
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It is common that learners of English as a foreign language (EFL) struggle in acquiring English sounds, particularly in producing and perceiving English vowels. Second language speech perception models such as the Second Language Linguistic Perception Model (L2LP) (Escudero, 2005) claimed that the EFL learners encounter many difficulties in producing non-native vowels because they perceive the vowels inaccurately, indicating that the difficulties in the production of non-native vowels have a perceptual basis. Previous studies argued that the problem with L2 learning results from assimilation into L1 categories but many studies did not directly test this hypothesis. Therefore, this thesis aims to examine the influence of the acoustic similarity between Tripolitania-Libyan Arabic (TLA) vowels and English vowels on the perceptual similarity of English vowels by Libyan EFL learners. Seventy Libyan participants were recruited in this study. They performed two tasks: two speech production tasks and a speech perception task. The production task included producing TLA vowels and English vowels that were embedded in carrier sentences in the two languages, while the perception task examined the assimilation of English vowels to specific TLA sounds. The findings of the production tasks for the TLA vowels showed that the differences between the acoustic measurements of TLA vowels and English vowels produced by Libyan EFL learners are not significant. However, when the English vowels produced are compared with those produced by English native speakers as reported in Deterding (1995), with the exception for /i:/ and /ɜ:/, the vowels produced by Libyan EFL learners occupied a different vowel space. There was a bigger overlap found between the English vowels produced with TLA vowels providing empirical evidence of assimilation of L2 vowels into L1 vowel categories. The results of Euclidean Distance (ED) calculated predicted that the English /ɪ, e, æ, ɜ, ʌ, ɑ:, ɒ, ʊ, ɔ:/ are the most difficult vowels for Libyan learners to perceive as these vowels could be assimilated to more than one TLA vowels, while the /i:/ and /u:/ are easy to perceive as they are predicted to be assimilated to only their corresponding vowels in TLA. This was subsequently confirmed in the perception task where these vowels were

indeed found to be assimilated to more than one TLA vowel categories. The single linear regression test also revealed that the acoustic distance between English and TLA vowels can predict 43% of the degree of perceptual similarity between English vowels and TLA vowels. These results help to improve the understanding of the influence of native accent of learners on production and perception of FL sounds. In sum, the findings of this study confirmed that the acoustic similarity between L1 and foreign language (FL) vowels can successfully predict the difficulties faced by the EFL learners during the FL acquisition process. From a theoretical perspective, the results support the predictions made by L2LP that the acoustic between L1 vowels and L2 vowels can influence the perception of L2 vowels.

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PERSAMAAN AKUSTIK DAN PERSEPSI ANTARA BUNYI VOKAL ARAB TRIPOLITANIA-LIBYAN DAN VOKAL BAHASA INGGERIS YANG DIHASILKAN OLEH PELAJAR EFL LIBYA

Oleh

KALTHOUM RAMADAN M. SAID.

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Pengerusi   :   Profesor Madya Yap Ngee Thai, PhD
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Secara amnya, pelajar bahasa Inggeris *sebagai bahasa asing (EFL)* di lihat *berusaha keras untuk* menguasai bunyi bahasa Inggeris, terutama dalam *pemahaman dan penghasilan* vokal bahasa Inggeris. Menurut model persepsi pertuturan *bahasa kedua (L2)* seperti Model Persepsi Linguistik Bahasa Kedua (L2LP) *oleh* Escudero (2005), pelajar EFL menghadapi banyak kesukaran dalam menghasilkan vokal bukan asli *berikutan pemahaman vokal* mereka yang tidak tepat. Ini menunjukkan bahawa kesukaran dalam penghasilan vokal bukan asli mempunyai asas persepsi. Kajian terdahulu *berpendapat bahawa* masalah berkaitan pembelajaran *bahasa kedua* (L2) adalah berpunca dari proses asimilasi ke dalam kategori *bahasa ibunda* (L1). *Walaubagaimana pun,* banyak kajian tidak menguji kesahihan hipotesis ini. *Oleh itu,* tesis ini bertujuan untuk mengisi jurang ini dengan meneliti pengaruh kesamaan akustik antara vokal Tripolitania-Libya Arab (TLA) dan vokal Inggeris terhadap persamaan persepsi vokal Inggeris oleh pelajar EFL Libya. Tujuh puluh peserta Libya *telah dipilih untuk menjadi respoden* kajian ini. Mereka telah melakukan dua *tugasan yang berkaitan penghasilan pertuturan/produksi* dan persepsi pertuturan. *Tugasan penghasilan pertuturan/produksi* adalah merangkumi penghasilan vokal TLA dan vokal bahasa Inggeris yang terkandung di dalam ayat pembawa yang disediakan dalam dua bahasa, *manakala* tugasan persepsi pula memfokuskan kepada asimilasi vokal bahasa Inggeris dengan vokal TLA tertentu. Dapatan dari *tugasan produksi* untuk vokal TLA menunjukkan tiada perbezaan yang signifikan antara pengukuran akustik vokal TLA dan vokal bahasa Inggeris yang dihasilkan oleh pelajar EFL Libya. *Namun*, apabila vokal bahasa Inggeris yang dihasilkan dibandingkan dengan penutur asli Inggeris seperti *laporan* Deterding (1995), *kecuali* / iː / dan / ɜː /, vokal yang dihasilkan oleh pelajar EFL Libya menempati ruang vokal yang berbeza . Terdapat pertindihan yang lebih besar antara vokal Inggeris yang dihasilkan dengan vokal TLA yang memberikan bukti empirikal *bahawa terdapat* asimilasi vokal bahasa kedua (L2) ke dalam kategori vokal bahasa ibunda (L1). Hasil pengiraan Jarak Euclidean (ED) *meramalkan* bahasa Inggeris / ɪ, e, æ, ɜ, ʌ, ɑ ː, ɒ, ʊ, ɔː / adalah vokal yang paling sukar

