AN INSTRUMENTAL ANALYSIS OF /e/, /ɛ/, /o/ AND /ɔ/ IN MALACCA PORTUGUESE CREOLE

SITI RAIHAN BINTI ROSLI

FACULTY OF LANGUAGES AND LINGUISTICS
UNIVERSITY OF MALAYA
KUALA LUMPUR

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SITI RAIHAN BINTI ROSLI

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AN INSTRUMENTAL ANALYSIS OF /e/, /ɛ/, /o/ AND /ɔ/

IN MALACCA PORTUGUESE CREOLE

ABSTRACT

Previous work on the vowel system of Malacca Portuguese Creole (MPC) has highlighted that there are overlaps between particular vowels (Pillai, Chan & Baxter, 2015), therefore suggesting the possibility of phonological instability. However, these studies have been inconclusive about the status of /e/, /ɛ/, /o/ and /ɔ/. Hancock (2009), for example, suggests that /e/ and /ɛ/ contrast only in two words while Baxter (1988) suggests that the use of these vowels are not systematic, contrasting only before /t/, /s/ and /z/. Similarly, Baxter (1988) also posits that /o/ and /ɔ/ contrast before /t/, /d/ and /l/. However, there has thus far not been any empirical evidence to show the extent and status of the contrast between these vowels. This study therefore, instrumentally examines the vowels /e/, /ɛ/, /o/ and /ɔ/ to investigate if there is a difference in vowel quality between the vowels and to also determine their phonological status in MPC. Recordings of 1,141 words containing /e/, /ɛ/, /o/ and /ɔ/ from two MPC dictionaries (Baxter & de Silva, 2004; Scully & Zuzarte, 2004) and the glossary in Singho et al (2016) by five native speakers of MPC, were orthographically transcribed and annotated using Praat, version 5.4.18 (Boersma & Weenik, 2015), a speech synthesis and analysis programme. The vowels were then analysed using the Formant Frequency Model, which posits that the lower the F1, the higher the vowel and the higher the F2, the more front the vowel is. Besides that, a two-tailed independent sample t-test and ANOVA were conducted to the overall and individual measurements of F1 and F2 between /e/ and /ɛ/, and /o/ and /ɔ/. Based on the findings, the overall placement of /e/, /ɛ/ and /o/ are in accordance to Klein (2006) but /ɔ/ appears to be more fronted. Although findings indicate a significant difference, F1 reported a high practical significance while F2

reported a low practical significance. This means that the key difference between the vowels lies in height rather than fronting. Nevertheless, overlaps are apparent between the five native speakers, which suggest the possibility of speaker variance and the interchangeable use of /e/ and /ɛ/ as well as /o/ and /ɔ/. There was also evidence of individual variance where speakers have a tendency of pronouncing the /ɔ/ sound differently from one word to another word. Besides that, Baxter's (1988) claim of vowel harmony is supported by findings of the present study since /e/ and /o/ did precede high vowels. However, this was not the case for /ɛ/ and /ɔ/ since a schwa is more likely to follow compared to low vowels. Additionally, 30 out of 37 borrowed words originated from Malay. Despite having English borrowings in MPC, there is a notable difference in pronunciation. From the findings, it appears that the vowels /e/, /ɛ/, /o/ and /ɔ/ are distinct phonemes in Malacca Portuguese Creole.

Keywords: instrumental analysis, phonetics and phonology, vowels, Malacca Portuguese Creole.

KAJIAN INSTRUMENTAL /e/, /ɛ/, /o/ DAN /ɔ/

DALAM KREOL PORTUGIS-MELAKA

ABSTRAK

Kajian terdahulu berkaitan sistem vokal dalam Kreol Portugis-Melaka (MPC) telah memberi penekanan bahawa terdapat pertindihan di antara vokal-vokal tertentu (Pillai, Chan & Baxter, 2015), justeru mencadangkan kemungkinan terdapat ketidakseimbangan fonologi. Walaubagaimanapun, bagi vokal /e/, /ɛ/, /o/ dan /ɔ/, kajian-kajian ini tidak membawa kepada sebarang keputusan. Sebagai contoh, Hancock (2009) menyarankan /e/ dan /ɛ/ hanya berbeza dalam dua perkataan manakala Baxter (1988) mengemukakan cadangan bahawa penggunaan vokal-vokal ini tidak sistematik, hanya akan berbeza sebelum bertemu /t/, /s/ dan /z/. Pada masa yang sama, Baxter (1988) turut menganjurkan bahawa /o/ dan /ɔ/ akan berbeza sebelum /t/, /d/ dan /l/. Walau bagaimanapun, masih belum terdapat bukti empirikal untuk menunjukkan lanjutan kajian ini dan status setakat perbezaan di antara vokal-vokal ini. Oleh itu, kajian ini secara asasnya mengkaji kemungkinan wujudnya perbezaan kualiti di antara vokal-vokal /e/, /ɛ/, /o/ dan /ɔ/ dan menentukan status fonologinya dalam MPC. Sebuah rakaman berjumlah 1,141 perkataan yang mengandungi /e/, /ɛ/, /o/ dan /ɔ/ dari dua kamus MPC (Baxter & de Silva, 2004; Scully & Zuzarte, 2004) dan glosari dari Singho et al (2016) oleh lima penutur jati dalam kalangan MPC, telah ditranskipsi secara ortografi dan dianotasi menggunakan sebuah perisian sintesis dan analisis ucapan bernama Praat, versi 5.4.15 (Boersma & Weenik, 2015). Vokal-vokal tersebut dianalisa menggunakan *Formant Frequncy Model*, yang mana mengusulkan semakin rendah F1, semakin tinggi vokal dan semakin tingg F2, semakin kedepan sesuatu vokal itu. Selain itu, kajian independen sampel t secara *two-tailed* dan ANOVA telah dikendalikan untuk

mengukur kesuluruhan dan setiap satu F1 dan F2 di antara /e/ dan /ɛ/, serta /o/ dan /ɔ/. Berdasarkan keputusan yang diperoleh, keseluruhan penempatan /e/, /ɛ/ dan /o/ adalah selari dengan Klein (2006), tetapi /ɔ/ kelihatan lebih kehadapan. Walaupun keputusan memberikan indikasi bahawa terdapat perbezaan signifikan di antara dua set vokal, F1 dilaporkan mempunyai signifikan amali yang tinggi manakala F2 dilaporkan mempunyai signifikan amali yang rendah. Ini bermaksud, perbezaan utama diantara vokal-vokal tersebut adalah daripada sudut ketinggian (*height*) vokal bukannya pengedepanan (*fronting*). Namun begitu, penindihan yang berlaku diantara lima penutur jati mencadangkan terdapat kemungkinan variasi unik seseorang penutur dan penggunaan boleh saling tukar diantara vokal /e/ dan /ɛ/, juga diantara /o/ dan /ɔ/. Dapat juga menunjukkan terdapat variasi kendiri dimana penutur jati mempunyai kecenderungan untuk menuturkan bunyi /ɔ/ secara berbeza dari satu perkataan ke satu perkataan lain. Selain itu, pada pendapat Baxter (1988), kemurnian vokal disokong oleh dapatan kajian melihat kepada vokal-vokal /e/ dan /o/ yang didahului dengan vokal yang tinggi. Walau bagaimanapun, kes ini tidak boleh terpakai untuk vokal /ɛ/ dan /ɔ/ kerana bunyi schwa berkemungkinan akan terjadi berbanding vokal-vokal rendah. Sebagai tambahan, 30 dari 37 perkataan pinjaman adalah dari Bahasa Melayu. Walaupun terdapat pinjaman dari Bahasa Inggeris dalam MPC, terdapat perbezaan yang ketara dalam cara sebutan. Daripada dapatan, vokal-vokal /e/, /ɛ/, /o/ dan /ɔ/ adalah fonem yang berbeza dalam Kreol Portugis-Melaka.

Kata kunci: analisis instrumental, fonetik dan fonologi, vokal, Kreol Portugis-Melaka.

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MPC	Malacca Portuguese Creole
UNESCO	United Nations Educational, Scientific and Cultural Organization
MPEA	Malacca Portuguese-Eurasian Association
LC	Language Consultant
MalE	Malaysian English
SM	Standard Malay
LPC	Linear Predictive Coding
SD	Standard Deviation
Hz	Hertz
Min	Minimum Value
Max	Maximum Value
N	Noun
Pro	Pronoun
V	Verb
Adv	Adverb
Adj	Adjective
Num	Number

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CHAPTER ONE

INTRODUCTION

1.0 Background

In 1511, the Portuguese conquered Malacca, which is located about 153km south of Malaysia's capital city, Kuala Lumpur. Malacca's strategic location in the South-East Asia spice trade routes attracted many other colonial powers such as the Dutch, which ruled Malacca in 1641, followed by the British in 1824 (Lee, 2011). However, unlike other colonial conquests, the Portuguese encouraged unions with the locals as a means of providing manpower and establishing loyalty to Portugal (Hancock, 2009). The mixture of heritage resulted in the creation of a creole among the *mestiço* populations bonded by the Catholic faith (Lee, 2011; Pillai, Chan & Baxter, 2015). Figure 1.1 briefly illustrates the mixed marriages that took place over the years. Having said that, this may not be totally accurate since the Portuguese came to Malacca with their soldiers and slaves (Holm, 1989).

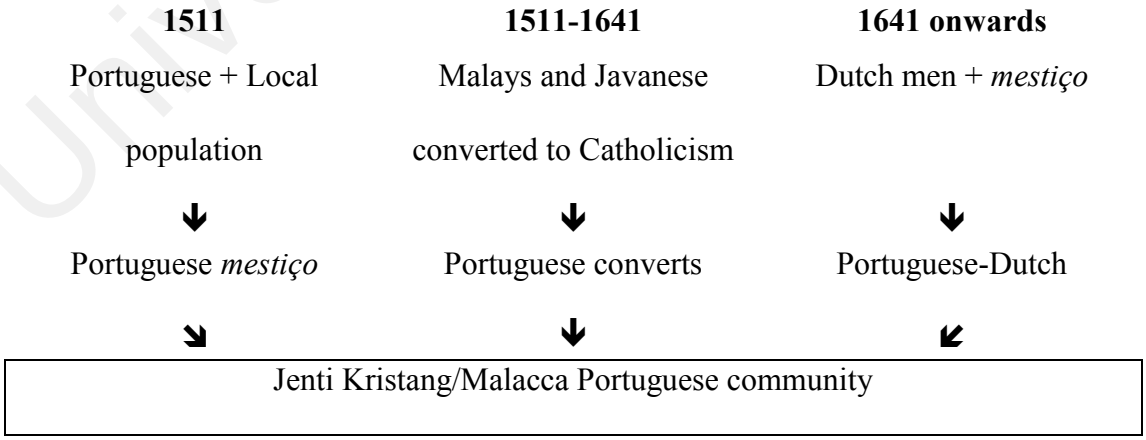

Figure 1.1: Multiethnic Roots of the MPC Speech Community

(Reproduced from Lee, 2011, p. 2)

Baxter (2005) further explains that Malacca Portuguese Creole (MPC) emerged due to the adaptation of Portuguese and local languages by the offspring of the *casado* class, which consist of European Portuguese men who officially married local women. Currently, the largest group of MPC speakers can be found in Malacca at the Portuguese Settlement (see Figure 1.2).

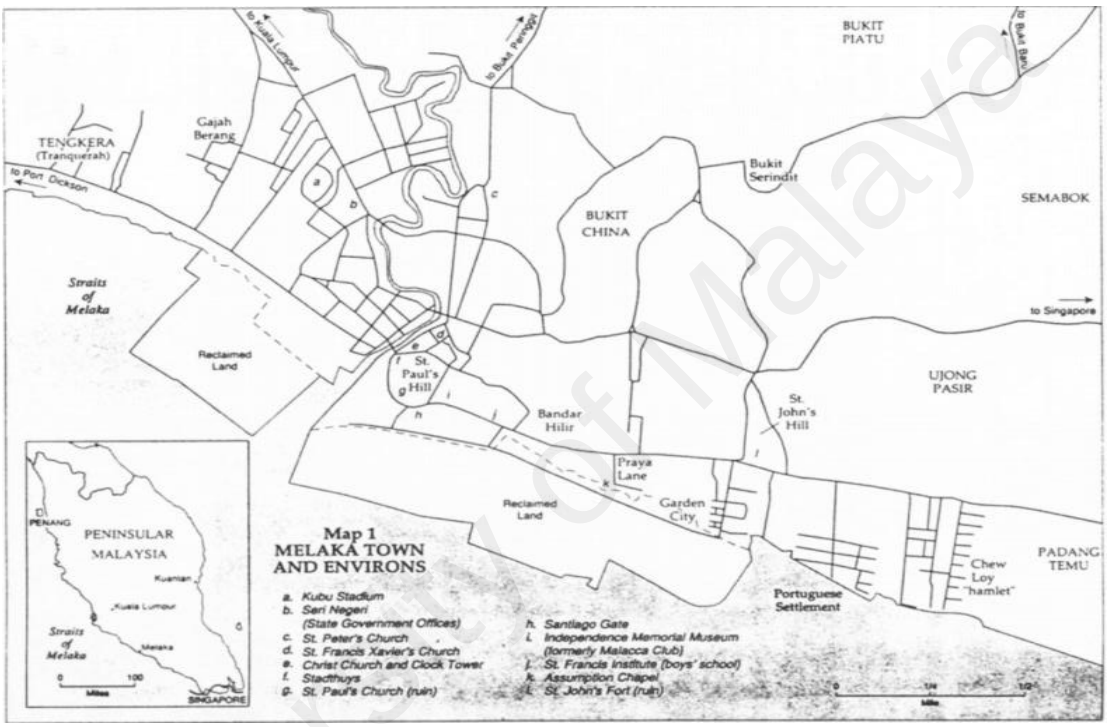

Figure 1.2: Map of Malacca

(Reproduced from Sarkissian, 1995, p. 38)

1.1 Portuguese Descendants in Malaysia

Kampong Portugis or commonly known as the Portuguese Settlement in Ujong Pasir, Malacca, was first known as "*Padre Sa Chao"* (Sta Maria, 1982, p. 130) or "*Padre Sa Chang"* (Baxter, 2012, p. 118), which means 'the Father's Land' (Pillai, 2015). Reverend Father Jules Pierre François and Reverend Father Alvaro Martin Coroado, who are Catholic priests, established the Portuguese Settlement in the 1930s. The Settlement's main purpose was to house low income Portuguese-Eurasians

scattered around Malacca, specifically in Tranquerah, Ujong Pasir, Bunga Raya, Banda Hilir and Kubu (Sta Maria, 1982; Fernandis, 2003; Sarkissian, 2005). This seaside village originally had a Customs and Fisheries Department, a school, a playing field as well as a village square (Fernandis, 2003, p. 290).

Being a multiracial and multilingual country, ethnic boundaries in Malaysia can be vague. With influences from the English, Dutch and Filipinos as well as the local Malays, Chinese and Indians, it is only natural for the Portuguese community to be a fusion of many cultures and races (Fernandis, 2003; Baxter, 2012; Pillai, 2015). Yet, conventional ethnic divisions or popularly called 'race', exist in Malaysia today as Malay, Chinese, Indian and Others. While the Malaysian constitution defines a Malay as someone who was born in Malaysia, practices Islam, follows Malay customs and speaks Malay habitually (Mohammed Suffian Bin Hashim, 1976; Goh, 2002), no definition is given for what constitutes as a Chinese, Indian and Others. Hirschman (1987) however, stated that the Chinese and Indian communities are supposedly descendants of immigrants from Mainland China and India, while those who do not qualify for the three main categories, like the Portuguese descendants, will be pigeonholed as 'Others' (see Table 1.1).

Table 1.1: Ethnic Classifications in Malaysia in 1980

(Reproduced from Hirschman, 1987)

Malaysia's Ethnic Classification			
I) Malay	**II) Chinese**	**III) Indian**	**IV) Others**
Malay	Hokkien	Indian Tamil	Thai
Indonesian	Cantonese	Malayali	Vietnamese
Negrito	Khek (Hakka)	Telegu	Other Asian
Jakun	Teochew	Sikh	**Eurasian**
Semai	Hainanese	Other Punjabi	European
Semelai	Kwongsai	Other Indian	Others
Temiar	Hokchia	Pakistani	
Other Indigenous	Hokchiu	Bangladeshi	
Other Malay race	Henghwa	Sri Lankan Tamil	
	Other Chinese	Other Sri Lankan	

However, even under the category of 'Others', these Portuguese descendants are grouped with other ethnic communities who are also the offspring of Euro-Asian marriages as Eurasian. Furthermore, these Portuguese descendants are led by a village headman called the *regedor* or *rejidó* (O'Neill, 2008), are often described variously as Portuguese-Eurasians, Malaysian Portuguese, *Serani*, *Nesrani*, Luso-Malays and *Kristang* (Pillai, 2015). Table 1.2 shows the family names of the Malacca Portuguese Eurasian community.

Table 1.2: Family Names of the Malacca Portuguese Eurasian Community

(Reproduced from Pillai, 2015, p. 89)

Portuguese	Dutch	British	Others
1) Collar	1) Danker	1) Lowe	1) Banerji (Bengali)
2) De Costa	2) De Witt	2) Farnel	2) Gimino (Filipino)
3) De Mello	3) Frederick	3) Marsh	3) Aeria
4) De Roche	4) Goonting	4) Savage	4) Singho (Burger)
5) De Rozario	5) Hendricks	5) Scully	5) Tan (Chinese)

The absence of an agreed representation and identity consensus is due to the evolution these descendants have gone through over the past 500 years (Sta Maria, 1982). As mentioned earlier, the Portuguese colonisers encouraged unions with the locals, resulting in offspring who are neither Iberian Portuguese nor Asian. This generation is known as *mestiço.* Interestingly, Sta Maria (1982) pointed out that the *mestiço* of Malacca were called 'Topazese' because their skin colour is similar to the Topaz stone, which is yellowish brown. Fernandis (2000) on the other hand noted that the natives first called them 'Benggali Puteh' or 'White Benggalis' but later referred to them as *Nesrani* and *Serani* because of their Christian religion. In 1639, the Dutch used the word 'Malayan' to represent them followed by 'Malaccans', after the Portuguese were defeated (Sta Maria, 1982). It did not end there. Rêgo, a Portuguese historian, referred to them as 'Malacanese' (Sta Maria, 1982), while Sta Maria (1982) identified these Portuguese descendants as Malacca Portuguese. Eventually, a misnomer, 'Kristang', which means Papist Christian emerged to represent these Portuguese descendants. Having said that, Baxter (2012) highlighted that the word 'Kristang' traditionally refers to three things; the language they speak, the religion they practice and their ethnic group.

Since the Portuguese community in Malacca today are not a lineal descendent of those from Portugal, they also have separate identities from Portugal citizens, therefore, forming their own new ethnic group in Malaysia (Chan, 2014). During the British occupation, the community was divided into two social classes according to their education, occupation and wealth; the upper class *kasta altu* and the lower class *kasta bassu* (Sarkissian 2005; O'Neill, 2008). While the *kasta altu* worked primarily as civil servants, the *kasta bassu* worked as fishermen (O'Neill, 2008, p. 56). Even though the Portuguese are mostly known to earn an honest living as fishermen, many of them today are either businessmen or working in the service and manufacture industries as factory workers, hotel supervisors and teachers to ensure a more stable income (Fernandis, 2003; O'Neill, 2008; Pillai, 2015). Sarkissian (1995) also noted that they are earning a lucrative sideline from performing their songs and dances for tourists, festivals and company dinners.