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difahami oleh pelajar Libya *disebabkan* vokal ini boleh diasimilasikan kepada lebih daripada satu vokal TLA, manakala / i: / dan / u: / mudah difahami kerana ia diramalkan hanya *diasimilasikan* dengan vokal yang sesuai dalam TLA. Ini dapat disahkan dalam *tugasan persepsi* di mana vokal-vokal ini didapati berasimilasi dengan lebih dari satu kategori vokal TLA. Ujian regresi tunggal *turut* mendapati jarak akustik antara vokal bahasa Inggeris dan TLA boleh meramalkan 43% tahap persamaan persepsi antara vokal Inggeris dan vokal TLA. *Dapatan ini* membantu meningkatkan pemahaman tentang pengaruh *loghat* pelajar terhadap *penghasilan/produksi* dan persepsi bunyi bahasa asing (FL). Ringkasnya, *dapatan* kajian ini mengesahkan bahawa persamaaan akustik antara huruf vokal bahasa ibunda(L1) dan bahasa asing (FL) boleh meramalkan kesukaran yang dihadapi oleh pelajar EFL semasa proses pemerolehan bahasa asing (FL). Dari perspektif teori, dapatan kajian menyokong ramalan yang dibuat oleh L2LP bahawa persamaan akustik antara vokal L1 dan vokal L2 dapat mempengaruhi persepsi vokal L2.

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In The Name of Allah, the Most Gracious, the Most Merciful
Allah says

''وَإِذْ تَأَذَّنَ رَبُّكُمْ لَئِن شَكَرْتُمْ لَأَزِيدَنَّكُمْ'' (Ibrahim, 7)

Alhamdulillah, Alhamdulillah, Alhamdulillah, all praises belong to Allah, the Lord of all the worlds. I am very grateful to the Almighty Allah, for guiding me to praise Him, which in itself requires more praise, Alhamdulillah. I thank the Almighty Allah the Omniscient and Omnipresent for His blessings for giving me health, strength, and patience throughout this great PhD journey of seeking knowledge. Peace and blessings be upon his Prophet Muhammad (SAW) and the entire members of his households.

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Kalthoum Ramadan

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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Declaration by Members of Supervisory Committee

This is to confirm that:
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- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

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LIST OF ABBREVIATIONS

PAM-L2	Perceptual Assimilation Model for L2 learners
SLM	Speech Learning Model
L2LP	Second Language Linguistic Perception Model
TC	Two-Category
CG	Category-Goodness
SC	Single-Category
UC	Uncategorisable - Categorizable
UU	Uncategorizable -Uncategorizable
L1	First Language
FL	Foreign language
L2	Second language
EFL	Learners of English as a foreign language
TLA	Tripolitanian Libyan Arabic
BLA	Benghazi Libyan Arabic dialect
FLA	Fezzan Libyan Arabic
EA	Eastern Arabic
WA	Western Arabic
F1	First Formant Frequency
F2	Second Formant Frequency

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Language is the most powerful tool in human communication. It helps people to express their ideas and feelings easily and successfully. It can be either their first language, which is acquired in the first years of life, or it can be another language that is acquired later during their life span. Nowadays, adults usually learn another language, and English as a second or a foreign language is a popular choice. For example, Arab speakers acquire English as a foreign language (EFL) as it is an international language and is very commonly used in social media, and technology, and English is often used to discuss political issues that are of interest to the international community (Walker, 2010). Therefore, they try to master the language to the level as near native-like as possible in order to communicate with other speakers of English and to keep in touch with the globalization movements around the world.

Learning English as a foreign language (EFL) is known to be very challenging for most EFL learners. They need to master many essential skills, including listening and speaking skills that play an important role in the communication process. Fraser (2010) stated that while these skills are the most challenging skills for many learners, they are, at the same time, the most important skills the learners aim to master. Prodanovska-Poposka (2017) pointed out that the accurate pronunciation and successful communication are positively associated. That is, if the speaker and the listener did not understand each other, the interaction could break down. Correct pronunciation is related to the accurate production and perception of sounds (Gilakjani, 2012). Therefore, the production and perception of any language sounds are considered the most important factor in the acquisition of foreign language (FL) sounds.

The difficulties that EFL learners face in learning English sounds in general and vowels in particular, are often related to the influence of the first language (L1) phonological system on the acquisition of FL sounds. That is, the way the learner will perceive, understand and ultimately produce FL sounds is influenced by the L1 phonetic system (Best, 1995; Flege, 1995; Escudero, 2005, 2009). Many EFL learners struggle to produce and perceive the FL sounds accurately; particularly the sounds that differ from their L1 sounds. Specifically, the FL sounds that do not exist in the L1 inventory seem to be the most difficult sounds to acquire compared to other sounds (Iverson & Evans, 2009). The difficulty in learning FL sounds is explained by the fact that FL learners assimilate the sounds of FL to the sounds of their native language (Escudero, 2005; Best & Tyler, 2007).

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A number of acoustic models and theories have been proposed to examine the influence of L1 phonological system and the difficulties faced by FL learners in producing and perceiving the FL sounds. The Speech Learning Model (Flege, 1995, 2002) and the Perceptual Assimilation Model (Best, 1995; Best & Tyler, 2007), and Second Language Linguistic Perception model (Escudero, 2005) all suggest that the relationship between native language and FL sound inventories can predict whether or not a specific FL sound will pose difficulty to the learner. Flege (1995) hypothesized that the FL segments, which are phonetically similar to L1 categories are thought to be assimilated into those L1 categories, but those that are perceptually distinct from any L1 category are thought to be easier to learn, since they fall into relatively unoccupied regions in the phonological space. Best (1994, 1995) also proposed that the difficulty in distinguishing non-native sounds can be predicted by the relation between the L1 and FL phonological systems. That is, identification of foreign sounds will be much challenged when two FL sounds categories are perceived or assimilated to one L1 sound category; while it will be easy if two FL sounds are perceived or assimilated as two different L1 sounds. Further, Escudero (2005) claimed that the relationship between the perception and production of L1and FL sounds is influenced by the acoustic characteristics of the sounds in the two languages (Escudero & Boersma, 2004; Escudero, 2005).

Production and perception of FL phonemes are two main processes in language acquisition that have always been of great concern to the theorists and researchers. Previous studies have shown that there is a very close connection between speech production and speech perception. The assumption was that speech perception of FL sounds often influences the production of these sounds (Flege, 1995; Munro & Derwing, 1995; Schmid & Yeni-Komshian, 1999).

Studying the production and perception across FL and L1 is called cross language speech perception studies in which the sounds in FL and L1 are compared acoustically. The comparison is made based on the acoustic properties of sounds such as the spectral features (F1, F2, and F3) and the temporal feature (duration). These studies generally address the extent to which the phonological system of the first language influences the production and perception of the FL sounds. Cross-language speech perception examines the perception of non-native speech typically by 'functional monolinguals … [who] are naïve to the target language' (Best & Tyler, 2007: 16).

The main focus of these studies is on the perception of phonetic similarities between the foreign sounds and L1 sounds by L1 listeners (Best et al., 1996; Escudero, 2001; Williams & Escudero, 2014).

A number of studies of cross-language speech perception have focused on the assimilation of non-native contrasts that are absent from the listeners' first language and have identified several factors that influence the identification of English vowels. One of the most important factors is the acoustic similarity between L1 and FL sounds (Best et al., 1996; Nishi et al., 2008; Gilichinskaya & Strange, 2010; Escudero &

Vasiliev, 2011). Escudero and Boersma (2004) examined the perception of /iː/ and /ɪ/ in two different dialects: Standard Scottish English (SSE) and Standard Southern British English (SSBE), by Spanish learners. The results indicated that Spanish learners perceive /iː/ and /ɪ/ differently depending on the dialect whether it is Scottish or Southern British English. This indicated that acoustic similarity between L1 and FL phonemes could predict the perception of FL sounds.

In most cross language studies, acoustic similarity is connected with perceptual similarity. In other words, acoustic similarity between the acoustic properties such as spectral and temporal features of L1 and FL may influence the learner's judgment on how similar or different the FL sound is to its corresponding L1 sound (e.g., Best et al., 1996; Nishi et al., 2008; Gilichinskaya & Strange, 2010; Escudero & Vasiliev, 2011). One way in which the phonetic similarity of vowels has been investigated in a previous research (e.g. Strange, 2007) is by comparing measures of several acoustic properties of vowels to objectively quantify how similar one vowel from one language is to that in the other language. In doing so, it is revealed what acoustic features could be involved in listeners' judgments on perceptual similarity (Escudero & Vasiliev, 2011).

Every language has its own vowel inventory, which may differ from the inventory found in other languages. For example, Arabic and English differ in their vowel system inventory; there are differences in the quality and quantity of vowels found. There are six pure vowel phonemes in Arabic, while there are twelve vowels in English. The Arabic vowels also differ from English vowels in their acoustic features, such as F1, F2, and duration (Huthaily, 2003; Tsukada, 2009; Khalil, 2014). These differences could contribute to the difficulties faced by Arab EFL learners in learning English vowels; especially vowels that do not exist in their L1 (Ahmed & Abuelhassan, 2015; Faris, 2017; Shamallakh, 2018). There are only a few studies that were found to have dealt with the influence of acoustic similarity between Arabic sounds and English sounds on the perception of FL sounds. Therefore, this study aims to investigate acoustic similarity and perceptual similarity between Tripolitania-Libyan Arabic (henceforth TLA) vowels and British English vowels.