According to Sta Maria (1982), the establishment of the Portuguese Settlement is of utmost importance as it provides more opportunities for the Portuguese descendants to speak the local Portuguese patois (MPC). This is further explained by Baxter (1988):

> "The significance of the Portuguese Settlement as a linguistic and cultural core is clear. It has the largest concentration of the Creole population…"

In other words, this village has created a cultural homeland whereby the traditional values, norms and Creole seem to be well maintained. For example, the Settlement still celebrates festivals like *Festa San Pedro* (the Feast of St. John the Baptist)*, Festa San Juang* (the Feast of St. Peter) and *Intrudu,* a water festival to welcome the Lent season (Sta Maria, 1982; Pillai, 2015). Apart from that, Portuguese-Eurasian food is available

at restaurants in the Settlement, in addition to a chapel, a school, and the Portuguese Square where performances of traditional songs and dances take place. The layout of the Portuguese Settlement is illustrated in Figure 1.3.

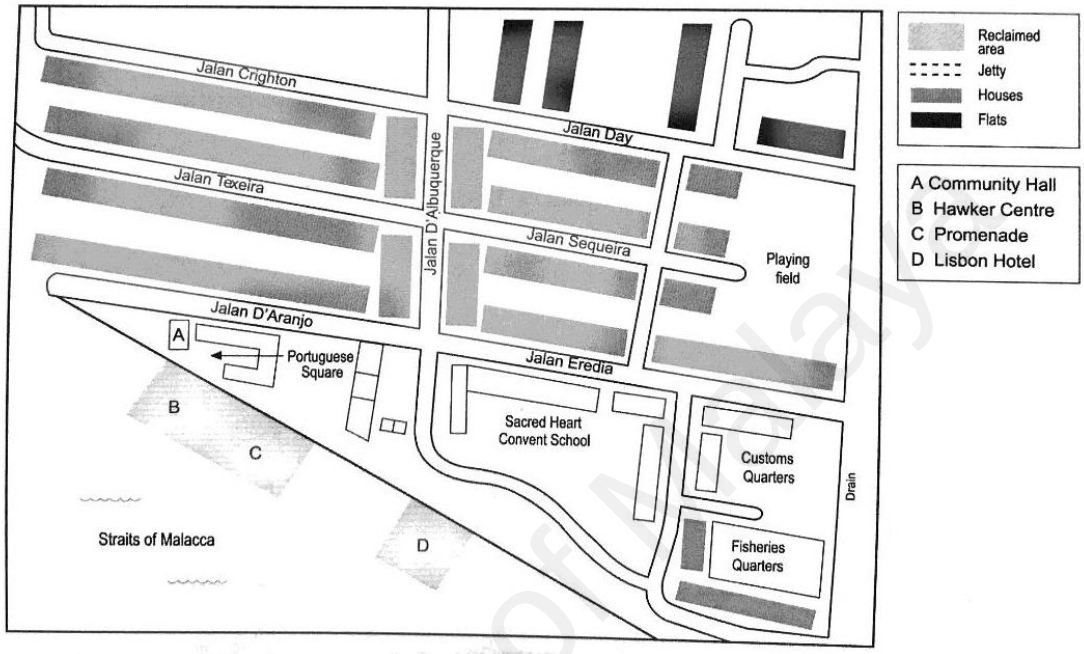

Figure 1.3: Layout of the Portuguese Settlement in Malacca

(Reproduced from Pillai, 2015, p. 82)

Despite reports of dwindling numbers of younger MPC speakers (e.g. Baxter, 2005; Pillai, Soh & Katija, 2014), the Settlement and its immediate surrounding areas comprise of approximately 120 houses and 1,200 residents (Pillai, 2015). Nunes (2015) however emphasized that the Portuguese-Eurasians who total approximately 25,000 exist in other parts of Peninsular Malaysia.

1.2 An Endangered Language: Malacca Portuguese Creole (MPC)

More than 350 years have passed since the withdrawal of the Portuguese from Malaysia but amazingly, a creolized variety of Portuguese can still be found at the Portuguese Settlement in Malacca, Malaysia (Hancock, 2009). A key factor to its

survival is the role of religion (Baxter, 2012). Although Malacca was no longer ruled by the Portuguese, priests from Portugal were still sent to Malacca under the Portuguese Mission (Fernandis, 1999; Baxter, 2012). These trained priests were fluent MPC speakers, thus providing linguistic reinforcement to Malaysians of Portuguese descent who are followers of the Roman Catholic faith. Besides religious events, the resident priests of Malacca also encouraged the usage of MPC for cultural events like performances during Easter and Christmas celebrations (Baxter, 2012).

Despite having Malaysians of Portuguese descent living in a contained area, MPC or variously known as Kristang, Cristao and Papiá Cristang has now become one of Malaysia's endangered languages and is currently listed in the UNESCO Red Book of Endangered Languages (Lee, 2011). With the absence of resident Portuguese priests in Malacca due to a lack of priests in Portugal and Malaysia's Immigration laws (Fernandis, 1999), the Catholic congregation of the Portuguese Mission of St. Peter's Church is now administered by other races who use English instead of MPC (Fernandis, 1999; Baxter, 2012). Other factors causing many Malaysian Portuguese-Eurasians to switch their first language to English include intermarriage, urbanisation, education, social and geographic mobility, as well as a lack of intergenerational transmission (David & Faridah Mohd. Noor, 1999; Baxter, 2012; Pillai & Khan, 2011; Pillai, Soh & Kajita, 2014).

This is supported by Nunes (2015) and Baxter (2012) who noted that the language shift to English started in the mid-nineteenth century and became more prominent due the establishment of schools and employment during the British rule. Furthermore, Sarkissian (2005) highlighted that English was also deemed to be of a higher prestige during the British rule as it was seen as a distinct class marker, whereby English was

spoken by the upper class, while those who spoke Kristang or MPC are associated to being poor and low class. This yearning to move up the social ladder further facilitated the shift to English.

Having said that, there is awareness to preserve MPC, especially among the Portuguese community in Malacca, since the language is a strong symbol of their cultural identity. A survey done by Nunes (2015) revealed that MPC is mostly used for conversation and mostly for gossip, which supports Marbeck's (1999) claim that MPC functions as a secret language to conceal certain information from non-MPC speakers. Currently, MPC classes are held in the Portuguese Settlement for free. Besides that, efforts to revitalise their language have been ongoing thanks to the collaboration between the Portuguese Settlement village committee and the Malacca Portuguese-Eurasian Association (MPEA) with language researchers from a local university. Moreover, a language commission has also been established by members of the community to discuss and make informed decisions regarding MPC.

1.3 Problem Statement

According to Hancock (2009, p. 298) and Klein (2006, p. 9), MPC has eight vowels, namely /i/, /e/-/ɛ/, /o/-/ɔ/, /u/, /a/ and /ə/. However, previous studies by Hancock (2009) and Baxter (1988) suggested that the vowels /e/, /ɛ/, /o/ and /ɔ/ are in free variation. Although efforts have been made (Baxter & de Silva, 2004; Scully & Zuzarte, 2004; Hancock, 2009), contradictions and inconsistencies are still apparent in the orthographic and phonetic representation of this endangered language (Pillai, Chan & Baxter, 2015), which will be discussed further in Chapter 2.0. Further, previous studies on the vowel system of MPC have also highlighted overlaps between particular vowels (Pillai, Chan & Baxter, 2015), therefore suggesting the possibility of phonological instability.

However, these studies (Baxter, 1988; Hancock, 2009; Pillai, Chan & Baxter, 2015) have been inconclusive about the status of /e/, /ɛ/, /o/ and /ɔ/. Moreover, there has not been any empirical evidence to show the extent and status of the contrast between these two sets of vowels thus far. This is the research gap this study hopes to fill.

1.4 Research Objectives

Pillai, Chan and Baxter (2015) highlighted that efforts to describe MPC sounds could be contradictory and inconsistent due to a largely impressionistic analysis. Although an acoustic analysis on MPC sounds have been done (Chan, 2014; Pillai, Chan & Baxter, 2015), there seem to be overlaps between the vowels /e/, /ɛ/, /o/ and /ɔ/. This study therefore attempts to instrumentally examine the vowels /e/, /ɛ/, /o/ and /ɔ/. Specifically, this study intends to meet these objectives:

i. To investigate if there is a difference phonetically in vowel quality between /e/ and /ɛ/ as well as /o/ and /ɔ/.
ii. To determine the phonological status of /e/, /ɛ/, /o/ and /ɔ/ in Malacca Portuguese Creole.

1.5 Research Questions

With regards to the aims, this study strives to answer these questions:

i. To what extent are /e/ and /ɛ/ contrasted based on their average F1 and F2 values of the vowels?
ii. To what extent are /o/ and /ɔ/ contrasted based on their average F1 and F2 values of the vowels?

iii. What is the phonological status of /e/, /ɛ/, /o/ and /ɔ/ in Malacca Portuguese Creole?

1.6 Significance of Study

Findings obtained from the present study will increase our awareness of the MPC sound system by clarifying the inconsistencies surrounding the vowels /e/, /ɛ/, /o/ and /ɔ/, in addition to contributing towards revitalisation efforts of this endangered language.

1.7 Summary

This chapter briefly describes the background, problem statement, research objectives and questions, in addition to the significance of conducting this study. The next chapter will review the literature related to the study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents literature on the formation of MPC as a creole. Descriptions by previous researches on the MPC vowels will also be presented. Besides that, the characteristics of the vowels of local languages, Malay and Malaysian English are explored to investigate the influences these languages have on MPC. Issues pertaining to the transcription and spelling of MPC are also highlighted in this chapter. This chapter also discusses how the formant frequency model is used to acoustically analyse MPC vowels.

2.1 Malacca Portuguese Creole

A pidgin according to Holm (1989) is defined as a reduced language formed to supplement social contexts like trade among people without a common language. Basically, a pidgin has no native speakers (Holm, 1989). Holm (1989) further explains that over time, a pidgin will evolve due to non-intimate social interactions between the less powerful group of speakers or substrate language speakers and the more powerful group of speakers, which are the superstrate language speakers. In other words, the substrate language will eventually adopt the vocabulary of the superstrate language (Holm, 1989). Since the main purpose was restricted for specific purposes like trade, grammar was not emphasised. A creole, on the other hand, developed from a pidgin by becoming a native language to a speech community (Holm, 1989; 2000). This happened when their forefathers were moved to other places for slavery (Holm, 2000), immigration and political movements (Haring, 2003).

As mentioned in the previous chapter (see Chapter 1.0), the Portuguese conquered Malacca in 1511 due to trade. Along with other Portuguese-derived creoles from Asia and Africa, MPC was developed from a common variety of Portuguese origin in the 16th century during the Portuguese colonial expansion (Hancock, 1975). According to Hancock, (1975), Africans who first learned the Portuguese pidgin when they were brought to Europe as slaves, taught it to Portuguese seamen who visited and settled on the West African coast. These Portuguese seamen and slaves later used this pidgin when they conquered Malacca in 1511 (Holm, 1989). In other words, the Portuguese pidgin brought to Malacca in the 16th Century was already used by the Portuguese seamen, soldiers and slaves who learned the pidgin during their voyages in Africa and India, before coming to Malacca (Baxter, 2005).

The mixture of heritage due to unions between the Portuguese and locals in Malacca resulted in the emergence of the creole MPC as a native language when it was spoken by the offspring of the *casado* class (Baxter, 2005). However, Holm (1989) highlights that the multilingual setting of Malacca meant that MPC coexisted with the local languages, therefore subjecting it to continuous change. The Malay influences found in the lexicon and grammar of present-day MPC (Hancock, 1975) proves that MPC has evolved from 16th Century Portuguese, which therefore debunks the popular opinion that MPC is a form of old Portuguese. More importantly, MPC is the final variety with active young speakers belonging to the East and Southeast Asian Portuguese creoles (Baxter, 1988, 1996; Holm, 1988).

2.1.1 Malacca Portuguese Creole Lexicon

Being a Portuguese-based creole, it is only natural that the majority of MPC's lexicon is derived from Portuguese (Sta Maria, 1982; Pillai, 2015). What is interesting, however, is that presently, 300 to 400 words of the Malay language are also borrowed from Portuguese (Pillai, 2015). The fact that the Portuguese language enriched the vocabulary of MPC and Malay is the reason why both languages share similar lexical items as shown in Table 2.1.

Table 2.1: Portuguese lexical items used in present day MPC and Malay

(Adapted from Sta Maria, 1982, p. 212)

Portuguese	**MPC**	**English**	**Malay**
meza [ˈmeza]	mesa [ˈmɛzə]	table	meja [ˈmedʒə]
escola [isˈkəla]	escola [ɛskələ]	school	sekolah [səˈkola]

Since MPC evolved in a multilingual setting, some of its lexicon is borrowed from the local languages. Examples include *changkol* 'hoe' from the Malay word *cangkul* and *chengsi* 'spatula' from the Hokkien word *chien*^{1} *si*^{5} (Baxter and de Silva, 2004, p.xvii). Hancock (1975) also noted that while elder speakers would provide explanations in MPC during vocabulary sessions, younger speakers tend to use its Malay counterparts first. This can be attributed to a lack of intergenerational transmission as mentioned in the previous chapter (see Chapter 1.2). Other contributing factors are the use of colloquial Malay with other locals and the formal instruction of Malay received in schools since the early 1970s (Baxter, 2012). Since then, Baxter (2005) reports an increase of Malay and English borrowings into MPC. However, there is a growing preference to use English borrowings compared to Malay (Baxter, 2005).

This language shift from MPC to English is more prevalent in the younger MPC speakers due to socioeconomic factors (Baxter, 2005).

Recently, Baxter (2012) discovered an emergence of Portuguese influences on MPC words, which he attributes to the increasing presence and language contact with Portuguese journalists, tourists and European Portuguese lessons in the last decade. An example is the MPC word *kifoi* 'what happened?' [kifoi], which is pronounced as [kə fój] or [kᵊ fój] in Modern European Portuguese (Baxter, 2012). In this example, the introduction of an unstressed [ə] and syllable reduction signifies a phonological and semantic change. However, Baxter (2012) highlights that these influences are still in the early stages and remains to be seen if it will last. Further, Baxter (2012) emphasized that these influences were based on his observations during his visits to Malacca and not on a quantified study.

Having said that, there is multiple evidence (Rêgo, 1942; Hancock, 1973, 1975; Baxter & de Silva, 2004; Baxter, 2005) showing MPC losing its lexicon and undergoing a semantic shift. A comparison of the collection of lexicon between Rêgo (1942) and Baxter and de Silva (2004) reveal a total lexicon loss of 9.3% and a semantic shift rate of 1.5% over the course of 60 years (Baxter, 2005). Despite recognizing a number of words, some words like *nozamintu* 'mourning' and *muchadu* 'full, swollen' were still removed because the MPC speakers could not assign the words to a meaning (Baxter, 2012). Lexicons are also classified as archaic if they were used very rarely by MPC speakers or if there is a preference to use another equivalent of the same word (Baxter, 2005). Table 2.2 displays some lexical items that are obsolete in MPC together with its current equivalent.

Table 2.2: Examples of lost MPC lexicons

(Adapted from Baxter, 2005, p.25)

Rêgo (1942)		**Current equivalent**	
Word	**Meaning**	**Word**	**Meaning**
emado	glutton	*pustemadu*	glutton, glutinous
fermosura	beauty	*buniteza*	beauty
nescitá	to need	*prësizu*	to need

Another comparison between the lexical collection of Hancock (1973) and Baxter and de Silva (2004) also revealed the extinction of 68 words and a change of meaning in 15 words, which means that MPC has lost 7% of its lexicon in just 28 years (Baxter, 2005). Efforts to maintain MPC needs to be more aggressive since the number of lost MPC lexicon seem to be receding faster and faster.

2.1.2 Malacca Portuguese Creole Grammar

Although the majority of MPC lexicon was derived from Old Portuguese, its grammar is influenced by Malay (Hancock, 1975; Baxter, 1988; Pillai, 2015). For example, the reduplication of nouns, which also occurs in Malay in the MPC word *keng-keng* to mean whoever. Reduplication in MPC is also evident to show plurality like the words *barku-barku*, meaning boats or *kapal-kapal* in Malay (Hancock, 1975, p. 219). Furthermore, Malay-modeled calquing is extensively found in MPC. An example provided by Hancock (1975, p. 219) is *kumi bentu* for the Malay counterpart *makan angin*, which translates literally to 'eat wind'.

Besides that, Baxter (1988, p. 119) highlighted that the auxiliary complex Time-Mood-Aspect to represent past, present and future tenses reflected in MPC's *ja*, *ta*, and

logu, is similar to its Malay counterparts *sudah*, *sedang* and *nanti* respectively. Furthermore, the concept of negation to express 'have yet' and 'do not' is realized in the MPC words *nenang* and *nang*, which is comparable to *belum* and *jangan* in Malay (Baxter 1988, p. 222).

There are two main classes of common nouns in MPC, which are countable nouns like *trigi* 'tiger' [trigi] and *kaza* 'house' [kaza], and uncountable nouns like *agu* 'water' [agu] and *lama* 'mud' [lamə] (Baxter, 1988). Baxter (1988, 2012) also found MPC words with gender distinction, for example *kuzinyera* 'female cook' [kuziɲerə] and *kuzinyeru* 'male cook' [kuziɲeru].

2.2 Malacca Portuguese Creole Vowels

According to Hancock (2009, p. 298), there are eight vowels in MPC, namely /i/, /e/-/ɛ/, /o/-/ɔ/, /u/, /a/ and /ə/ which is also supported by Baxter (1988) (see Table 2.3) and Klein (2006, p. 9) (see Figure 2.1).

Table 2.3: Classification of MPC Vowels

(Reproduced from Baxter, 1988, p. 23)

	Unrounded		**Rounded**
	Front	**Center**	**Back**
High	i		U
	e		o
Mid	ę (æ)	ë	ǫ
Low		a	

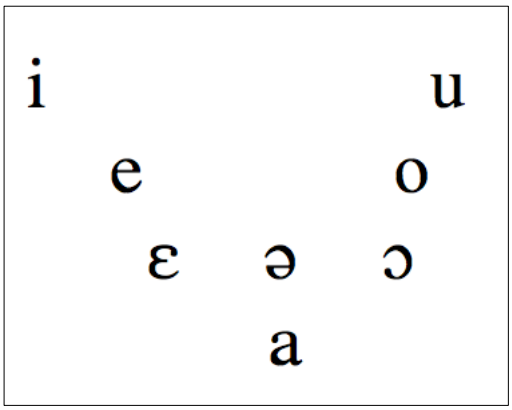

Figure 2.1: Vowel Chart of MPC

(Reproduced from Klein, 2006, p. 9)

However, Hancock (2009) states that only six of the vowels are contrastive, emphasising the existence of free variation between /i/ and /e/, as well as /o/ and /u/. Baxter (1988) on the other hand proposed that /e/ and /ɛ/ are in free variation in all environments except before /t/, /s/ and /z/, yet the examples presented below does not show a distinct pattern since both vowels can occur before the aforementioned consonants (Baxter, 1988, p. 26):

- Before /t/

  léti 'milk' [ˈleti]

  sẹ́ti 'seven' [ˈsɛti]

- Before /s/

  bésu 'lip' [ˈbesu]

  mẹ́su 'still' [ˈmɛsu]

- Before /z/

  rẹ́zu 'prayer' [ˈrɛzu]

  tézu 'tight' [ˈtezu]

For the vowels /o/ and /ɔ/, Baxter (1988) indicated that contrasts between the two phonemes occur before /t/, /d/ and /l/. However, similar to the vowels /e/ and /ɛ/, no distinct patterns can be determined since both /o/ and /ɔ/ can occur before the consonants /t/, /d/ and /l/ as illustrated in the examples provided by Baxter (1988, p. 27) below:

- Before /t/

  anóti 'night' [aˈnoiti]

  sǫti 'type' [ˈsɔti]

- Before /d/

  dódu 'crazy' [ˈdodu]

  bǫdu 'edge' [ˈbɔdi]

- Before /l/

  góli 'marble game' [ˈgoli]

  mǫli 'soft' [ˈmɔli]

Having said that, a later study by Pillai, Chan and Baxter (2015) discovered that the vowels /i/ and /e/, overlap one another due to considerable variation in the vowel quality produced. To put it simply, Pillai, Chan and Baxter (2015) supports the possibility of free variation for the vowel set /i/ and /e/ but not for /o/ and /u/.

Besides that, Baxter (1988) posits that the distribution of /e/ and /ɛ/ may be an effect of vowel harmony since the preceding vowel is influenced by the height of the final vowel. In other words, the lower vowel /ɛ/ is used if a low vowel like /a/ follows in the next syllable such as in *pęga* 'to catch' [pɛˈga]. Conversely, /e/ is used if a high vowel like /u/ follows. However, only *prégu* 'nail' [ˈpregu] supports this claim (Baxter, 1988, p. 27). Baxter (1988, p. 28) provides a similar explanation for transcriptions 'o' and 'ǫ', which can be assumed respectively as /o/ and /ɔ/. The higher /o/ is used if the

subsequent syllable is a high vowel such as /u/, for instance, *sógru* 'father-in-law' but /ɔ/ is used if the next syllable is a low like /a/ like in the word *bǫla* 'ball'. In addition, Baxter (1990, p. 9) propounds that the diphthong /ei/ in Old Portuguese is realised as /e/ in MPC as seen in the lexical items *pesi* 'fish' and *besu* 'lip'.

2.3 Issues in Transcription and Spelling

Revitalisation and documentation efforts of MPC are hampered largely due to inconsistent orthography and contradicting phonetic representation (Baxter, 2005), which may have been the outcome of a largely impressionistic analysis of the MPC sounds (Pillai, Chan & Baxter, 2015). This is especially reflective of the vowels /e/, /ɛ/, /o/ and /ɔ/ whereby studies have been inconclusive about their status in MPC. Such inconsistencies and contradiction is proven by the orthography employed by Hancock (2009) and Baxter and de Silva (2004), whereby the vowels /e/ and /ɛ/ are represented differently for the same lexical item as presented in Table 2.4.

Table 2.4: Comparison of The Portrayal of /e/ and /ɛ/ in MPC

(Reproduced from Pillai, Chan & Baxter, 2015, p. 250)

Word	**Representation**	**Hancock (2009, p. 298)**	**Baxter and de Silva (2004, p. xii)**
chest	orthographic	pétu	*pêtu*
	phonemic	[pɛ̲tu]	[pe̲tu]
near	orthographic	pétu	*petu*
	phonemic	[pe̲tu]	[pɛ̲tu]

The examples shown in Table 2.4 shows that Hancock (2009) did not distinguish between the vowel sounds /e/ and /ɛ/ in the orthography he adopted since both vowel

sounds are represented by an acute accent, ‘é’. In contrast, Baxter and de Silva (2004) differentiated the two vowel sounds with different representations: a circumflex ‘ê’ for the /e/ phoneme, and an unaccented ‘e’ for the /ɛ/ phoneme. As presented in Table 2.4, Hancock (2009) is of the impression that the /e/ and /ɛ/ sounds for the two lexical items differ from what was perceived by Baxter and de Silva (2004). While Hancock (2009) uses /ɛ/ for the word *pétu* / *pêtu* ‘chest’, Baxter and de Silva (2004) presume that /e/ is used instead. Conversely, Baxter and de Silva (2004) uses /ɛ/ in the word *petu / pétu* ‘near’ whereas Hancock (2009) believes that /e/ is used in its place. To add to the confusion, these two lexical items were orthographically transcribed in the dictionary of Scully and Zuzarte (2004) as follows:

pertu ‘near’ [ˈp**æ**rtu]

peitu ‘chest’ [ˈp**ei**tu]

Nevertheless, Pillai, Chan & Baxter (2015) reported that the unrounded low front vowel /æ/ is not included in the MPC vowel inventory. Furthermore, the /ɛ/-/æ/ vowel is conflated in Malaysian and Singaporean English whereby words like *bet* and *bad* are produced as homophones (Deterding, 2005; Pillai, Zuraidah Mohd Don, Tang & Knowles, 2010).

With regards to the spellings used in MPC, Baxter and de Silva (2004) highlighted the three main orthographies adopted; a Portuguese-based system, a Malay-based system and a mixed system. This further proves that MPC currently has no agreed orthography. According to Baxter and de Silva (2004), the preference for a Portuguese-based spelling system rose in the 19th and 20th centuries due to the misconception that MPC is a variety or dialect of Portuguese instead of a new creole language. Furthermore, Baxter and de Silva (2004) argues that although adopting a Portuguese-based spelling system would allow the community at the Portuguese Settlement easier

access to Kristang resources (e.g. Rêgo, 1942), it is not practical because the community will have difficulty reading it since it is a foreign orthography (Baxter, 1988; Baxter, 2005).

Therefore, a more phonemic Malay-based orthography was proposed by Hancock (1973). The rationale behind this idea is due to the similarity shared between MPC and Malay with regards to the phonological system (Baxter, 2005), in addition to the influences Malay and other local languages have on the grammar and vocabulary of MPC (Pillai, Chan & Baxter, 2015). Nevertheless, a Portuguese-based spelling system is still preferred by some parties, which according to Baxter (2012) and Soh (2015) could be the influence of Portuguese lessons and contact from Portuguese language teachers, tourists and journalists who came to the Portuguese Settlement in Malacca. This gave rise to the adoption of a mixed spelling system (e.g. Sta Maria, 1982; Singho et al., 2016). Baxter and de Silva (2004) however raised two problems. First, the representations of MPC sounds are inconsistent and second, the mixed spelling system might not be understood by both speakers and non-speakers of MPC. Having said that, Baxter and de Silva (2004) stressed that ultimately, the speech community has the power to decide which orthography to adopt since it is their mother tongue. Because of this reason, this study adopted a mixed spelling system used by Singho et al. (2016), which is explained further in Chapter 3.2.2.

2.4 Influence of Other Languages

As Malaysia is a multilingual nation, it is only natural for MPC to be influenced by the local languages as well as other languages due to language contact over time. Although majority of the lexical items in MPC originated from older varieties of Portuguese, there are also many words and influences from Malay, Chinese dialects,

Indian languages, English and Dutch (Baxter and de Silva, 2004; Hancock, 2009). As noted by Asmah Haji Omar (2017), Malay was once deemed a high status language not only in the Malay Peninsular but also Southeast Asia due to trade and regional hegemonies like the Srivijaya and Majapahit empires.

In addition to being the lingua franca of Malaysia today, Malay is also the national language. Even though English stopped being Malaysia's official language in 1967, the importance of English has been greatly emphasized and is deemed as the "second most important language" (Asmah Haji Omar, 2017). Past researches (David & Faridah Noor Mohd Noor, 1999; Pillai & Khan, 2011; Pillai, Soh & Katija; 2014) proved that the youth is fast replacing MPC with English as their first language. The status that these two languages enjoy in Malaysia is largely the reason why Malay and the local variety of English, which is Malaysian English, is thought to have the most influence on the MPC sounds used presently (Chan, 2014).

2.4.1 Malay

Standard Malay is both the national language and official language of Malaysia. According to Asmah Haji Omar (1977), there are six monophthongs in Standard Malay, which are /i/, /ə/, /e/, /a/, /u/ and /o/ as shown in Table 2.5.

Table 2.5: Vowel Chart of Standard Malay

(Reproduced from Tan, Xiao, Tang, Chng & H. Li, 2009, p. 26)

Position	**Front**		**Back**
Close	i		u
Close-Mid	e	ə	o
Open		a	

The result of an acoustic analysis of Standard Malay monophthongs of three female native speakers of Malay from Kuala Lumpur, Malaysia is illustrated in Figure 2.2.

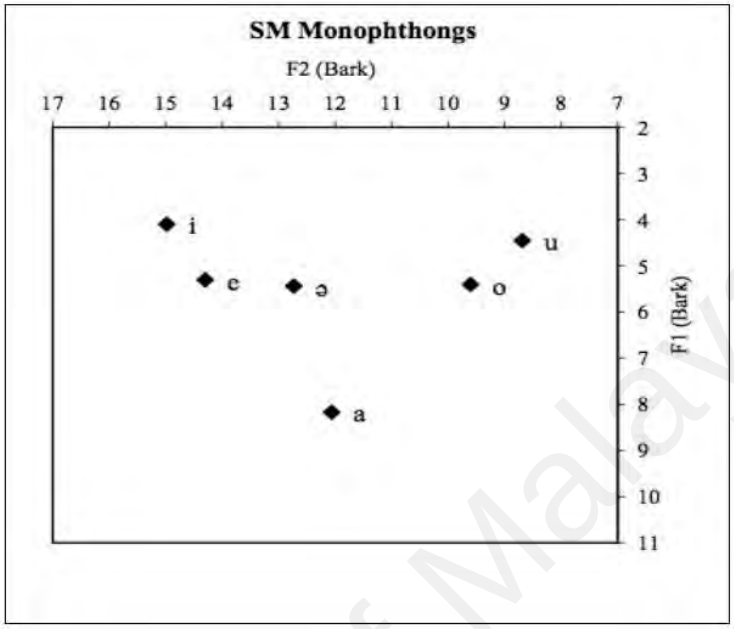

Figure 2.2: Scatter Plot of Malay Monophthongs

(Reproduced from Chan, 2014, p. 20)

Nevertheless, Asmah Haji Omar (1977) discovered that some Malay dialects in Malaysia have an eight-vowel system as shown in Table 2.6. However, it is highlighted that the phonetic realisations of /ɛ/ and /ɔ/ are similar to /e/ and /o/, differing only in the degree of openness (Asmah Haji Omar, 1977).

Table 2.6: Vowels of Malay Dialects in Malaysia

(Reproduced from Asmah Haji Omar, 1977, p. 18)

Dialect	Vowel
Perak, Kedah, Penang, Negeri Sembilan, Sarawak	/i/, /e/, /ɛ/, /ə/, /o/, /ɔ/, /u/ and /a/
Kelantan	/i̵/, /e̵/, /ɛ̵/, /ə/, /o̵/, /ɔ̵/, /u̵/ and /a/

The phonological systems of Malay and MPC are said to be similar (Hancock, 1975; 2009; Baxter, 1988; Baxter & de Silva, 2004). Because of this, a Malay based orthography for the purpose of language maintenance is proposed (see Chapter 2.3). Furthermore, Baxter (1988, p. 24) stated that the orthographic 'a', can be realised as /a/ or /ə/ in word-final position in both Malay and MPC, which is also supported by Hancock (1975) and Asmah Haji Omar (1977). However, Asmah Haji Omar (1977) highlights that this is associated to regional differences. The a-variety is used in the northern states of Penang, Kedah and Perlis, as well as in the Borneo states of Sabah and Sarawak while the schwa-variety prevails in the remaining states.

Besides that, Standard Malay has three diphthongs, which are exemplified in the words *cukai* 'tax', *pulau* 'island' and *dodoi* 'lullaby'. However, previous studies represented these three diphthongs in two ways; first as /ai/, /au/ and /oi/ (Teoh, 1988) and second as /aj/, /aw/ and /oj/ (Asmah Haji Omar, 1985; Zaharani Ahmad, 1993; Tan, Xiao, Tang, Chng & H. Li, 2009; Clynes & Deterding, 2011). Other features of Malay include the conversion of /k/ in word-final position to a glottal stop like in *ketuk* 'knock' [kəto?] and /a/ also in word-final position to a schwa like in *saya* 'I, my, me, mine' [sayə] (Tan, Xiao, Tang, Chng & H. Li, 2009; Clynes & Deterding, 2011). Additionally, the syllable structures available in Malay are V, CV, CVC, CCV, CCVC and CCCVC (Tan, Xiao, Tang, Chng & H. Li, 2009) (see Table 2.7).

Table 2.7: Malay Syllable Structures

(Reproduced from Tan, Xiao, Tang, Chng & H. Li, 2009, p. 27)

Syllable	Word	Description
V	i.kan	**V.**CV
CV	sa.tu	**CV.**CV
CVC	ban.tu	**CVC.**CV
CCV	dwi.bahasa	**CCV.**CVCVCV
CCVC	prak.tik	**CCVC.**CVC
CCCV	stra.tegi	**CCCV.**CVCV
CCCVC	struk.tur	**CCCVC.**CVC

2.4.2 Malaysian English

Malaysian English or MalE is an umbrella term that encompasses all English varieties spoken by different Malaysian social and ethnic groups (Pillai, Zuraidah Mohd Don, Knowles & Tang, 2010). Besides the practice of accent-switching, Pillai, Zuraidah Mohd Don, Knowles and Tang (2010) highlighted that Malaysians have a tendency to adopt features that are less ethnically prominent when switching to a more acrolectal variety of MalE.

Other studies (Wan Aslynn Wan Ahmad, 2005; Azirah Hashim & Tan, 2012) have attributed MalE's smaller vowel inventory to the impact of first language. This is largely due to a lack of vowel contrast, which often result in the production of homophones as presented in Table 2.7. Although it has not been reported, the vowel /e/ does exist in MalE, for instance, 'bed' [bed], 'bread' [bred] and 'head' [hed].

Table 2.8: Vowels Realized as Homophones

(Reproduced from Pillai, Zuraidah Mohd Don, Tang & Knowles, 2010, p. 161)

Vowel contrasts in British English	Realized in Malaysian English as
[iː] and [I]	[i]
[uː] and [ʊ]	[u]
[e] and [æ]	[ɛ]
[ɔ] and [ɒ]	[o]
[ɑː] and [ʌ]	[a]
[ə] and [ɛ]	[ə]

An acoustic analysis of MalE vowels based on 47 female Malaysians of different ethnicity by Pillai, Zuraidah Mohd Don, Knowles and Tang (2010) did discover a lack vowel contrast. Nevertheless, a significant difference was apparent for vowel duration (see Figure 2.3).

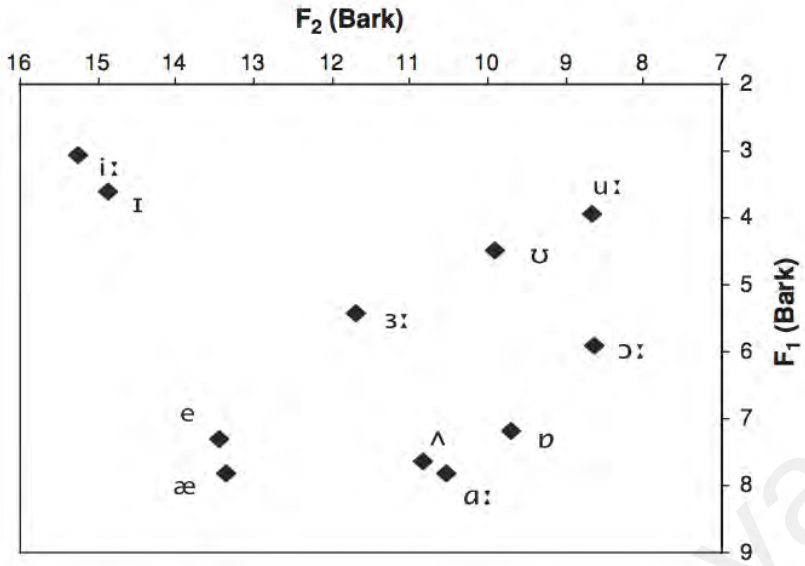

Figure 2.3: Vowel Chart of An Acoustic Analysis of Malaysian English

(Reproduced from Pillai, Zuraidah Mohd Don, Knowles & Tang, 2010, p. 165)

Besides that, Lim (2014) provided evidence of MalE vowels undergoing monophthongization in words 'cure' /kjuə/ becoming /kjɔ/ and 'there' /ðɛə/ becoming /ðɛ/. Other examples are found in Azirah Hashim & Tan (2010, p. 59) as shown in the following:

/eɪ/ to [e] – [tek] take

/əu/ to [o] – [bot] boat

/ɛə/ to [ɛ] – [pɛ] pair

2.5 Formant Frequency Model

Formants according to Fant (1971, p. 20) are spectral peaks found in the sound spectrum whereby each vocal resonance is formed by acoustic signals that reflects the shape of the vocal tract. This is supported by Benade (1976) who provided a similar definition of formants, which are peaks in the spectrum envelope. The appearance of formant frequencies can be seen in a spectrogram within the duration of vowels as horizontal black lines.

In acoustic studies of vowel qualities, the first formant (F1) and second formant (F2) are usually analysed since these values will reveal the position of vowels in the vowel chart (Watt & Tillotson, 2001). According to the formant frequency model, the frequencies of F1 and F2 are reflective of how the human speech system is perceived. This is because the frequencies of F1 and F2 are able to provide necessary cues to recognise separate vowel qualities since F1 corresponds to height, and F2 is inversely related to fronting (Watt & Tillotson, 2001). In other words, the position of the vowel in the vowel chart will be higher as the F1 value decreases, whereas the position of the vowel will be more front as the F2 value increases (see Figure 2.4).

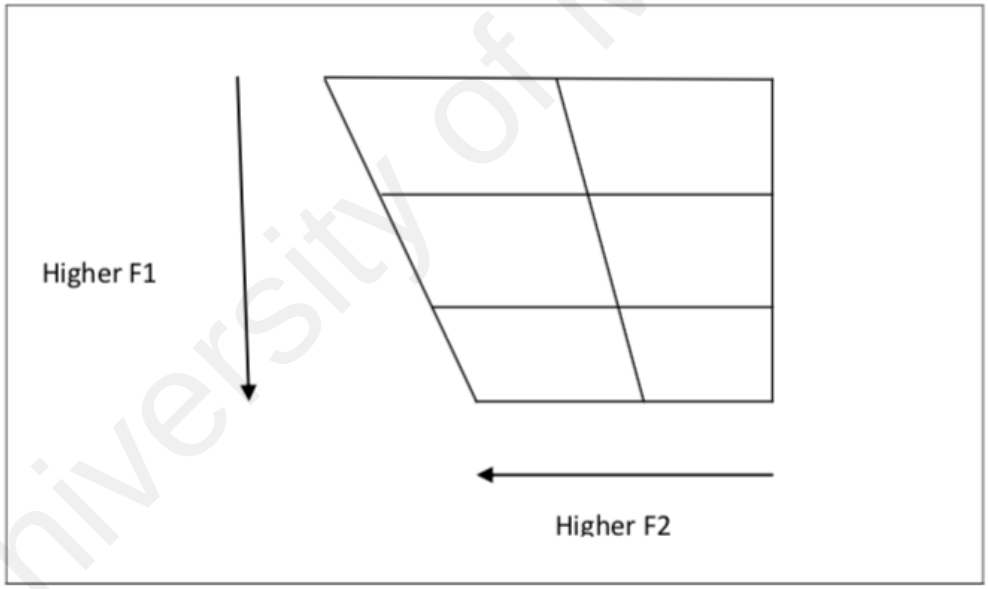

Figure 2.4: Vowel Chart of F1 and F2 Values

(Reproduced from Ladefoged, 2001, p. 116)

Although formants are measured in the Hertz unit, Hayward (2000) recommends converting the F1 and F2 values to a Bark scale for the purpose of chart-plotting using the formula: $\mathbf{Z = 13 \arctan (0.00076F) + 3.5 \arctan (F/7500)^2}$ (Zwicker & Terhadt, 1980, p.1524). The conversion to a Bark scale is done because it closely reflects how

the ear analyses vowels (Hayward, 2000). Kent and Read (2002) share the same opinion since the Bark scale provides a close approximation of how the ear actually analyses incoming frequencies.