1.2   Background of Libya

This section describes and provides brief background information about the context in which the participants of the study acquired and learned their first language (L1) and English.

1.2.1   Geographical and Historical Overview about Libya

Libya is one of the Arab countries located in the north of Africa. It links the African countries to European countries through the Mediterranean Sea; and thus it is called the northern gate of Africa. It is populated by approximately 6 million people and its capital is Tripoli. It shares the borders with Egypt on the east, Tunisia and Algeria on

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the west, Chad and Niger on the south, and the Mediterranean Sea on the north. Figure 1.1 shows the map of Libya.

Figure 1.1 : Map of Libya
(Source : New York Review of Books, 2015)

Figure 1.1 shows the location of Libya and its borders. In addition, it shows the internal division of the Libyan provinces. Libya has historically been classified under three regional provinces: the northwest is Tripolitania, the east is Cyrenaica and the southwest is Fezzan. Each of these provinces has its own dialect, which differs phonetically from other Libyan dialects (as will be explained in detail in Chapter 2). However, Libyans may not find it difficult to understand any of these dialects. It should be mentioned that Modern Standard Arabic is the official language used in Libya in media and formal events.

As for the history of Libya, it is similar to many African and Arab countries in that it was under colonization from different forces for a long time. It was colonized by Ottomans Turks for centuries, followed by Italian colonization from 1911 until 1940 and then British and France colonization until 1943. In 1949, it was decreed by the UN that Libya must be an independent country and hence it got its independence in 24 December 1950. On 1 September 1969, there was a new military revolution that brought down the King of Libya. In 2011, in concurrence with the so-called 'the Arab Spring', which ended the previous Tunisian and Egyptian regimes, Libya also followed the same direction and ended the 42 years of the previous regime with 17th of February revolution (Elabbar, 2011).

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1.2.2 Educational System in Libya

There are two types of schools in Libyan education: public schools and private schools. Public schools, or as it is called governmental schools, are free for all citizens and compulsory from the age of 6 years until 14 years. The Ministry of Education (the Secretary of Education) is responsible for all charges relating to the education process, for example, preparing school, supporting materials, and teachers' salary. Private schools, on the other hand, are run by private organizations; thus, they are not free. The private schools were introduced on Libya only in the 1990s, thus it was not in favour of Libyan citizens because it was expensive and was not considered to provide equal qualification as public education. However, private schools gained acceptance when it was encouraged by the Libyan government since it fitted with a wide range of parents' requirements such as earlier school enrolment at the age of 5 instead of 6 years, as well as teaching of English as a compulsory subject from the first year of school.

Both types of education followed the same structure. The student is required to study six years at the primary level, followed by three years of preparatory level (preparation of secondary school). Thus, there are nine years of primary teaching level that have to been finished by the student.

After completing the primary level, the student has the choice to continue in the secondary schools which are normally in the same school-building with the primary education. These general secondary school learning consists of another three years. There are two majors offered in the secondary school; they are literature department and science department. Students also have the option of joining some vocational institutes for work preparation rather than pursuing their study at the secondary school.

In 2006, the education system had undergone some changes regarding the general secondary school phase. After completing the nine-years of primary school, if they preferred to continue with secondary school learning, they had to study for four years instead of three years. The secondary schools were called specialist secondary schools where students specialised in their desirable field before university level (Abushafa, 2014). Though, in the case of not joining secondary schools, the student had the choice to enrol in any vocational institutes. At the university level, students have to study for four years to obtain bachelor degree certificate. After completing the university level, the majority of students choose to join the field of work unless they award a scholarship to pursue their high education. Further, some students who are interested in obtaining a master's degree may join the Academy of Higher Education in the capital and then they may have an opportunity to receive a PhD scholarship.

The study year usually starts in September and end in June. In the first three years of the primary school, students have three to four classes that focus mainly on religion, Arabic language alphabets, and basic Math. In the second three years, they have five to six classes that focus on the advanced level of religion, Arabic syntax and morphology, math, biology, in addition to basics of English language. Starting from the seventh year

of the primary school until the last year of the secondary school, they have six to seven classes and the subjects are diverse and more complicated. The class period for every subject lasts for thirty minutes for the primary education, and forty minutes to the secondary education.

1.2.3   Teaching English in Libya

Learning foreign languages in Libya has been highly appreciated and approved by Libyan civilians. The location and history of Libya makes it possible to learn many languages such as Turkish, Italian, French, and English. During the 1940s learning such languages were introduced into Libyan society and then into schools (Abushafa, 2014). Despite the Ottomans long colonization, it failed at that time to make Turkish language to be spoken by Libyans. In contrast to that, Libyans were influenced by Italian colonization and many Libyans can speak Italian fluently.

During the Italian invasion in 1944, the British government adopted English as a compulsory subject at all levels of schools (Ali, 2008). British attracted and supported anyone who was interested in learning English (Abdulhamid, 2011). In the mid of 1950s until 1960s, it was limited in the preparatory and the secondary schools only. By 1968, the authority of education decided to introduce English language as a subject in the primary school as well. This decision was of great approval by the majority of the citizens. However, after the 69th revolution, English language learning was removed from the primary school policy and it was kept for the preparatory and the secondary schools only. English classes at that time were run by native British English speakers.

The worst situation appeared when the educational authority banned learning English from all levels in 1985; starting from primary school to secondary school. It was a kind of offensively reaction to some political disorders between Libya and some European countries. It was constrained only at the university level. This situation did not attract or encourage many Libyan youths to learn English (Orafi, 2008).

The suspension of learning English continued until 1991 when the Libyan authority allowed English language to be a subject in schools starting from the seventh year of the primary level. Most of the teachers were Arab from different countries (such as Iraq and Egypt) and some of them were Libyans. As the importance of English language increased rapidly, it was essential to introduce English as compulsory subject in the fourth year of primary school (at the age of 9 years), and as an elective subject in the first three years of primary school. The students have to achieve four periods every week containing 40 minutes per period.

All the previous changes in teaching and learning English in Libya and the missing five years period of learning English from 1985-1991 has obviously a negative impact on the acquisition of English by Libyans (Ali, 2008; Orafi, 2008).

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1.2.4   English Materials in Libyan Education

Due to the changes in teaching English in Libya that mentioned above, there were many changes in English curriculum to meet the needs of the society and youths. After the independence in 1951, the first series of English language learning introduced in Libyan schools was Basic Way to English by K.C. Odgen. This series was based on vocabulary, facts memorizing, reading, and writing skills. The approach of teaching this material was grammar-translation method (Hashim, 1997; Mohsen, 2014). In 1960s, Libyan authority and English inspectors worked together to improve English language policy. Thus, they proposed a program that could develop learning English pedagogy. Accordingly, this was supported by implementing a new series called "English for Libya" written by a Libyan-English teacher (Al-Gusbi). The series was designed to meet culture and social needs of Libyan students and society. It was built on audio-lingual methods with more focus on listen-repeat skills that could improve students' comprehension skill. Consequently, a number of foreign English teachers were invited to teach this material to Libyans to achieve the desired goals.

At the beginning of 1970, Al-Gusbi worked to extent and to improve the previous series, which was called later "Further English for Libya". It consisted of two books: book 1 and book 2 that introduced to first and second year of secondary school. In the third year, another material was used to match students' specialization. This series was used until 1985.

In 1991, when teaching and learning English was approved again by the ministry of education, there was no choice to use Al-Gusbi series for another period of time (Mohsen, 2014). In 1998, a new material was implemented in Libyan school called "English for Libya" by Jenny Quintana. The material is designed to match students' needs and culture. It presents all the four skills reading, writing, listening, and speaking (Abushafa, 2014). It was based on communicative approach (Orafi & Borg, 2009). Nowadays, Libyans realize the fact that they have to acquire at least one foreign language, especially English as it is very essential for vocational careers such as medical fields, engineering, and business (Youssef, 2012).

1.3   Problem Statement

It is well documented in the literature that EFL learners may have serious difficulties in learning new language sounds, especially in perceiving and producing the sounds. Previous studies have proposed that acoustic similarity between L1 vowels and FL vowels could help to predict the difficulties faced by EFL learners in perceiving and producing FL vowels (e.g. Lengeris, 2009; Escudero & Vasiliev, 2011; Williams, 2013; Escudero, Sisinni, & Grimaldi, 2014; Aboultaif, 2016; Strange, Hisagi, Akahane-Yamada, & Kubo, 2011). Second language acquisition theories such as the Second Language Linguistic Perception Model (L2LP) (Escudero, 2005) claimed that the EFL learners encounter many difficulties in producing non-native vowels because they perceive the vowels inaccurately. Such models indicated that the accurate

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perception and production of English vowels is highly related to the degree of acoustic similarity between the L1 vowels and English vowels, which in turn could explain (or predict) the perceptual assimilation pattern of the English vowels to the L1 vowels. Perceptual assimilation of English vowels to the L1 vowels can identify the difficulties in perceiving and producing the English vowels. According to Ellis (1994), cross-language acoustic similarity can either facilitate or hinder the acquisition of the target language. However, past studies did not provide empirical evidence to test the impact of acoustic similarity on perceptual similarity between L1 and FL vowels.