2.6 Previous Studies on Malacca Portuguese Creole

Previous studies on MPC include grammar by Hancock (1973, 1975, 2009) and Baxter (1988), sound system (Baxter, 1988; Klein, 2006; Hancock, 2009; Pillai, Chan & Baxter, 2015), lexicon (Rêgo, 1942; Hancock, 1973; Sta Maria, 1982; Baxter, 2012), historical accounts (Sta Maria, 1982; Fernandis, 2000, 2003; Baxter, 2005; Sarkissian, 1996, 2005) and an extensive research on language shift and language maintenance (David & Faridah Noor Mohd Noor, 1999; Lee, 2001; 2004; Pillai & Khan, 2011; Pillai, Soh & Katija; 2014; Nunes, 2015). Two MPC dictionaries have also been produced (Baxter & de Silva, 2004; Scully & Zuzarte, 2004) in addition to a glossary in Singho et al. (2016). Besides that, Marbeck produced a collection of prose, songs and poems called *Linggu Mai* in addition to phrasebooks (Marbeck, 1996; 2004; 2012). A learning resource was also recently published by Singho et. al. (2016).

2.7 Summary

This chapter explored previous studies done on the characteristics of MPC as well as the characteristics of the languages that have influenced it, namely Malay and Malaysian English. This was done to enable comparisons between MPC with the local languages in order to gauge a better understanding. This chapter also explained the present issues regarding the transcription and spelling of MPC. Besides that, the use of formant frequency model to acoustically analyse vowels was also discussed in this chapter. The next chapter will focus on the procedures and methodology employed in the present study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

Chapter three features the methodology of data selection, data collection as well as data analysis, whereby the stages of procedures are described and explained. This includes the criteria for data selection, the methods used for data collection, sampling methods and research instruments.

3.1 Data Selection: Language Consultants

Previous studies (Lee, 2011; Pillai, Chan & Baxter, 2015; Pillai, Soh & Katija, 2014) have reported that eloquent speakers of MPC at the Portuguese Settlement are decreasing. Moreover, Baxter (2005) highlighted that fluent speakers of MPC are mainly aged 40 and above. Consequently, the five language consultants (LC) involved in this study are females ranging between 46 and 65 years old with an average age of 54 years. Besides that, the selected LCs are all Portuguese Eurasians raised in the Portuguese Settlement and are currently living there. All five LCs have MPC as their mother tongue and were born into families who spoke MPC predominantly, both at home and with others at the Portuguese Settlement. Like many Malaysians, all five LCs are multilinguals as they speak Malay and English. The preference to involve only one gender is to ensure uniformity in the acoustic analysis due to differing pitch ranges of females and males (Pillai, Zuraidah Mohd Don, Knowles, & Tang, 2010).

Although five respondents are considered small for a quantitative and qualitative research, Harrington (2010, p. 18) emphasized that it is typical to have 1-5 respondents

in the studies of phonetics since it can be difficult to find subjects. As mentioned earlier in this study, the Portuguese Settlement is a small community consisting of only 120 houses and 1,200 residents (Pillai, 2015), out of which, only the senior age group is considered to be respondents of this study due to their fluency in MPC. Even then, speech clarity could be a problem since speakers may have teeth loss, poor vocal quality, weak hearing ability or are physically unfit due to old age or illnesses. Furthermore, the time needed to record, analyse and document the speech data can be long and arduous (Harrington, 2010). Table 3.1 shows the demographic information of the five LCs, which are coded as LC1, LC2, LC3, LC4 and LC5.

Table 3.1: Demography of Language Consultants

LC	**Age**	**Profession**	**Spoken Language**					**Level of Education & Medium of Instruction**		
			MPC	MalE	SM	Chinese and other dialects	Tamil and other dialects	Primary Education	Secondary Education	Tertiary Education
1	65	Teacher	Yes	Yes	Yes	No	No	English	English	-
2	49	Housewife	Yes	Yes	Yes	No	No	Malay	Malay	Malay
3	50	Housewife	Yes	Yes	Yes	No	No	Malay	Malay	-
4	46	Housewife	Yes	Yes	Yes	No	No	Malay	Malay	-
5	55	Housewife	Yes	Yes	Yes	No	No	Malay	Malay	-

Since MPC is an endangered language, a known probability sampling method is used. The reason why random selection is not suitable is because it might select respondents who are not fluent MPC speakers, therefore resulting in skewed results. Having said that, this study employs a mixed sampling method comprising of purposive sampling method as proposed by Cresswell (2009), in addition to snowball sampling method. The rationale behind using purposive sampling method is due to the need to have LCs who meet the pre-set requirements (see Table 3.2).

Table 3.2: Requirements for Language Consultants

Gender	Female
Age	40 and above
Ethnicity	Portuguese Eurasians who were raised and currently reside at the Portuguese Settlement
First Language	MPC
Spoken language	MPC is used in daily communication at home and at the Portuguese Settlement

The snowball sampling method on the other hand, is used because the researcher is not directly part of the speech community. Therefore, having an intermediary from the community helped facilitate the communication between the researcher and the target community. Also, being an endangered language, access to fluent MPC speakers is limited. By using the snowball sampling method, an LC can help identify other prospective LCs who fulfils the aforementioned requirements after establishing a relationship with the researcher. By doing so, the selection process of the LCs was made easier. Once the LCs were briefed about the study's purpose and nature of the recordings, written consent was then acquired.

3.2 Data Collection Procedure

Selecting LCs who meet the aforementioned requirements proved to be challenging since the researcher is not directly part of the speech community. To overcome this, an intermediary helped facilitate the communication between the researcher and the target community. Initial visits to the Portuguese Settlement in Malacca were mainly focused on establishing bonds with the community and observing their customs and practices. Once a relationship is forged with members of a family, introductions to their relatives, neighbours and friends were made, therefore expanding the network and connections in

the target community. Extra consideration and prior arrangements were made with the LCs before each recording session to avoid misunderstanding and interference with their daily lives.

3.2.1 Word List

An initial word list of 1,141 words from two MPC dictionaries (Baxter & de Silva, 2004; Scully & Zuzarte, 2004) and the glossary in Singho et al. (2016) was compiled (see Appendix B1 to Appendix B4). The number of words for /e/ was 659, while /o/ totalled 482 words. This was done by selecting words containing the orthographic 'e' and 'o' from the two MPC dictionaries and glossary mentioned earlier. In cases where the target vowel is pronounced as /ə/, the word is then eliminated. Although MPC is a spoken language and does not have a standard writing system, a word list is thought to be best for this study to enable systematic examination of the targeted vowels by ensuring all LCs use the same words (Kirk, Pisoni & Osberger, 1995).

3.2.2 Adopted Malacca Portuguese Creole Orthography

As mentioned previously in Chapter 2.3, Baxter (2005) and Hancock (1973) proposed a Malay-based orthography. However, Singho et al. (2016) adopted a mixture of both Portuguese and Malay orthographic systems. Also, Singho et al. (2016) comprise of both language researchers and representatives of the Portuguese Settlement from the Malacca Portuguese-Eurasian Association (MPEA). This means that the MPC orthography adopted by Singho et al. (2016) is based on informed decisions made by linguists with the consensus of the Portuguese Settlement community. Since MPC is the mother tongue of these Portuguese descendants, their input with regards to how their language is pronounced and spelled is important.

It is with these factors in mind that this study chose to adopt the orthographic system used by Singho et al. (2016) in the word list that the LCs read out. For words containing /e/, the regular 'e' is used like in the words *cabelu* 'hair' [ka'belu] and *denti* 'tooth' ['denti]. On the other hand, words containing /ɛ/ like *fébri* 'fever' ['fɛbri] and *mérse* 'thanks' [mɛr'se] are spelled with an accent, 'é'. However, no distinctions were made for /o/ and /ɔ/. Both vowels are represented by the regular 'o' such as the words *grago* 'shrimp' [gra'go] and *sabola* 'onion' [sa'bɔlə]. In word-final positions, the schwa sound /ə/, is spelled with a regular 'a', while /a/ is spelled with an accent, 'á' as seen in words *cabésa* 'head' [ka'bɛsə] and *mulerá* 'brain' [mu'lera] respectively.

Besides that, the letter 'c' is used in word-initial positions for combinations of /ka/ as in *cantiga* 'song' [kan'tigə], /ko/ as in *corsang* 'heart' [kɔr'saŋ] and /ku/ as in *cuze* 'to cook' [ku'ze]. However, word initial position combinations like /ki/ and /ke/ will be represented by the letter 'k' like in the words *kinta-féra* 'Thursday' [kintə'fɛrə] and *kenti* 'hot' ['kenti] respectively. The letter 'k' is also used at the word end position to indicate glottalisation as shown in the words *chubek* 'to pinch' [tʃu'beʔ] and *fedek* 'smelly' ['fedeʔ]. Table 3.3 provides a summary of the spelling conventions used in this study.

Table 3.3: Summary of Spelling Conventions

Vowel	Spelling Convention	MPC Word	Meaning	Transcription
/e/	regular 'e'	*cabelu*	hair	[ka'belu]
		denti	tooth	['denti]
/ɛ/	accent 'é'	*fébri*	fever	['fɛbri]
		mérse	thanks	[mɛr'se]

/o/ and /ɔ/	regular ‘o’	*grago*	shrimp	[gra’go]
		sabola	onion	[sa’bɔlə].
/ə/ in word-final position	regular ‘a’	*cabésa*	head	[ka’bɛsə]
/a/ in word-final position	accent ‘á’	*mulerá*	brain	[mu’lera]
word-initial position /ka/, /ko/, /ku/	regular ‘c’	*cantiga*	song	[kan’tigə]
		corsang	heart	[kɔr’saŋ]
		cuze	to cook	[ku’ze]
word-initial position /ki/, /ke/	regular ‘k’	*kinta-féra*	Thursday	[kintə’fɛrə]
		kenti	hot	[‘kenti]
glottalisation in word-final position	regular ‘k’	*chubek*	to pinch	[tʃu’beʔ]
		fedek	smelly	[‘fedeʔ]

3.2.3 Instrumentation

A structured interview designed to obtain demographic information, language use and education background was conducted with each LC (see Appendix A). After that, the compiled word list was recorded using the Marantz PMD661 Solid State Sound Recorder, a 16-bit rate digital professional recorder and an Audio Technica ATM73a Cardioid Condenser Headworn Microphone positioned near to the LCs’ mouth. By doing so, clearer recordings were obtained. Recordings were done in the comfort of the LCs’ homes (see Figure 3.1) and were conducted during less busy periods to minimise external noise. Besides that, breaks were taken between recordings to avoid the LCs being tired and uncomfortable as each recording session took a long time.

Figure 3.1: Recordings Done at the Home of One of The LCs at the Portuguese Settlement

3.3 Data Analysis

3.3.1 Data Transcription and Selection

In order to increase reliability and validity, the process of listening and identifying target vowels underwent a few phases. In the first phase of listening, the researcher used Praat, version 5.4.18 (Boersma & Weenik, 2015), a speech synthesis and analysis programme to listen to the recordings and to also orthographically transcribe the words into the first tier of the TextGrid function in Praat as illustrated in Figure 3.2. The target vowel was then marked and phonetically transcribed into the second tier.

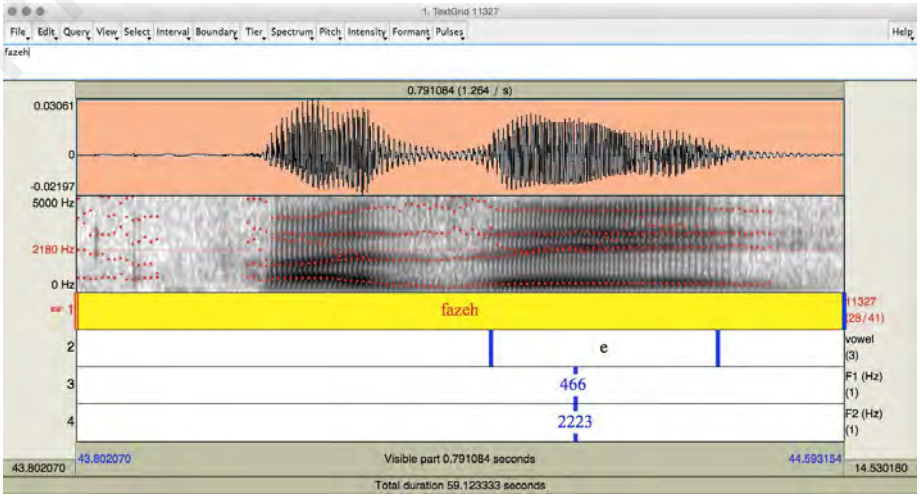

Figure 3.2: TextGrid of MPC /e/ by LC1

In the second phase of listening, the target vowels were identified in each of the recordings by four inter-raters, without referring to the determined vowels done in the first phase of listening. After comparing the first and second phases of listening, a third phase of listening was carried out to resolve the differences in the identified vowels. Results from the third phase of listening were as follows:

1) Words were retained if four out of the five LCs used the same target vowels.

2) Words were removed if the target vowels were not used at all by the LCs. For example, the word *trigera* 'tigress', was removed from the word list because it was pronounced as *trigi* by four of the LCs.

3) In cases where both [e] and [ɛ] or [o] and [ɔ] were used in the same word by different speakers, the word is only retained if at least two LCs used the same vowel. For example, the word *kobri* 'copper' was retained since three speakers produced it as [kɔ'bri] while two speakers produced it as [ko'bri].

Eventually, only 1,014 words were retained and analysed: /e/ 574 words, /o/ 440 words. The final word list together with its translation and transcription is compiled in Appendix B1 to Appendix B4.

3.3.2 Measurements and Analysis

An acoustic methodology is applied to add on to existing impressionistic studies on MPC sounds, for example the analysis of MPC sounds by Baxter (1988) (Pillai, Chan & Baxter, 2015). This was achieved by analysing the vowels according to the formant frequency model (see Chapter 2.5) (Pillai, Zuraidah Mohd Don, Knowles & Tang, 2010) where the lower the first formant (F1), the higher the vowel and the higher the second formant (F2), the more front the vowel is. After orthographically transcribing

the words and annotating the target vowels into the first and second tiers in Praat, the automatic linear predictive coding (LPC) function in Praat was then used to measure the temporal midpoint of the vowels as it is the most stable and least likely position for vowels to be influenced by neighbouring sounds (Adank, Smits & Van Hout, 2004; Hawkins & Midgley, 2005). The F1 and F2 values were initially measured by using a Praat script but manual corrections were done where necessary by inspecting the waveforms and examining the vowels auditorily.

Besides identifying the F1 and F2 values, vowel durations were also measured using a Praat script (Lennes, 2017). The generated results were subsequently transferred from a text file to an Excel file for further analysis. Next, the average values of the vowels were placed in a vowel chart by plotting F1 vs F2. For chart plotting purposes, the average values of F1 and F2 were converted from Hertz to a Bark scale by employing the formula: $\mathbf{Z = 13 \arctan (0.00076F) + 3.5 \arctan (F/7500)^2}$ (Zwicker & Terhadt, 1980, p.1524). The conversion to Bark scale is necessary because it closely demonstrates how the ear analyses vowels (Hayward, 2000; Kent & Read, 2002). Scatter plots were also created to compare the vowels produced by the five LCs.

The total number of tokens analysed for each vowel is different for every LC due to the decisions made by the researcher and four inter raters regarding the identity of the target vowel. It was discovered from the recordings that while some LCs would use the vowel /e/, others would use /ɛ/. The same goes for /o/ and /ɔ/. For example, *peladu* 'bald', while three LCs pronounced the word as [pɛladu], two LCs pronounced it as [peladu]. This differing use of vowels contribute to the uneven number of tokens across all five LCs.

3.3.3 Statistical Analysis

In this study, two-tailed independent t-tests were run to compare the F1 and F2 means between the vowels /e/ and /ɛ/ and also between /o/ and /ɔ/. A one-way ANOVA was also done to compare the means of different LCs on the F1 and F2 values of the aforementioned vowel pairs. Tukey post-hoc tests were carried out if significant differences were discovered between the pairs of the five LCs. Additionally, Cohen's effect size test was used to measure the magnitude of difference on the vowels /e/ and /ɛ/ as well as /o/ and /ɔ/. Cohen's conventions for the three effect sizes are small, d =.2, medium, d =.5 and large, d =.8 where d is the difference between two means, and small is f =.1, medium is f =.25 and large is f =.4 where f is the effect size obtained from the results of ANOVA test (Cohen, 1988).

3.3.4 Examination of Emerging Patterns of Target Vowels

In order to determine the phonetic and phonological patterns of /e/, /ɛ/, /o/ and /ɔ/, the phonetic environment of the targeted vowels were examined. This was done by identifying neighbouring sounds and grouping the targeted vowels into different categories like word class, consonant clusters and syllable types (CV, CVC, CCV). By doing so, it eased the process of determining if the vowels /e/, /ɛ/, /o/ and /ɔ/ are minimal pairs as suggested by Baxter (1988) or in fact, separate phonemes.

3.4 Summary

Chapter three described the approaches and methodology implemented in this research. Chapter four will show the results of data analysis. Findings on the four MPC vowels, /e/, /ɛ/, /o/ and /ɔ/ will also be discussed.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.0 Introduction

The findings gathered on the vowel contrast of MPC /e/ and /ɛ/, and /o/ and /ɔ/ among the five LCs will be presented in this chapter. Furthermore, findings on patterns that emerged based on the examination of the target vowels' phonetic environment will also be discussed.

4.1 Malacca Portuguese Creole Vowels /e/ and /ɛ/

The monophthong /e/ occurred in words like *skribe* 'to write', *fazemintu* 'doing', *pesi* 'fish', *kabelu* 'hair', *sestu* 'basket', *besu* 'lip', *diskuniseh* 'to not know', *sedi* 'thirst' and *fetor* 'ugly'. The monophthong /ɛ/ on the other hand, occurred in words like *séku* 'dry', *kabésa* 'head, leader', *fésta* 'festival', *wésti* 'west', *jéma* 'yolk', *tésta* 'forehead', *séti* 'seven', *pégatori* 'purgatory' and *kadéra* 'chair, waist'. A total of 1399 and 1322 tokens of F1 and F2 for both [e] and [ɛ] respectively were measured. The overall mean value of F1 for [e] was 442 Hz while F2 was 2242 Hz (SD: F1 = 61, F2 = 382). As for [ɛ], the overall mean values were 599 Hz for F1 and 2077 Hz for F2 (SD: F1 = 75, F2 = 299). Table 4.1 summarises the overall formant measurements of [e] and [ɛ] produced by all five LCs for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.1: Summary of the Overall Formant Measurements for [e] and [ɛ]

	e		ɛ	
	F1	**F2**	**F1**	**F2**
Average (Bark)	4.23	13.53	5.58	13.10
Average (Hertz)	442	2242	599	2077
SD	61	382	75	299
Min	322	1063	364	930
Max	710	2930	813	2701

SD = Standard Deviation Max = Maximum Value
Min = Minimum Value

Figure 4.1 shows the vowel chart for [e] and [ɛ] based on their average F1 and F2 values. The placement of [e] and [ɛ] demonstrates that they are two distinct vowels and are in accordance with Klein (2006) and Baxter (1988).