An important factor in the acquisition of FL sounds is how close or distant the learner's L1 and FL are from each other. The acoustic similarity between L1 vowels and FL vowels could facilitate or hinder the perception and production of FL sounds. Based on speech perception studies, there are acoustic cues available in assisting FL users to correctly identify the members of a phonological contrast (Wang, 2008b; Wang & Yoon, 2008; Holliday, 2010). Peterson and Barney (1952) stated that the most vital acoustic cues in describing the vowels of any language are the first two formant frequencies (F1 and F2) and the duration. These acoustic cues are available for both L1 and FL since all language users share the same basic acoustic function. As a result, FL users only need to learn to attend to the cue or set of cues that lead to the reliable identification of the members of an FL contrast. In other words, as argued in Holliday (2010), the difficulties that FL learners encounter are due to their inadequate perceptual skills to such acoustic cues since FL users are expected to exhibit some degree of L1 influence on their weighting of acoustic cues in perception. This is because phonological contrasts contain variable acoustic cues cross-linguistically. If one cannot accurately perceive the acoustic-phonetic and articulatory properties of a sound, it may be difficult to accurately produce that sound. Ultimately, the differential weighting of cues in speech perception and production may lead to poor discrimination and pronunciation of FL vowels. Thus, when they try to speak a FL, they will produce FL sounds that are close to the L1 sounds with similar acoustic cues.

English and Arabic differ in their vowel inventories. While English has eleven vowels, Arabic has six vowels. Therefore, English vowels that do not exist in Arabic dialects tend to be very challenging for Arab learners (e.g. Almbark, 2012; Khalil, 2014). On the other hand, the vowels that do exist in both languages may be produced and perceived as Arabic vowels instead, rather than as English vowels pronounced by natives. Producing English vowels as L1 vowels may lead to misunderstanding the sentence and thus affect the intelligibility of English pronunciation between speakers of non-native varieties of English, which will lead to communication hindrance. While intelligibility is a worthwhile area of search, this study seeks to understand the acoustic similarity between English vowels and TLA vowels.

Arabic has different regional dialects that differ in their vowel inventories and acoustic properties (Al-Ani, 1970; Ahmed, 2008; Alotaibi & Husain, 2010; Saadah, 2011). Recent studies indicated that a learner's L1 dialect plays a vital role in the acquisition of FL sounds (Escudero & Boersma, 2004; Chládková & Podlipský, 2011; Escudero, Simon, & Mitterer, 2012; Escudero & Williams, 2012). For example, Williams (2013)

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indicated that listeners from different L1 dialects differ in their production and perception of FL sounds. Therefore, Arab speakers of different dialects may experience different difficulties in perception and production of English vowels (Abduh, 2011). For example, Khalil (2014) found that the vowels /æ/, /ɛ/, /o/, /ɔ/ and /ɑ/ are the most difficult for Egyptian learners. Kalaldeh (2018) on the other hand, found that Jordanian learners usually produce /ɒ/ as /ʊ/ and /e/ as /ɪ/, which leads to the production of both words like /set/ and /sɪt/ as the single word /sɪt/. Emran and L.B (2017) stated that Libyan learners mispronounced the vowels /iː/, /ɪ/, /ə/, /ɜː/, /ɑː/, /ɔː/ and /uː/. Shamallakh (2018) indicated that Palestine learners mispronounced the English vowels /iː/, /ɜː/, /æ/, /ɒ/, /ɔː/ and /uː/. Moreover, Taqi, Algharabali, and Akbar (2018) reported that Kuwaiti learners faced difficulties in producing the vowels /iː/, /ʌ/, and /ʊ/. Ali (2013) and Setyaningsih, Wijayanto, and Suparno (2019) both stated that Sudanese learners mispronounced the vowels /iː/, /uː/ and /ɔ/. In addition, Ababneh (2018) demonstrated that Saudi learners confused the vowel /e/ with /ɪ/ and /æ/. Haji and Mohammed (2019) also found that Kurdish Iraqi learners faced difficulties in pronouncing the vowels /ʌ/, /ɜː/, /ə/, /ʊ/ and /uː/, while Al-Badawi and Salim (2014) reported that Jordanians have problems in perceiving the vowels /ɪ/ and /e/. Lastly, Al-Abdely and Yap (2016) found that the vowels /ɒ/ and /æ/ are the most difficult for Iraqi learners.

According to the Education First's (EF) English Proficiency Index (2019), most Arab speakers ranked between low to extremely low in their English skills, including pronunciation. Many Arab EFL learners have the goal to speak English in an intelligible manner as it is the language of global economic and culture development. It requires them to be able to pronounce and understand English sounds accurately, particularly English vowels as they are the core syllable of any English word. Those learners struggle in acquiring English sounds, particularly in producing and perceiving English vowels, which lead to serious communication problems and confusion, such as misunderstanding or inability to participate in a long discussion (Pathan, Aldersi, & Alsout, 2014; Emran & L.B, 2017). It was found that Arab learners usually replace an English vowel with another, which can cause embarrassment for the speaker, difficulties for the receiver or even changing the meaning of the message delivered altogether. For example, Arab learners often confuse the vowels /e/ and /ɪ/, /ɒ/ and /ʊ/, /ɑː/ and /æ/. Thus, the words containing these vowels are produced and perceived incorrectly, such as in /tən/, /hat/, /kaːt/, which are usually produced as /tɪn/, /hʊt/, and /kært/ respectively (Setyaningsih, Wijayanto, & Suparno, 2019). These problems not only affect individual sounds but the whole conversation. If they cannot produce FL sounds and words accurately, they might not be able to make themselves be understood. The same situation applies for listeners; if they cannot accurately recognize FL sounds or distinguishes between minimal pairs in the FL, and then they might not be able to understand others (Díaz, Mitterer, Broersma, Escera, & Sebastián-Gallés, 2015). However, there is a scarcity in literature on the difficulties and errors that Tripolitania-Libyan Arabic EFL learners may have in learning English vowels.