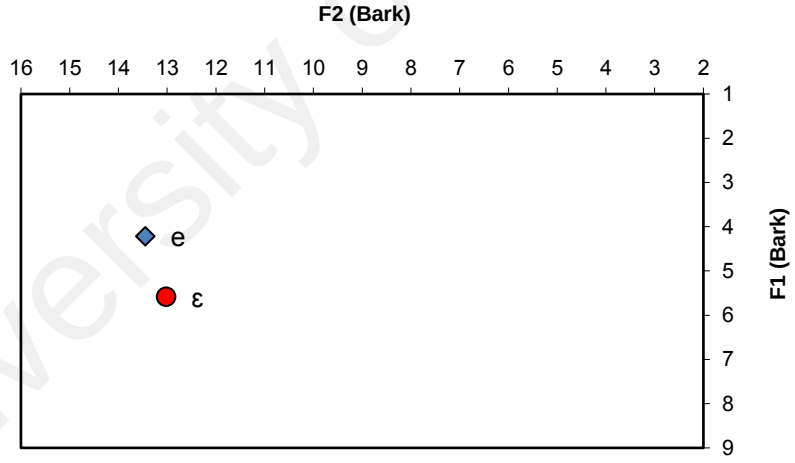

Figure 4.1: Overall vowel chart for [e] and [ɛ]

However, a generated scatter plot revealed overlaps between the two vowels (see Figure 4.2).

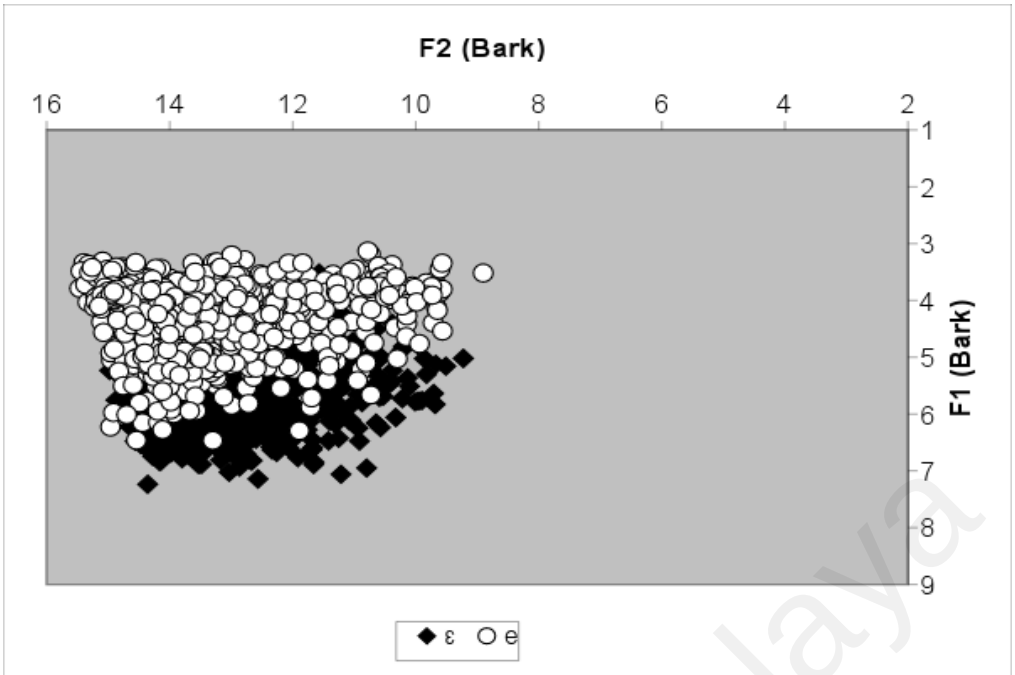

Figure 4.2: Scatter plot of MPC [e] and [ɛ]

A two-tailed independent sample t-test was conducted to compare the F1 and F2 values of both [e] and [ɛ]. A significant difference was found in the average F1 values for [e] (M = 442 Hz, SD = 61) and [ɛ] (M = 599 Hz, SD = 75): $t(2719) = 60.07$, $p <$ .0001. Similarly, a significant difference was also found in the average F2 values for [e] (M = 2242 Hz, SD = 382) and [ɛ] (M = 2077 Hz, SD = 299); $t(2719) = 12.51$, $p <$ .0001. The results therefore still suggest that the two vowels are distinct. Further, a large effect size was found for F1 (d = 2.29), while a small effect size was found for F2 (d = 0.48). This indicates that the difference between [e] and [ɛ] lies in vowel height instead of vowel fronting. Table 4.2 also reveals significant differences found between all the LCs average F1 and F2 values of [e]. The great contrast between the minimum and maximum values shown by each LC seem to suggest the possibility of speaker variation.

Table 4.2: Average F1, F2 and SD Values of [e] For Each LC

	F1 (Hz)				F2 (Hz)			
LC	**Average**	**SD**	**Min**	**Max**	**Average**	**SD**	**Min**	**Max**
1	405	32	329	610	2048	436	1063	2781
2	485	43	391	644	2145	243	1431	2543
3	471	65	330	710	2206	315	1176	2700
4	425	65	322	688	2160	466	1176	2930
5	426	56	342	652	2545	178	1940	2920

Figure 4.3 displays a dispersed distribution of [e] across the vowel space. While the [e] produced by LC1 and LC4 were mainly spread at the top of the vowel space, the [e]'s of LC2 and LC3 were dispersed at the bottom. LC5's [e] vowel on the other hand, were concentrated at the front of the vowel space.

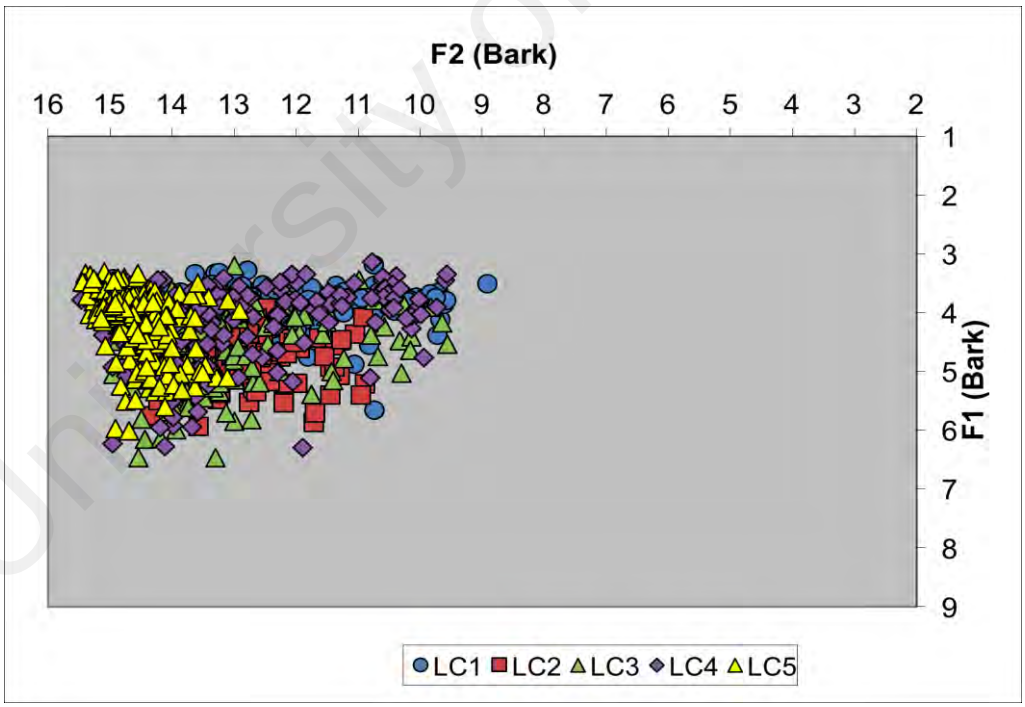

Figure 4.3: Scatter plot of MPC [e] Produced by LC1-LC5

A one-way ANOVA was then conducted to compare the F1 values of [e] between the LCs. A statistically significant difference was discovered among the five LCs: *F*(4,

1394) = 108.66, $p < .0001$). A Tukey post hoc test revealed a significant difference between the mean F1 values for all LCs at $p < .01$, except for between LC4 and LC5. Similarly, Cohen's effect size also suggested a large effect size between the mean F1 values for all LCs except for between LC4 and LC5 ($f = 0.012$), which suggested a small effect size.

Statistically significant differences were also discovered in a one-way ANOVA test among the five LCs F2 values of [e]: $F(4, 1394) = 91.23$, $p < .0001$). A Tukey post hoc test revealed that all the LCs differed significantly at $p < .01$, except for between LC2 and LC3, as well as between LC3 and LC4. This is similar to the large effect size found between the mean F2 values for all LCs except for between LC2 and LC3 ($f = 0.055$) and between LC3 and LC4 ($f = 0.017$), which revealed a small effect size.

Table 4.3: Average F1, F2 and SD Values of [ɛ] For Each LC

	F1 (Hz)				**F2 (Hz)**			
LC	**Average**	**SD**	**Min**	**Max**	**Average**	**SD**	**Min**	**Max**
1	545	75	365	690	1955	347	1117	2620
2	630	66	415	800	1935	190	1327	2390
3	633	67	380	789	1992	240	930	2548
4	605	72	364	813	2147	309	1195	2701
5	566	50	401	719	2365	133	1967	2666

Since significant differences were also found between all the LCs average F1 values and F2 values of [ɛ] (see Table 4.3), the notion that [e] and [ɛ] are distinct vowels is strengthened. Nevertheless, like [e], considerable variation is also apparent in the production of [ɛ] among the five LCs as shown in Figure 4.4.

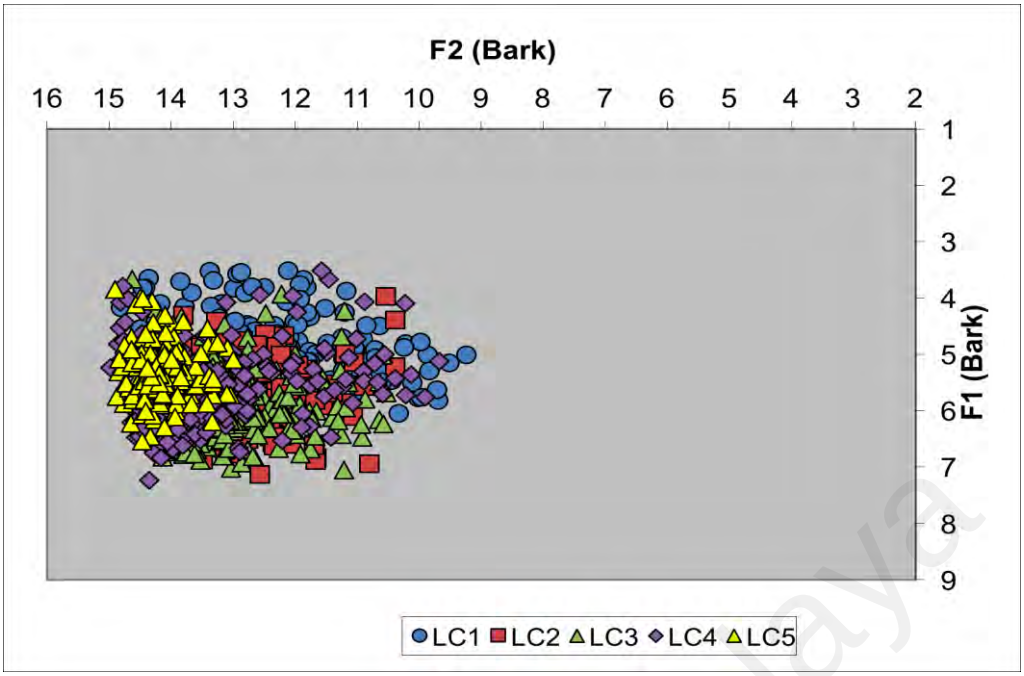

Figure 4.4: Scatter plot of MPC [ε] Produced by LC1-LC5

A one-way ANOVA found a statistically significant difference among the LCs F1 values of [ε]: $F(4, 1317) = 85.52$, $p < .0001$. A Tukey post hoc test revealed significant differences among all the LCs at $p < .01$ except for between LC2 and LC3. Similarly, Cohen's effect size also suggested a large effect size between the mean F1 values for all LCs except for between LC2 and LC3 ($f = 0.015$), which suggested a small effect size.

Statistically significant differences were also discovered in a one-way ANOVA test among the LCs F2 values of [ε]: $F(4, 1317) = 126.21$, $p < .0001$). A Tukey post hoc test revealed that all the LCs differed significantly at $p < .01$, except for between LC1 and LC2, LC1 and LC3, as well as between LC2 and LC3. This is supported by the large effect size found between all the LCs except for between LC1 and LC2 ($f = 0.023$), LC1 and LC3 ($f = 0.045$), and between LC2 and LC3 ($f = 0.057$), which revealed a small effect size.

As mentioned earlier, the F1 and F2 values of both [e] and [ɛ] recorded significant differences. However, the considerable variation of minimum and maximum values for each LC reflected in the scatter plots (see Figure 4.3 and Figure 4.4) seem to suggest the possibility of speaker variation. Thus, further acoustic analysis on the production of [e] and [ɛ] by each LC was carried out to determine the extent of speaker variation within each LC.

4.1.1 LC 1

A total of 279 and 226 tokens of F1 and F2 for both [e] and [ɛ] respectively were measured. Table 4.4 summarises the overall formant measurements of [e] and [ɛ] produced by LC1 for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.4: Average F1, F2 and SD Values of LC1

	e		**ɛ**	
	F1	**F2**	**F1**	**F2**
Average (Bark)	3.892	13.257	5.123	12.957
Average (Hertz)	405	2048	545	1955
SD	32	436	75	347
Min	329	1063	365	1117
Max	610	2781	690	2620

A two-tailed independent sample t-test was conducted to compare the F1 and F2 values of both [e] and [ɛ]. A significant difference was found in the average F1 values for [e] (M = 405 Hz, SD = 32) and [ɛ] (M = 545 Hz, SD = 75): $t(503) = 27.33$, $p < .0001$. Similarly, a significant difference was also found in the average F2 values for [e] (M = 2048Hz, SD = 436) and [ɛ] (M = 1955 Hz, SD = 347); $t(503) = 1.97$, $p < .0001$. These results therefore suggest that the two vowels are distinct. Besides that, a large

effect size was found for F1 (d = 2.42), while a small effect size was found for F2 (d = 0.23). In other words, [e] and [ɛ] are clearly differentiated in terms of vowel height but in relation to vowel fronting, both vowels appear to be dispersed evenly in the vowel space (see Figure 4.5).

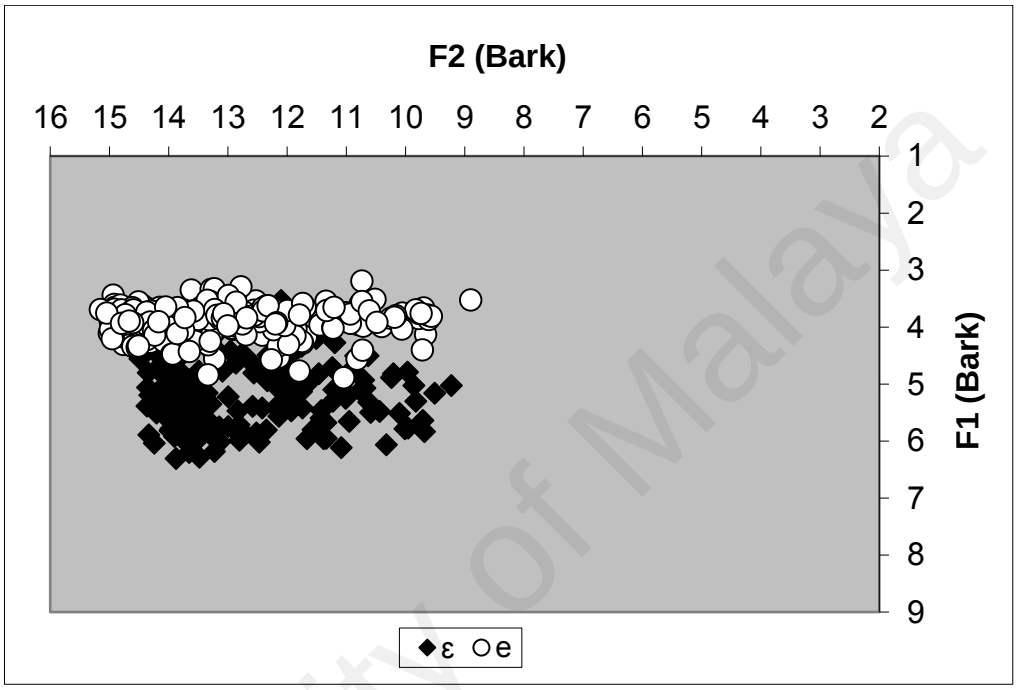

Figure 4.5: Scatter plot of MPC [e] and [ɛ] Produced by LC1

4.1.2 LC 2

A total of 289 and 279 tokens of F1 and F2 for both [e] and [ɛ] respectively were measured. Table 4.5 summarises the overall formant measurements of [e] and [ɛ] produced by LC2 for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.5: Average F1, F2 and SD Values of LC2

	e		ɛ	
	F1	**F2**	**F1**	**F2**
Average (Bark)	4.606	13.282	5.830	12.682
Average (Hertz)	485	2145	630	1935
SD	43	243	66	190
Min	391	1431	415	1327
Max	644	2543	800	2390

A two-tailed independent sample t-test discovered significant differences in the average F1 values for [e] (M = 485 Hz, SD = 43) and for [ɛ] (M = 630 Hz, SD = 66): $t(566) = 30.55$, $p < .0001$ and also in the average F2 values for [e] (M = 2145 Hz, SD = 243) and [ɛ] (M = 1935 Hz, SD = 190); $t(566) = 9.69$, $p < .0001$. Interestingly, a large effect size was found for both F1 (d = 2.60), as well as for F2 (d = 0.96). As shown in Figure 4.6, both the [e] and [ɛ] vowels produced by LC2 appear to be distinct in height and more concentrated centrally in fronting compared to the vowels produced by LC1.

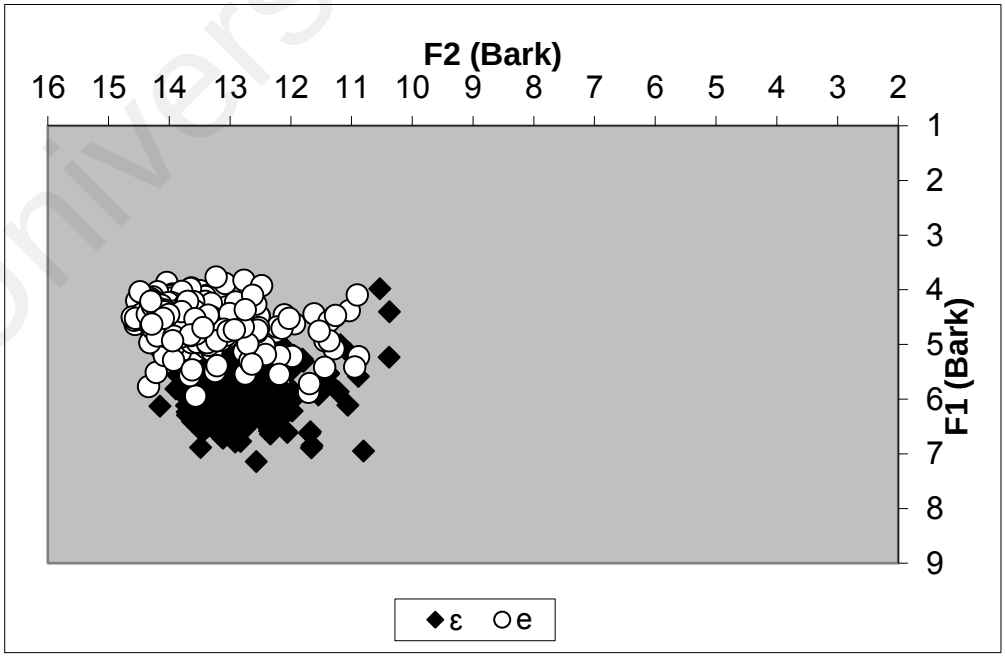

Figure 4.6: Scatter plot of MPC [e] and [ɛ] produced by LC2

However, Figure 4.6 also shows three outliers for [ɛ] on the top right corner of the vowel space for the words *kunténtimintu* 'pleasure, contentment' [kuntɛntimintu], *péntiadu* 'combed' [pɛntiadu] and *ménus* 'less' [mɛnus]. The outlier on the bottom right corner of the vowel space is the word *piménta* 'pepper' [pimɛntə]. Upon inspection by four other raters, the target vowels of these words were still determined as [ɛ].