Further, there are several perceptual and instrumental studies that have investigated the perception and production of English vowels by Arab EFL learners (Almbark, 2012; Al-Dilaimy, 2012; Khalil, 2014; Al-Abdely & Yap; 2016; Hubais & Pillai, 2017).

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These studies revealed that Arab learners produced English vowels differently from native speakers and often misperceived most of the vowels. However, none of these studies compared between English vowels and Arabic vowels acoustically when produced by Arab speakers. In addition, there is no any published study that examined the acoustic similarity between Arabic vowels and English vowels, which could predict the difficulties faced by Arab EFL learners in acquiring English vowels. Therefore, this study aims to examine explicitly the acoustic similarity between Libyan Arabic vowels and English vowels and its role on the perception of English vowels by a group of Tripolitania-Libyan Arabic speakers.

1.4 Research Objectives

This study aims to achieve the following research objectives:

1. To describe the vowel space occupied by vowels in the Tripolitania-Libyan Arabic (TLA) dialect as the native speakers of TLA.
2. To describe the vowel space occupied by English vowels produced by Libyan EFL learners.
3. To determine whether TLA vowels can be distinguished from English vowels in terms of the vowel space that is occupied.
4. To identify the closest TLAvowels that correspond to English vowels produced by Libyan EFL speakers.
5. To determine the influence of the acoustic similarity on the perceptual similarity between English and TLA vowels produced by Libyan EFL learners.

1.5 Research Questions

1. What are the acoustic measurements of the TLA vowels produced by TLA native speakers?
2. What are the acoustic measurements of the English vowels produced by Libyan EFL learners?
3. To what extent is there a statistical difference between the acoustic measurements of TLA vowels and English vowels produced by Libyan EFL learners?
4. To what extent is there acoustic similarity between TLA vowels and English vowels when produced by Libyan EFL learners?
5. What is the influence of the acoustic similarity on perceptual similarity between English TLA vowels when produced by Libyan EFL learners?

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1.6   Research Hypotheses

As descriptive and inferential statistical analyses are needed to contrast distinctions between the vowel categories in each language, hypotheses need to be generated for the study. The researcher proposed to test the following hypotheses:

H1: There are differences between the TLA vowels in terms of temporal and spectral measurements.

H2: There are differences between the English vowels in terms of temporal and spectral measurements when produced by Libyan EFL learners.

H3: There are statistical differences between the TLA vowels and English vowels in terms of temporal and spectral measurements when produced by Libyan EFL learners.

H4: There is an influence of acoustic similarity on perceptual similarity between English vowels and TLA vowels when produced by Libyan EFL learners.

1.7   Significance of the Study

The overall significance of this study can be viewed from two different perspectives: the theoretical perspective and pedagogical perspective. The former is reflected by the results of the present study which improves the understanding of the influence of native accent of learners on production and perception of FL sounds. Specifically, it enhances the insights of the acoustic similarity between L1 vowels and the perception of L2/FL sounds. In fact, the native accent of FL listeners in across-language perception is not clearly understood as it is a recently discussed issue in perception speech studies (Chládková & Podlipský, 2011; Escudero et al., 2012; Williams, 2013). Hence, this study provides quantitative support to the models of speech perception since these models hypothesized that the identification of FL sounds are built on whether the two pairs of sounds in L1 and FL are new, similar, or different. By conducting this kind of study, the degree of similarity between sounds in L1 and FL, such as Arabic and English, is limited in numerical values in HZ; so that researchers and educators could classify L2 sounds as new, similar, or different sounds. Therefore, future researches may consider the results of the current study as an important part of their research.

From a pedagogical perspective, this study may help EFL instructors and learners during L2 learning process. It is very common that students in language classes are normally varied; they differ in their linguistic backgrounds, thus it is very crucial to exclusively understand the role and the influence of L1 and the native accent on the acquisition of FL sounds which will help developing a teaching method with a focus on the characteristics of the sounds. Teachers may use these results to focus on the most problematic vowels. Libyan English teachers at different levels lack the valuable resources for this kind of information, since the vowels of Libyan dialect compared to English vowels have not yet been thoroughly investigated. To the best knowledge of

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the researcher, no published research has been found to target Libyan dialect vowels and provide an acoustic comparison between the native language (Libyan dialect) and the foreign language (English). Further, understanding the degree of similarity between sounds and the effect of their properties on sound classification enables researchers and students focus on the primary cues that may lead to high intelligibility in perceiving and producing the EFL sounds.