4.1.3 LC 3

A total of 257 and 285 tokens of F1 and F2 for both [e] and [ɛ] respectively were measured. Table 4.6 summarises the overall formant measurements of [e] and [ɛ] produced by LC3 for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.6: Average F1, F2 and SD Values of LC3

	e		**ɛ**	
	F1	**F2**	**F1**	**F2**
Average (Bark)	4.483	13.443	5.854	12.857
Average (Hertz)	471	2206	633	1992
SD	65	315	67	240
Min	330	1176	380	930
Max	710	2700	789	2548

A two-tailed independent sample t-test found significant difference in the average F1 values for [e] (M = 471 Hz, SD = 65) and [ɛ] (M = 633 Hz, SD = 67): $t(540) = 28.52$, $p < .0001$. The average F2 values for [e] (M = 2206 Hz, SD = 315) and [ɛ] (M = 1992 Hz, SD = 240); $t(540) = 8.97$, $p < .0001$ also recorded significant differences. In addition, a large effect size was found for F1 (d = 2.60), while F2 recorded a medium effect size (d = 0.96). Although there is significant difference in height, overlaps still occur between [e] and [ɛ] at the front of the vowel space as seen in Figure 4.7.

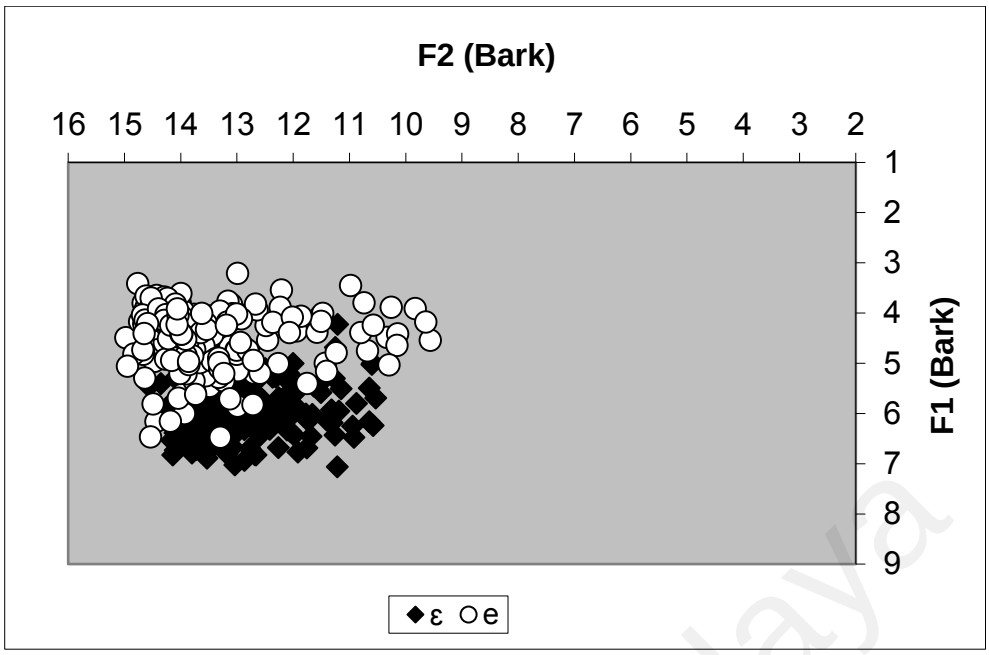

Figure 4.7: Scatter plot of MPC [e] and [ε] Produced by LC3

In terms of vowel fronting, the majority of [e] produced were concentrated at the front of the vowel space but some [e] vowels were also found dispersed further back. As for [ε], the vowels produced were slightly dispersed along the vowel space. Having said that, they were not as dispersed as the ones produced by LC1 (see Figure 4.5).

4.1.4 LC 4

A total of 263 and 290 tokens of F1 and F2 for both [e] and [ε] respectively were measured. Table 4.7 summarises the overall formant measurements of [e] and [ε] produced by LC4 for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.7: Average F1, F2 and SD Values of LC4

	e		ɛ	
	F1	**F2**	**F1**	**F2**
Average (Bark)	4.073	13.597	5.625	13.559
Average (Hertz)	425	2160	605	2147
SD	65	466	72	309
Min	322	1176	364	1195
Max	688	2930	813	2701

A two-tailed independent sample t-test discovered significant difference in the average F1 values for [e] (M = 425 Hz, SD = 65) and [ɛ] (M = 605 Hz, SD = 72): $t(551) = 30.02$, $p < .0001$. The average F2 values for [e] (M = 2160 Hz, SD = 466) and [ɛ] (M = 2147 Hz, SD = 309); $t(551) = 1.41$, $p < .0001$ also recorded significant differences. Furthermore, Cohen's effect value size suggested a high practical significance for F1 (d = 2.53) and a low practical significance for F2 (d = 0.19). In other words, the key difference lies in vowel height instead of vowel fronting. Despite an overall distinction in height (see Figure 4.8), overlaps are still apparent between the [e] and [ɛ] produced by LC4 at the front of the vowel space. Closer inspection by four other raters on the overlapping vowels in words like *enfetah* 'putting on makeup' [nfeta] and *pezadu* 'heavy' [pezadu] however, yielded no change in the targeted vowels.

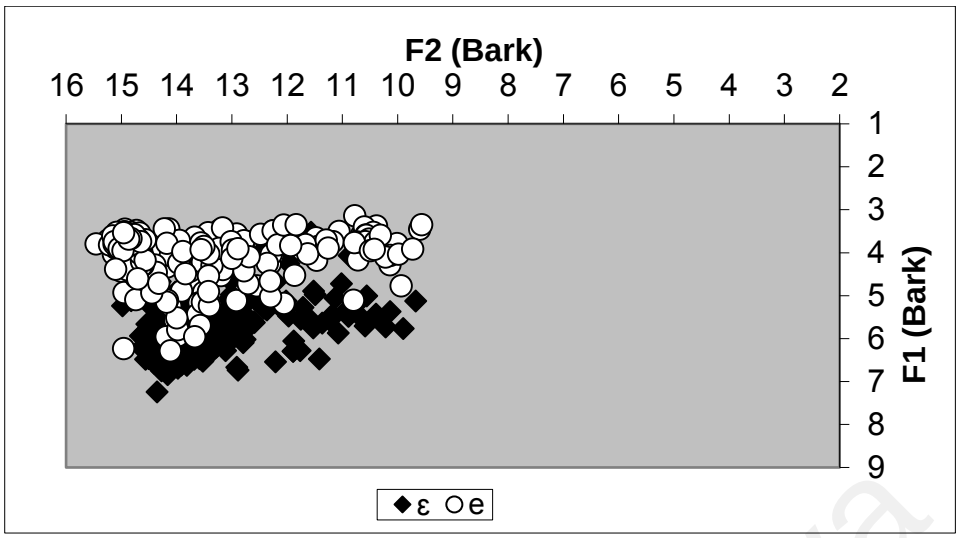

Figure 4.8: Scatter plot of MPC [e] and [ε] Produced by LC4

In terms of vowel fronting, [e] is dispersed evenly in the vowel space, while [ε] on the other hand appears to be centrally concentrated. Having said that, a few [ε] vowels were dispersed further back.

4.1.5 LC 5

A total of 315 and 240 tokens of F1 and F2 for both [e] and [ε] respectively were measured. Table 4.8 summarises the overall formant measurements of [e] and [ε] produced by LC5 for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.8: Average F1, F2 and SD Values of LC5

	e		**ε**	
	F1	**F2**	**F1**	**F2**
Average (Bark)	5.301	13.840	5.301	13.840
Average (Hertz)	426	2545	566	2365
SD	56	178	50	133
Min	342	1940	401	1967
Max	652	2920	719	2666

A two-tailed independent sample t-test found significant difference in the average F1 values for [e] (M = 426 Hz, SD = 56) and [ɛ] (M = 566 Hz, SD = 50): $t(557) = 30.58$, $p < .0001$. Significant differences were also found in the average F2 values for [e] (M = 2545 Hz, SD = 178) and [ɛ] (M = 2365 Hz, SD = 133); $t(557) = 11.73$, $p < .0001$. Similar to LC2, both F1 (d = 2.63) and F2 (d =1.14) reported a high effect size. In other words, [e] and [ɛ] differ in both height and fronting.

Despite some overlaps in terms of height (see Figure 4.9), both [e] and [ɛ] vowels were centrally concentrated, unlike previous LCs. Also, both vowels were more uniform in terms of fronting since they were found distributed in the same area, which is in the front of the vowel space.

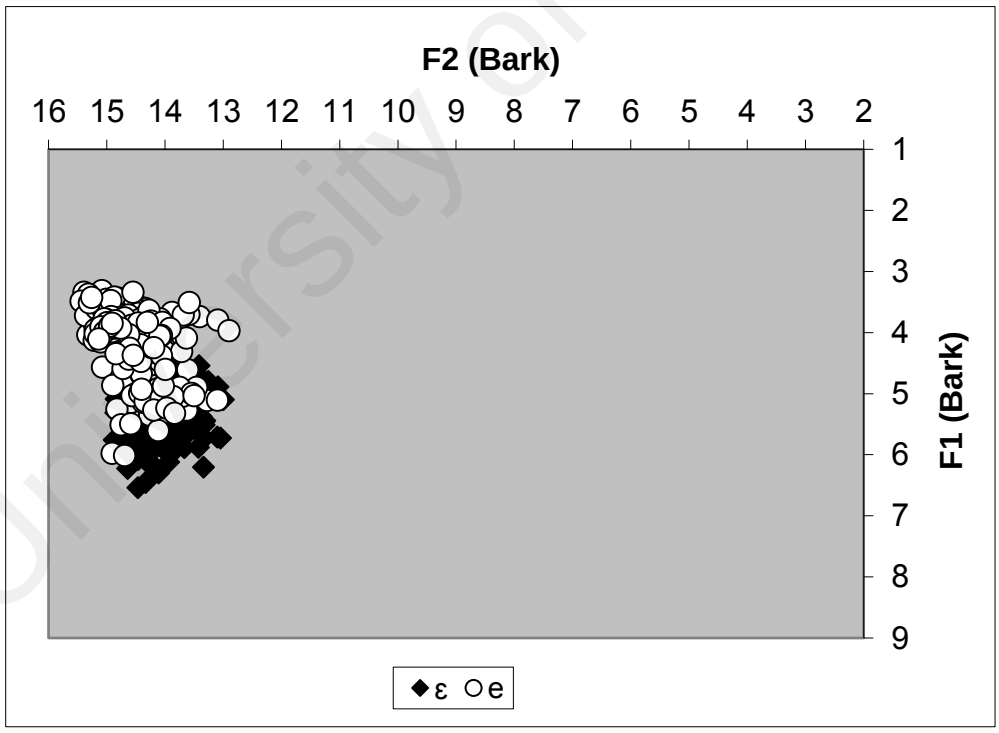

Figure 4.9: Scatter Plot of MPC [e] and [ɛ] Produced by LC5

4.2 Malacca Portuguese Creole Vowels /o/ and /ɔ/

The monophthong /o/ was taken from words like *grago* 'shrimp', *dos* 'two', *kapoti* 'zero', *tortu* 'blind, crooked, bent', *tochang* 'plaits', *podri* 'rotten', *aros* 'rice' and *abok* 'grandparent', while the monophthong /ɔ/ was taken from words like *agora* 'now, currently, at present', *fomi* 'hunger', *goyéba* 'guava', *tona* 'again', *tosi* 'cough', *sabola* 'onion', and *skola* 'school'. A total of 1087 and 1214 tokens of F1 and F2 for both [o] and [ɔ] respectively were measured. The overall mean value of F1 for [o] was 499 Hz while F2 was 972 Hz (SD: F1 = 68, F2 = 146). As for [ɔ], the overall mean values were 628 Hz for F1 and 1070 Hz for F2 (SD: F1 = 83, F2 = 124). Table 4.9 shows the overall formant measurements of [o] and [ɔ] produced by all five LCs for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.9: Summary of the Overall Formant Measurements For [o] and [ɔ]

	o		**ɔ**	
	F1	**F2**	**F1**	**F2**
Average (Bark)	4.728	8.330	5.814	8.947
Average (Hertz)	499	972	628	1070
SD	68	146	83	124
Min	362	677	384	786
Max	770	1547	867	1437

Based on the vowel chart in Figure 4.10, the overall placement of [o] and [ɔ] appears to be slightly different from Klein (2006) and Baxter (1988). While the placement of [o] is similar to Klein (2006) and Baxter (1988), [ɔ] is more fronted. Nevertheless, the vowels [o] and [ɔ] are distinct.

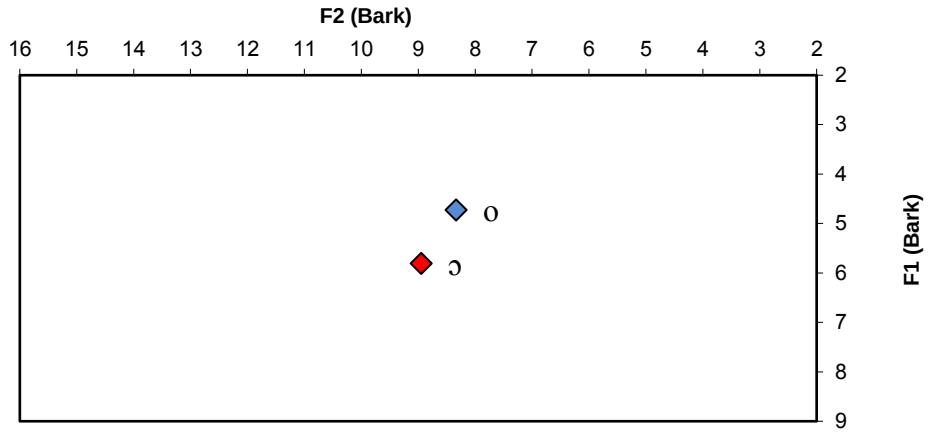

Figure 4.10: Overall Vowel Chart For [o] and [ɔ]

A generated scatter plot shows that the distribution of all [o] and [ɔ] vowels produced by the five LCs is centrally concentrated in the vowel space (see Figure 4.11). Having said that, the vowels do not seem to contrast acoustically, which could also suggest a difference in pronunciation between each LC.

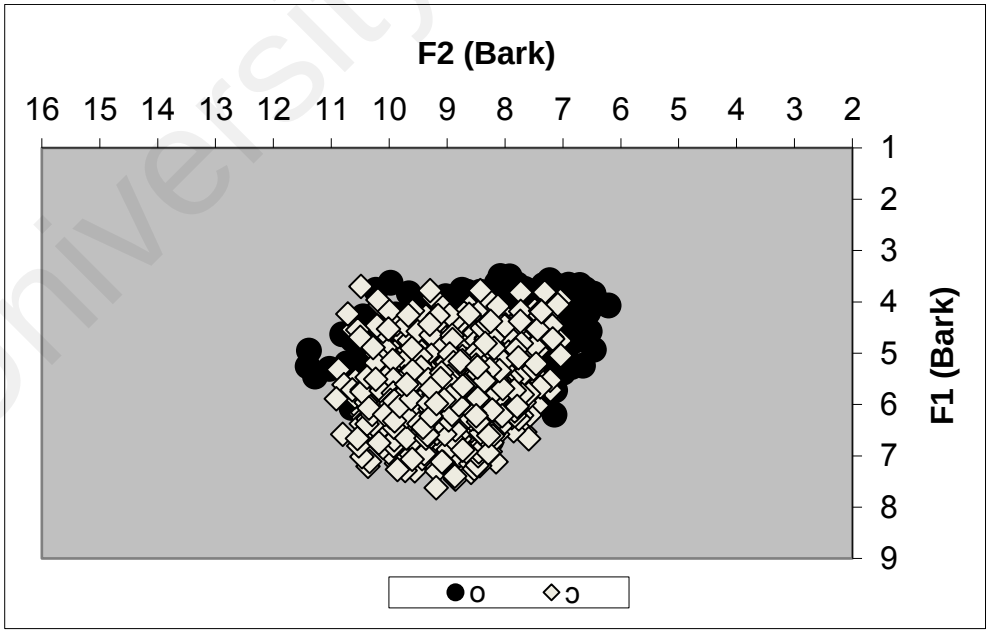

Figure 4.11: Scatter plot of MPC [o] and [ɔ]

A two-tailed independent sample t-test was then conducted to compare the F1 and F2 values of both [o] and [ɔ]. A significant difference was found in the average F1 values for [o] (M = 499 Hz, SD = 68) and [ɔ] (M = 628 Hz, SD = 83): $t(2299) = 40.69$, $p < .0001$. Similarly, a significant difference was also found in the average F2 values for [o] (M = 972 Hz, SD = 146) and [ɔ] (M = 1070 Hz, SD = 124); $t(2299) = 17.33$, $p < .0001$. Further, a large effect size was found for F1 (d = 1.70) while F2 (d = 0.72) recorded a medium effect size. Based on these results, the two vowels are still distinct.

Significant differences were also found between all the LCs average F1 and F2 values of [o] (see Table 4.10). Like [e] and [ɛ], the minimum and maximum values of [o] for every LC also vary greatly. This highlights the issue of great variance in pronunciation despite every LC producing the same sound.

Table 4.10: Average F1, F2 and SD Values of [o] For Each LC

	F1 (Hz)				**F2 (Hz)**			
LC	**Average**	**SD**	**Min**	**Max**	**Average**	**SD**	**Min**	**Max**
1	435	38	334	631	921	144	581	1693
2	529	47	420	664	1101	140	757	1677
3	551	69	404	811	1001	121	764	1423
4	489	66	381	676	887	112	676	1386
5	491	56	393	667	966	170	446	1700

A generated scatter plot however shows that the [o] produced by all five LCs are generally focused at the center of the vowel space.

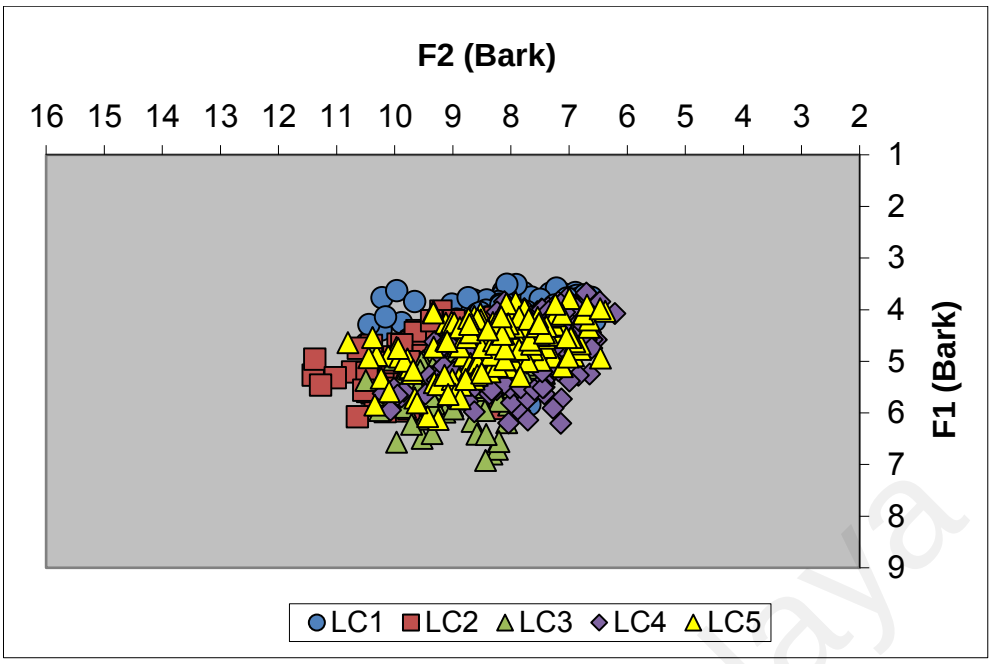

Figure 4.12: Scatter Plot of MPC [o] Produced by LC1-LC5

A one-way ANOVA was then conducted to compare the F1 values of [o] between the LCs. A statistically significant difference was discovered among the five LCs: $F(4, 1084) = 134.41$, $p < .0001$). A Tukey post hoc test revealed significant differences between the mean F1 values for all LCs at $p < .01$, except for between LC4 and LC5 as shown in Table 4.10. Similarly, a high effect size was found between the mean F1 values for all LCs except for between LC4 and LC5 ($f = 0.015$), which suggested a small effect size.

Statistically significant differences were also discovered in a one-way ANOVA test among the five LCs F2 values of [o]: $F(4, 1082) = 105.64$, $p < .0001$). A Tukey post hoc test revealed that all the LCs differed significantly at $p < .01$, except for between LC1 and LC4. Despite a high effect size found between the majority of LCs, the effect size between LC1 and LC4 ($f = 0.084$) was medium. Interestingly, a medium effect size was also found between LC3 and LC5 ($f = 0.089$). This means that although a significant difference was discovered between LC3 and LC5, its effect is not as

distinctive compared to the other LCs. Since significant differences were also found between all the LCs average F1 and F2 values of [ɔ] (see Table 4.11), this indicate that both [o] and [ɔ] are distinct.

Table 4.11: Average F1, F2 and SD Values of [ɔ] For Each LC

	F1 (Hz)				F2 (Hz)			
LC	**Average**	**SD**	**Min**	**Max**	**Average**	**SD**	**Min**	**Max**
1	524	70	337	793	1025	126	752	1422
2	654	46	523	840	1172	100	895	1471
3	689	69	518	867	1085	116	795	1649
4	647	58	414	806	980	109	786	1753
5	630	67	392	835	1083	127	786	1630

Although there is some variation among the five LCs production of [ɔ], their overall distribution in the scatter plot is focused at the center of the vowel space (see Figure 4.13).

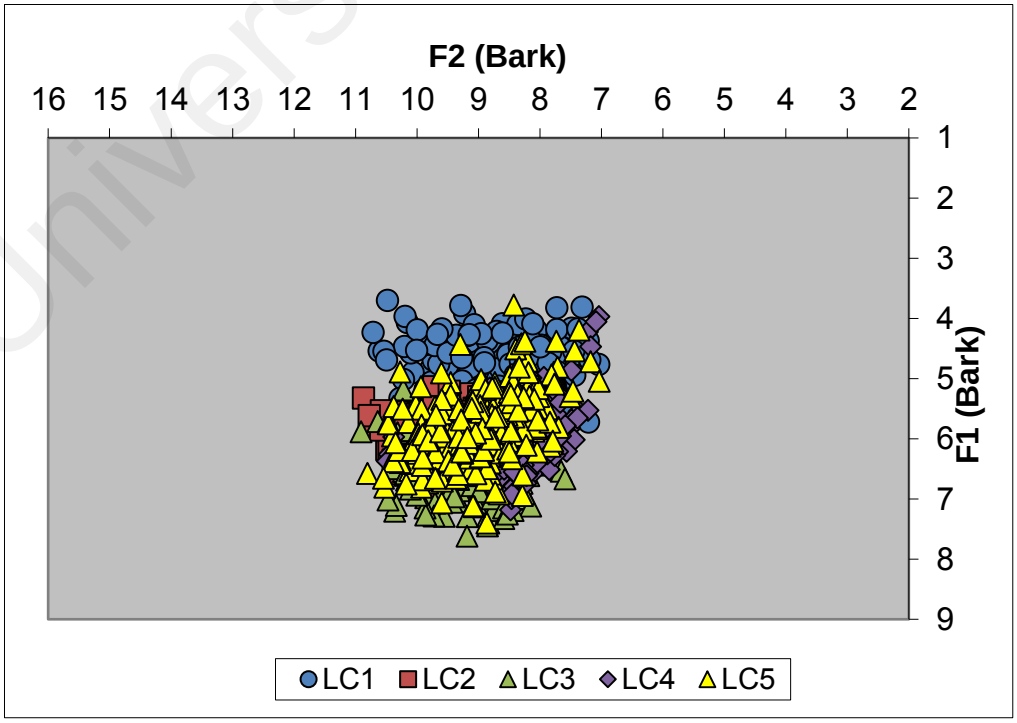

Figure 4.13: Scatter Plot of MPC [ɔ] Produced by LC1-LC5

A one-way ANOVA found a statistically significant difference among the LCs F1 values of [ɔ]: $F(4, 1209) = 250.94$, $p < .0001$. A Tukey post hoc test revealed significant differences among all the LCs at $p < .01$ except for between LC2 and LC4. A large effect size was also found between the mean F1 values for all LCs except for between LC2 and LC4 ($f = 0.026$), which had a small effect size.

Statistically significant differences were also discovered in a one-way ANOVA test among the LCs F2 values of [ɔ]: $F(4, 1209) = 97.33$, $p < .0001$). A Tukey post hoc test revealed that all the LCs differed significantly at $p. < .01$, except for between LC3 and LC5. This is supported by the large effect size between all the LCs except for the small effect size recorded between LC3 and LC5 ($f = 0.017$).

Based on the overall acoustic analysis, the vowels [o] and [ɔ] are distinct. However, a combined scatter plot (see Figure 4.11) saw overlaps between the two vowels. The production of [o] and [ɔ] by each LC was then examined in detail in order to ascertain the contrast between the two vowels.

4.2.1 LC 1

A total of 223 and 234 tokens of F1 and F2 for both [o] and [ɔ] respectively were measured. Table 4.12 summarises the overall formant measurements of [o] and [ɔ] produced by LC1 for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.12: Average F1, F2 and SD Values of LC1

	o		ɔ	
	F1	**F2**	**F1**	**F2**
Average (Bark)	4.164	7.991	4.941	8.670
Average (Hertz)	435	921	524	1025
SD	38	144	70	126
Min	334	581	337	752
Max	631	1693	793	1422

Despite the examination of target vowels by four other raters, a generated scatter plot shows considerable overlaps in LC1's production of [o] and [ɔ] (see Figure 4.14). Further inspection revealed that the [ɔ] sound is produced differently from one word to another word, which highlights the feature of individual variation. For example, the words *boka* 'mouth' [bɔkə], *moli* 'soft, tender' [mɔli] and *conta* 'account' [kɔntə].

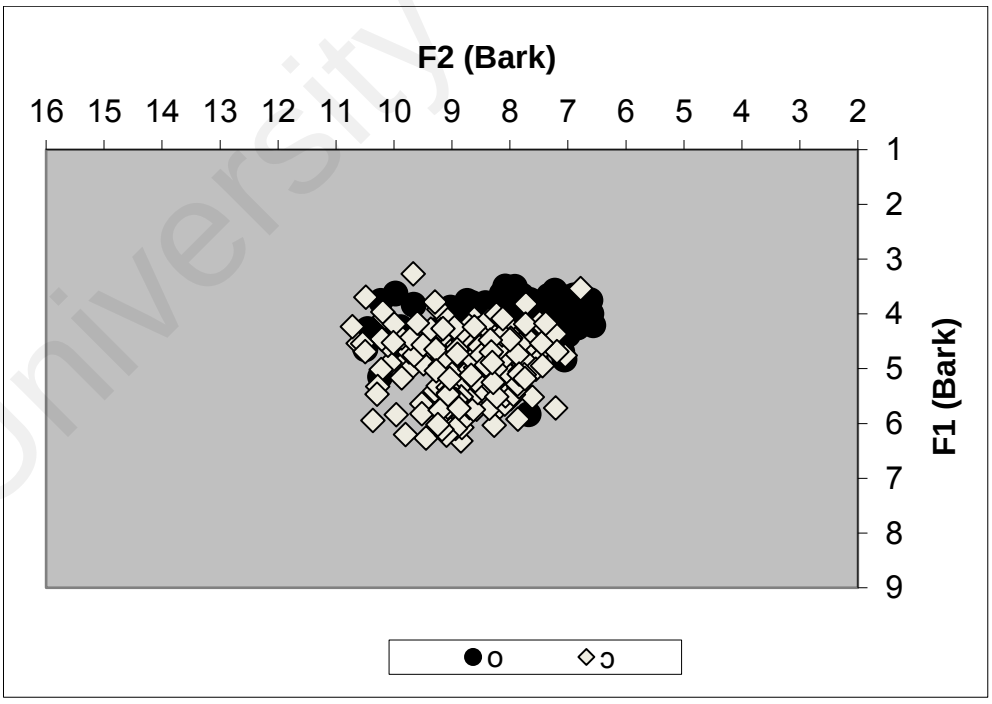

Figure 4.14: Scatter Plot of MPC [o] and [ɔ] Produced by LC1

A two-tailed independent sample t-test was then conducted to compare the F1 and F2 values of both [o] and [ɔ]. A significant difference was found in the average F1 values for [o] (M = 435 Hz, SD = 38) and [ɔ] (M = 524 Hz, SD = 70): $t(455) = 17.34$, $p < .0001$. Similarly, a significant difference was also found in the average F2 values for [o] (M = 921 Hz, SD = 144) and [ɔ] (M = 1025 Hz, SD = 126); $t(455) = 9.46$, $p < .0001$. Based on these results, the two vowels are distinct. Further, a large effect size was found for F1 (d = 1.58), while a medium effect size was found for F2 (d = 0.76). Since F1 correlates to vowel height and F2 correlates to vowel fronting, this means that LC1's production of [o] and [ɔ] differ more in height than in fronting.

4.2.2 LC 2

A total of 231 and 224 tokens of F1 and F2 for both [o] and [ɔ] respectively were measured. Table 4.13 summarises the overall formant measurements of [o] and [ɔ] produced by LC2 for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.13: Average F1, F2 and SD Values of LC2

	o		**ɔ**	
	F1	**F2**	**F1**	**F2**
Average (Bark)	4.985	9.133	6.023	9.547
Average (Hertz)	529	1101	654	1172
SD	47	140	46	100
Min	420	757	523	895
Max	664	1677	840	1471

A two-tailed independent sample t-test discovered significant differences in the average F1 values for [o] (M = 529 Hz, SD = 47) and [ɔ] (M = 654 Hz, SD = 46): $t(453) = 28.55$, $p < .0001$ and also in the average F2 values for [o] (M = 1101 Hz, SD = 140)

and [ɔ] (M = 1172 Hz, SD = 100); $t(453) = 9.69$, $p < .0001$. A large effect size was found for F1 ($d = 2.68$), while a medium effect size was found for F2 ($d = 0.58$).

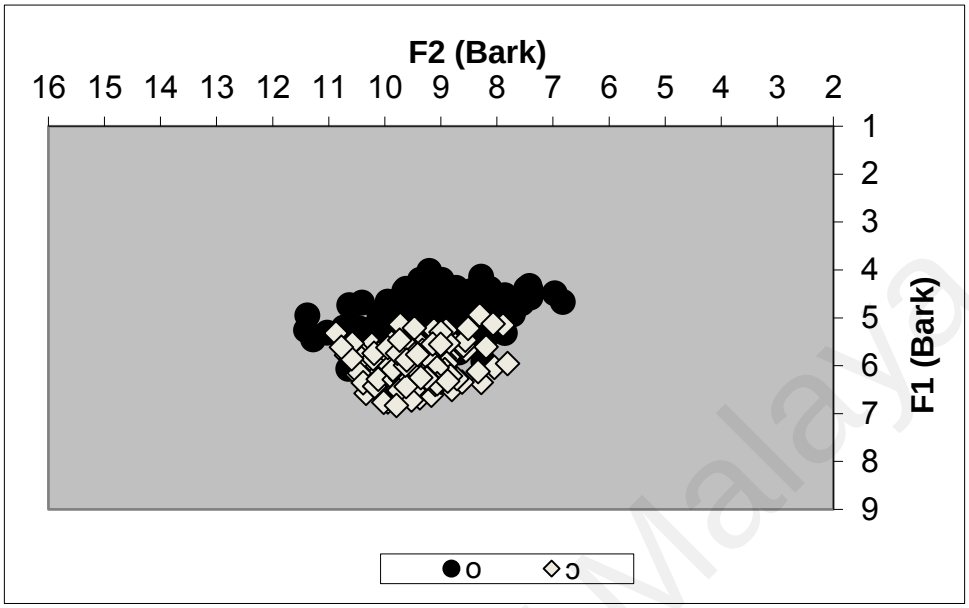

Figure 4.15: Scatter Plot of MPC [o] and [ɔ] Produced by LC2

As shown in Figure 4.15, both the [o] and [ɔ] vowels produced by LC2 appear to be distinct in height and although the [o] vowels are are slightly more dispersed in terms of fronting compared to [ɔ], both vowels are generally located at the center of the vowel space.

4.2.3 LC3

A total of 202 and 253 tokens of F1 and F2 for both [o] and [ɔ] respectively were measured. Table 4.14 summarises the overall formant measurements of [o] and [ɔ] produced by LC3 for F1 and F2 in both Herts and Bark, Standard Deviation (SD), and the minimum and maximum values.

Table 4.14: Average F1, F2 and SD Values of LC3

	o		ɔ	
	F1	**F2**	**F1**	**F2**
Average (Bark)	5.174	9.040	6.299	8.518
Average (Hertz)	551	1085	689	1001
SD	69	116	69	121
Min	404	795	518	764
Max	811	1649	867	1423

A two-tailed independent sample t-test discovered significant differences in the average F1 values for [o] (M = 551 Hz, SD = 69) and [ɔ] (M = 689 Hz, SD = 69): $t(453) = 21.53$, $p < .0001$ and also in the average F2 values for [o] (M = 1001 Hz, SD = 121) and [ɔ] (M = 1085 Hz, SD = 116); $t(453) = 8.00$, $p < .0001$. From the results, both [o] and [ɔ] are distinct. In addition, F1 recorded a large effect size (d = 2.01), while F2 recorded a medium effect size (d = 0.96). This means that although there are some overlaps, both the [o] and [ɔ] vowels produced by LC3 appear to be distinct in height (see Figure 4.16). In terms of fronting, the occurrences of [o] are slightly spread out from the centre of the vowel space to the top right, whereas [ɔ] remains centrally concentrated.

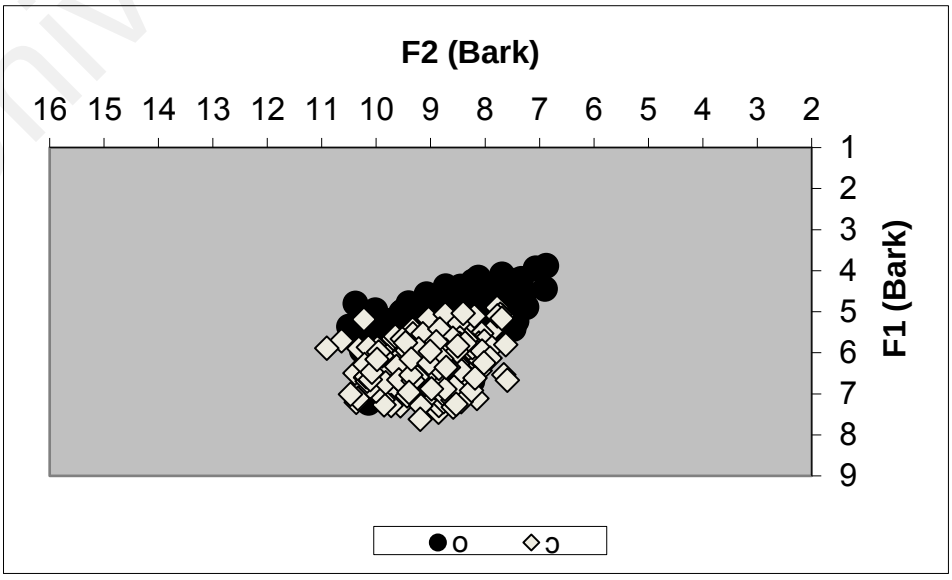

Figure 4.16: Scatter Plot of MPC [o] and [ɔ] Produced by LC3

4.2.4 LC 4

A total of 262 and 211 tokens of F1 and F2 for both [o] and [ɔ] respectively were measured. Table 4.15 summarises the overall formant measurements of [o] and [ɔ] produced by LC4 for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.15: Average F1, F2 and SD Values of LC4

	o		**ɔ**	
	F1	**F2**	**F1**	**F2**
Average (Bark)	4.638	7.760	5.968	8.379
Average (Hertz)	489	887	647	980
SD	66	112	58	109
Min	381	676	414	786
Max	676	1386	806	1753

A two-tailed independent sample t-test discovered significant differences in the average F1 values for [o] (M = 489 Hz, SD = 66) and [ɔ] (M = 647 Hz, SD = 58): $t(471) = 27.37$, $p < .0001$. The average F2 values for [o] (M = 887 Hz, SD = 112) and [ɔ] (M = 980 Hz, SD = 109); $t(471) = 9.98$, $p < .0001$ also recorded significant differences. More importantly, Cohen's effect value size suggested a high practical significance for both F1 (d = 2.54) and F2 (d = 0.85). In other words, both vowels produced by LC4 differ in terms of height and fronting as shown in Figure 4.17. Besides that, the outliers for [ɔ] on the top right corner of the vowel space are *apoyu* 'support' [apɔju], *aposta* 'bet' [apɔsta], *apostah* 'to bet' [apɔsta] and *bispontu* 'back stitch' [bispɔntu] (see Figure 4.17). After checking on the target vowels, four other raters still marked them as [ɔ].

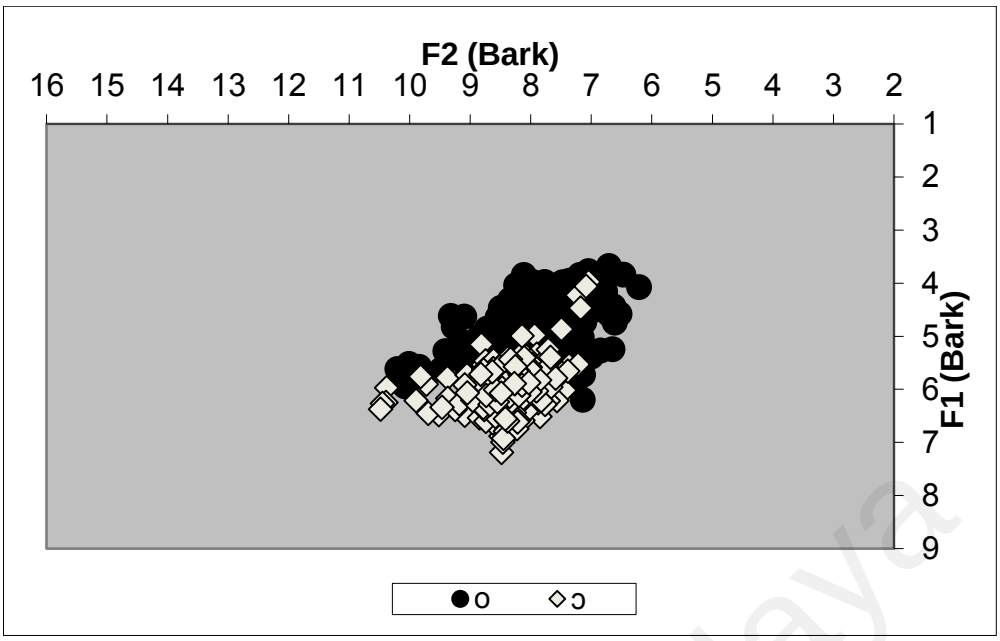

Figure 4.17: Scatter Plot of MPC [o] and [ɔ] Produced by LC4

4.2.5 LC 5

A total of 169 and 292 tokens of F1 and F2 for both [o] and [ɔ] respectively were measured. Table 4.16 summarises the overall formant measurements of [o] and [ɔ] produced by LC5 for F1 and F2 in both Hertz and Bark, Standard Deviation, and the minimum and maximum values.