1.8 Definition of Key Terms

Acoustic similarity: it was not defined officially in the literature. However, acoustic similarity in this study refers to the similarity in the acoustic cues, particularly first formant frequencies (F1 and F2) between TLA vowels and English vowels in the vowel space. That is, determining the closest TLA vowels to a specific English vowel through F1 and F2 using the Euclidean distance (ED) formula (Williams, 2013).

Acoustic distance: it refers to the distance between vowels in TLA and English through the calculation of the difference between the formant frequencies of vowels. Koffi and Lyons (2018) pointed out that "the smaller the distance between the vowels, the more acoustically similar they sound".

Perceptual similarity: it refers to the assimilation or mapping English vowels to TLA vowels by Libyan EFL listeners based on self-judgement on the similarity and dissimilarity between the two contrasts. Thus, it does not inform whether the assimilation is correct or not.

TLA vowels: they are the vowels that exist in the vowel inventory system of Tripolitania Libyan Arabic spoken in the western part of Libya.

English vowels: they are the eleven vowels exist in the vowel inventory system of Standard British English.

Libyan EFL learners: they are the Libyan learners who learn English as a foreign language, particularly in Malaysia.

1.9 Scope of the Study

This study focuses only on the acoustic measurements of TLA vowels and English vowels that are produced by Tripolitania-Libyan Arabic EFL learners. It is limited only on English and TLA vowels and thus other segments (consonants) and supra-segments are excluded. It is limited to the TLA dialect spoken in the western part of Libya only.

The other two Libyan dialects spoken in the eastern and southern part of Libya are not included. Further, the study did not include native speakers of English.

1.10   Organization of the Study

The thesis is structured as follows. **Chapter 2** presents an overview on the theoretical models in speech perception and production including Perceptual Assimilation Model of Second Language Speech Learning (PAM-L2), Second Language Linguistic Perception Model (L2LP), and Speech Learning Model (SLM). It further provides a thorough background on the inventory vowel system of Arabic focusing on Libyan dialects (particularly Tripolitania dialect) and English. The chapter critically reviewed and summarized previous studies conducted on the acoustic measurements of vowels and acoustic similarity across languages and its role in FL speech perception. **Chapter 3** describes the methodology and research design employed in the study including the sample size, data collection instruments, and data analysis methods. It also presents the pilot study that conducted prior to the actual study. **Chapter 4** presents the results of the production and perceptual tasks according to the sequence to research questions. Finally, **Chapter 5** summarizes, discusses, and interprets the results. It provides the implications of the results, explains the limitations of the study, and then proposes some recommendations for future researches.

1.11   Summary

This is an introduction chapter. It presented a general background of the current research, which focused on the perception and production of FL sounds by EFL learners, and a general background of Libya (the context of the current study). It also discussed the problems of the study as it is encountered by Arab EFL learners when learning English sounds. The objectives and the questions raised in the current study were stated to indicate the target and the scope of the study. In addition, a reference to the significance of the study and its contribution to current knowledge were also highlighted in this chapter. Finally, definitions of the most important terms used in this study and the scope of the study were provided. The next chapter provides a detailed discussion of the theoretical perspectives that form the conceptual basis of the study and the past studies and their findings.

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Kalthoum Ramadan was born in 1982, Yefern, Libya. She has obtained her bachelor degree in English language from faculty of art, al-jabal Algharbi University. She worked as an English secondary school teacher for 5 years. Then, she has received an academic scholarship from the ministry of high education to persuade her master. She completed her master in education in 2011 from faculty of educational studies, UPM, Malaysia. Kalthoum has worked as a lecturer at the Department of English language, faculty of education, Yefren. She taught phonetics and phonology, comprehension, in addition to general English.She worked with her colleagues at private language learning centre in Libya. Currently, she completed her PhD in applied comparative linguistics in 2021, from faculty of modern languages and communication, UPM. During her study, she has participated in a number of international conferences and has published journal papers in her field of study (phonology and phonetics).

LIST OF PUBLICATIONS

Ramadan, K., & Thai, Y. N. (2021). Production of English Vowel by Libyan EFL learners: Insights from Unnormalized and Normalized Data. International Journal of Academic Research in Business and Social Sciences, 11(7), 1586–1603.

Ramadan, K, Thai, Y. N., Mohamad Ali, A., & Jalaluddin, A. (2021). An instrumental analysis of English and Arabic Vowels Produced by Libyan EFL Learners, International Journal of Arabic-English Studies. Submitted - revision following positive review feedback.

Ramadan, K., & Thai, Y. N. (2021). Predicting Perceptual Similarity through Acoustic Similarity between Libyan Arabic Vowels and English Vowels. Submitted

Conferences and proceedings

1. International Conference on Creative Teaching, Assessment and Research in the English Language (ICCTAR) held at Hotel Equatorial, Melaka, Malaysia. Title of paper: **Acoustic similarity between Libyan Arabic vowels and English vowels.** 26th -28th June, 2019.

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