Table 4.16: Average F1, F2 and SD Values of LC5

	o		**ɔ**	
	F1	**F2**	**F1**	**F2**
Average (Bark)	4.658	8.291	5.830	9.026
Average (Hertz)	491	966	630	1083
SD	56	170	67	127
Min	393	446	392	786
Max	667	1700	835	1630

Although some overlaps were evident at the top right corner, the vowels [o] and [ɔ] appear to be distinct (see Figure 4.18).

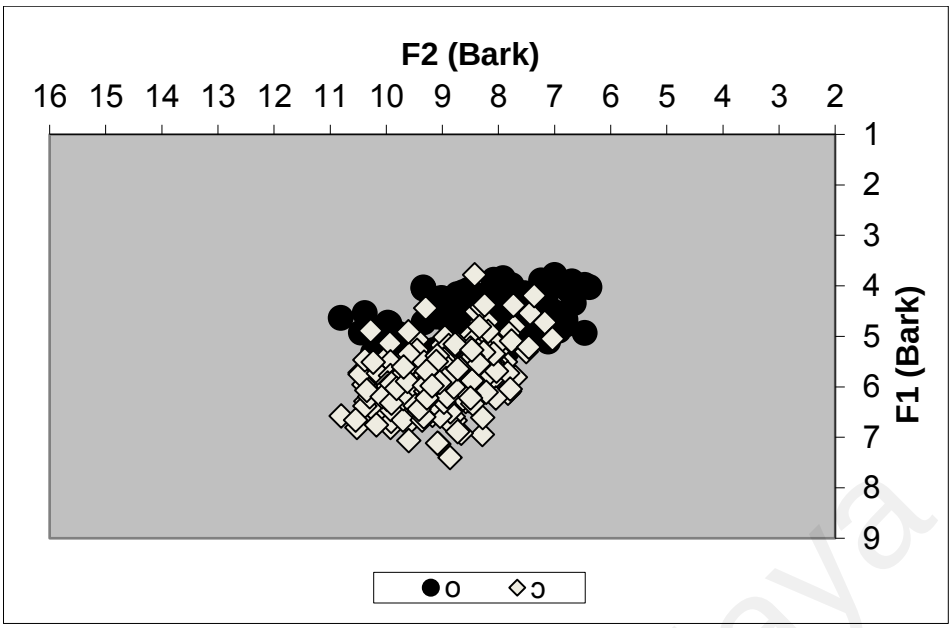

Figure 4.18: Scatter Plot of MPC [o] and [ɔ] Produced by LC5

Based on a two-tailed independent sample t-test, significant difference was found in the average F1 values for [o] (M = 491 Hz, SD = 56) and [ɔ] (M = 630 Hz, SD = 67): $t(459) = 22.84$, $p < .0001$. Significant differences were also found in the average F2 values for [o] (M = 966 Hz, SD = 170) and [ɔ] (M = 1083 Hz, SD = 127); $t(459) = 9.41$, $p < .0001$. Since both F1 and F2 values have significant differences, therefore both [o] and [ɔ] are distinct. Also, a large effect size was found for F1 (d = 2.25) and a medium effect size for F2 (d = 0.78). In other words, both vowels differ more in height compared to fronting.

4.3 Patterns of /e/, /ɛ/, /o/ and /ɔ/

Based on the findings from the acoustic analysis, the sounds preceding and following [e], [ɛ], [o] and [ɔ] were analysed further in order to discover possible emerging patterns. To achieve this, their phonetic environments were examined by identifying neighbouring sounds and grouping the targeted vowels into different categories like word class, consonant clusters and syllable types (CV, CVC, CCV).

4.3.1 Vowel Harmony

As mentioned previously in Chapter 2.2, Baxter (1988) claims that the distribution of /e/ and /ɛ/ may be an effect of vowel harmony since the preceding vowel is influenced by the height of the final vowel. Based on this, /e/ is used if the vowel is high like /u/ in the following syllable, while /ɛ/ is utilized if a low vowel like /a/ succeeds. A total of 292 words contained the vowel /e/, out of which, 150 words (51%) were succeeded by high vowels /u/ (n=71) /i/ (n=48), /e/ (n=28), or /o/ (n=3) in the following syllable (see Table 4.17).

Table 4.17: Examples of High Vowels Following /e/

/e/ + High Vowel	MPC Word	Meaning	Transcription
/e/ + /u/	*besu*	lip	/besu/
	kuzinyeru	cook	/kuziɲeru/
	marelu	yellow	/marelu/
/e/ + /i/	*alegri*	happy, joyful, pleased, glad	/alegri/
	leti	milk	/leti/
	repenti	naughty, mischivious	/ripenti/
/e/ + /e/	*bende*	to sell	/bende/
	fedeh	stench, stink	/fedeʔ/
	pedresang	loss	/pedresaŋ/
/e/ + /o/	*cherozu*	fragrant, aromatic, scented	/ʧerozu/
	fetor	ugly	/fetor/
	redonu	round	/redonu/

The vowel /e/ was also found in word-final position (n=57), closed syllables in word-final position (n=16) or monosyllabic (n=15) like *fel* ‘gall bladder’ [fel], *les* ‘to read’ [les] and *seng* ‘yes’ [seŋ]. Further, findings discovered that the vowel /e/ was followed by either the vowel /a/ (n=48), a schwa (n=3) or diphthongs (n=3). Table 4.18 shows a summary of the findings together with examples.

Table 4.18: Examples of Vowels Following /e/

/e/ + Vowel	MPC Word	Meaning	Transcription
/e/ +/a/	*alebadu*	puzzled	/alebadu/
	kabeladu	hairy	/kabeladu/
	letang	piglet	/letaŋ/
/e/ + / ə/	*betel*	betel leaf	/betəl/
	debel	used in Kari Debel, a traditional Kristang curry	/debəl/
	ketal	kettle	/ketəl/
/e/ + diphthongs	*deus*	God	/deius/
	repairu	shelter	/repairu/
	recheu	stuffing	/ retʃeu/

As for /ɛ/, out of 282 words containing /ɛ/, only 89 words (32%) were succeeded by low vowels /a/ (n=85) and /ɔ/ (n=4) (see Table 4.19).

Table 4.19: Examples of Low Vowels Following /ɛ/

/ɛ/ + Low Vowel	MPC Word	Meaning	Transcription
/ɛ/ + /a/	*jéma*	egg yolk	/dʒɛma/
	péladu	bald	/pɛladu/
	témpra	spices, condiments	/tɛmpra/
/ɛ/ + /ɔ/	*bégonya*	embarassed, humiliated, dishonoured	/bɛgɔɲə/
	répostah	rely	/rɛpɔsta/
	létori	shrine for saints	/lɛtɔri/

Interestingly, words with /ɛ/ followed by higher vowels totaled 82 words (28%); 35 words for /u/, 37 words for /i/, 3 words for /o/ and 7 words for /e/ (see Table 4.20).

Table 4.20: Examples of High Vowels Following /ɛ/

/ɛ/ + High Vowel	MPC Word	Meaning	Transcription
/ɛ/ + /u/	*frésku*	fresh	/frɛsku/
	jéru	son-in-law	/dʒɛru/
	rému	oar	/rɛmu/
/ɛ/ + /i/	*fébri*	fever	/fɛbri/
	méstri	teacher	/mɛstri/
	véntri	womb	/vɛntri/
/ɛ/ + /o/	*mémorá*	to remember, to commemorate	/mɛmora/
	mémoria	commemoration, monument	/mɛmoria/
	konfésor	confessor	/konfɛsor/
/ɛ/ +/e/	*béndedor*	hawker, seller	/bɛndedor/
	mérse	thanks	/mɛrse/
	résebe	to receive	/ rɛsebe/

The majority of words however (n=95, 34%) were followed by a schwa (see Table 4.21), while the remaining words consist of the following:

1) Closed syllables in word-final position (n=7, 3%). For example, *papél* 'paper, newspaper' [papɛl], *soném* 'little' [sonɛʔ], and *garnél* 'abundance, large quantity, a lot' [garnɛl].

2) Monosyllabic (n=5, 2%) in words like *dés* 'ten' [dɛs], *mél* 'honey' [mɛl] and *bés* 'time, occasion' [bɛs].

3) Words that are followed by the same vowel /ɛ/ (n=4, 1%) as seen in *préprésta* 'quickly, quite fast' [prɛprɛstə], *sénténsia* 'sentence' [sɛntɛnsiə] and *téléfon* 'telephone' [tɛlɛfon].

Table 4.21: Examples of Schwa Following /ɛ/

MPC Word	Category	Meaning	Transcription
anéla	n	ring	/anɛlə/
kintaféra	n	Thursday	/kintafɛrə/
stréla	n	star	/strɛlə/

Since 51% of words containing /e/ were followed by high vowels /u/, /i/, /e/ or /o/, there was some evidence proving that Baxter's theory of vowel harmony is right. However, this was not the case for words containing /ɛ/ because only 32% of words were followed by low vowels /a/ or /ɔ/. Interestingly, it was discovered that a schwa is more likely to occur after /ɛ/ (n=95, 34%) compared to /e/ (n=3, 2%).

Furthermore, Baxter (1988) also claims that the higher /o/ is used if a high vowel like /u/ succeeds in the next syllable but /ɔ/ is utilized if a low vowel like /a/ is next. Based on this, from a data of 188 words containing /o/, a total of 75 words (40%) were succeeded by high vowels /u/ (n=42), /i/ (n=26) or /e/ (n=7) in the following syllable (see Table 4.22).

Table 4.22: Examples of High Vowels Following /o/

/o/ + High Vowel	MPC Word	Meaning	Transcription
/o/ + /u/	*choru*	crying, weeping	/ʧoru/
	ponturia	sensitive, touchy	/ponturia/
	sabrozu	delicious, tasty	/sabrozu/
/o/ + /i/	*bodi*	armpit	/bodi/
	pochiteh	teapot	/poʧite/
	ponti	bridge	/ponti/
/o/ + /e/	*toleti*	rowlock	/toleti/
	nobresti	northwest	/nobresti/
	sombrelu	umbrella	/sombrelu/

113 words (60%) with the vowel /o/ were in word-final position (n=5), monosyllabic (n=5) like *bong* 'good, well' [boŋ], *dos* 'two' [dos] and *vos* 'voice' [vos] or followed by a diphthong (n=1) such as *kolau* 'open-air Chinese restaurant' [kolau]. The majority of words however were found in closed syllables in word-final position (n=46). For example, *abok* 'grandparent' [aboʔ], *aros* 'rice' [aros] and *mérkador* 'merchant' [mɛrkador]. The remaining words containing /o/ include words that were succeeded by a schwa (n=8), the same vowel /o/ (n=12) or low vowels /a/ (n=35) or /ɛ/ (n=1). Table 4.23 shows a summary of the findings together with examples.

Table 4.23: Examples of Vowels Following /o/

/o/ + Vowel	MPC Word	Meaning	Transcription
/o/ + /ə/	*choldabolda*	jumbled, topsy-turvy	/ʧoldəboldə/
	gobah	gossip	/gobə/
	gandola	edible medicinal leaf	/gandolə/
/o/ + /o/	*bolor*	dirty, filthy, soiled; mouldy	/bolor/
	golozu	greedy, gluttonous	/golozu/
	tontong	tortoise	/tontoŋ/
/o/ + /a/	*bondadi*	kindness, good will	/bondadi/
	malsombradu	haunted	/malsombradu/
	tochang	plaits	/totʃaŋ/
/o/ + /ɛ/	*disonéstu*	indecent, immodest	/disonɛstu/

As for /ɔ/, out of 252 words containing /ɔ/, only 84 words (33%) were succeeded by low vowels /a/ (n=65) or /ɛ/ (n=19) (see Table 4.24).

Table 4.24: Examples of Low Vowels Following /ɔ/

/ɔ/ + Low Vowel	MPC Word	Meaning	Transcription
/ɔ/ + /a/	*corsang*	heart	/kɔrsaŋ/
	korazi	pampered	/kɔrazi/
	montanya	mountain	/mɔntaɲə/
/ɔ/ + /ɛ/	*novénta*	ninety	/nɔvɛntə/
	goyéba	guava	/gɔjɛbə/
	donzéla	maiden	/dɔnzɛlə/

Besides that, words with /ɔ/ followed by higher vowels totaled 71 words (28%); 57 words for /i/, 7 words for /u/, 6 words for /e/ and one word for /o/ (see Table 4.25).

Table 4.25: Examples of High Vowels Following /ɔ/

/ɔ/ + High Vowel	MPC Word	Meaning	Transcription
/ɔ/ + /i/	*bigodi*	moustache	/bigɔdi/
	bofi	lung	/bɔfi/
	fomiadu	famished, starving	/fɔmiadu/
/ɔ/ + /u/	*bérgonyuzu*	shy	/bɛrgɔɲuzu/
	korduadu	awake	/kɔrduadu/
	koruasang	coronation	/kɔruəsaŋ/
/ɔ/ + /e/	*fosteru*	loner, orphan	/fɔsteru/
	konenadu	troublesome; nuisance	/kɔnenadu/
	sone	little, small	/sɔne/
/ɔ/ + /o/	*diskonsoladu*	disconsolate	/diskɔnsoladu/

Like /ɛ/ the majority of words with /ɔ/ (n=91; 36%) were followed by a schwa (see Table 4.26), while the remaining words consist of closed syllables in word-final position (n=2; 1%) such as *bisol* 'boil, ulcer' [bisɔl] and *Selon* 'Ceylon (Sri Lanka)' [Selɔn] or monosyllabic (n=4; 2%) like *gor* 'barley' [gɔr], *po* 'dust, powder' [pɔʔ] and *sol* 'sun' [sɔl].

Table 4.26: Examples of Schwa Following /ɔ/

MPC Word	Category	Meaning	Transcription
anzola	n	hook	/anzɔlə/
boka	n	mouth	/bɔkə/
gayola	n	cage	/gajɔlə/

Since 40% of words (n=75) containing /o/ were followed by high vowels /u/, /i/ or /e/, there was some but not overwhelming evidence supporting Baxter's theory of vowel harmony. However, this was not the case for words with /ɔ/ because only 33% of words (n=84) were succeeded by low vowels /a/ or /ɔ/, while 28% of words (n=71) were succeeded by high vowels /i/, /u/, /e/ or /o/. Findings also show that a schwa is more

likely to follow /ɔ/ (n=91, 36%) than /o/ (n=8, 4%). Besides this, no specific pattern can be determined for the vowels /o/ and /ɔ/.

4.3.2 Open and Closed Syllables

An open syllable occurs when a syllable ends with a vowel, while a syllable is closed when a vowel is followed by a consonant at the end of a syllable. Based on this, a total of 224 (77%) out of 292 words for /e/ were in open syllable and the remaining 68 words (23%) were in closed syllable. From the 224 words, only one was in word-initial position, which is *eli* 'he, she' [eli], while the majority of open syllables totaling 152 words occurred in word-medial position in words like *pesi* 'fish' [pesi], *afesang* 'affection' [afesaŋ] and *simateru* 'cemetary' [simateru]. The remaining 71 words occurred in word-final position as shown in Table 4.27.

Table 4.27: Examples of Open Syllable Words For Word-Final /e/

Word-final /e/	MPC Word	Meaning	Transcription
Monosyllabic words	*ke*	to want; to wish, to desire	/ke/
	fe	faith	/fe/
Bisyllabic words	*ampe*	jellyfish	/ampe/
	kuze	to cook, to sew	/kuze/
Trisyllabic words	*diskureh*	to flow from, to ooze, to leak	/diskure/
	raskunde	to answer, to reply	/raskunde]
Quadrisyllabic words	*intramete*	to interfere, to intrude, to meddle; to mediate	/intramete]
	diskunise	not recognise	/diskunise/

/ɛ/ on the other hand, had a total of 148 (52%) out of 282 words in open syllable and 134 words (48%) in closed syllable. From the 148 words, four words were in word-

initial position as shown in the following examples in Table 4.28. Examples of /ɛ/ in closed syllable include, *chongka* 'sea-snail, seashell' [tʃɔŋkə], *comprá* 'to buy [kɔmpra] and *sombra* 'shadow' [sɔmbrə].

Table 4.28: Examples of Open Syllable Words For Word-Initial /ɛ/

MPC Word	Category	Meaning	Transcription
ébra	n	grass	/ɛbrə/
éla	pro	he, she	/ɛlə/
éla	n	yard (measurement of length)	/ɛlə/
éradu	n, adj	mistaken, wrong, at fault, incorrect; fault, mistake	/ɛradu/

Unlike /e/, there were no instances of /ɛ/ in word-final position. 144 words of /ɛ/ were found in word-medial position in words like *fébri* 'fever' [fɛbri], *mulé́ra* 'brain' [mulɛrə], *kabilé́ra* 'wig' [kabilɛrə] and *péniténsia* 'penance' [pɛnitɛnsiə].

As for /o/, 101 (54%) out of 188 words were in open syllable and 87 words (46%) were in closed syllable. Only two from the total 101 words were found in initial position, which are *oferse* 'to make an offering to God' [oferse] and *otru* 'other, another' [otru], while only five words were in word-final position. These five words are listed in Table 4.29 below.

Table 4.29: Examples of Open Syllable Words For Word-Final /o/

MPC Word	Category	Meaning	Transcription
branyo	n	traditional Kristang dance and music	/braɲo/
grago	n	shrimp	/grago/
katcho	v	to disturb, to be a nuisance	/katʃo/
labo	n	robe used by priest or nun	/labo/
miyoh	adv	better, best	/mijo/

The remaining 94 words were in word-medial position as shown in Table 4.30 below.

Table 4.30: Examples of Open Syllable Words For Word-Medial /o/

Word-medial /o/	MPC Word	Meaning	Transcription
Bisyllabic words	*bodi*	armpit	/bodi/
	floris	flower	/floris/
Trisyllabic words	*cherozu*	fragrant, aromatic, scented	/tʃerozu/
	sabrozu	delicious, tasty	/sabrozu/
Quadrisyllabic words	*mémoria*	commemoration, monument	/mɛmoria/
	kobisozu	courteous	/kobisozu/
Pentasyllabic words	*ingkoliadu*	too much	/iŋkoliadu/
	pégatoriu	purgatory	/pɛgətoriu/

In contrast, the vowel /ɔ/ had 144 (57%) out of 252 words in open syllable and 108 words (43%) in closed syllable. A total of 14 words were found in word-initial position, which is the most compared to /e/, /ɛ/ and /o/. Some examples are shown in Table 4.31 below.

Table 4.31: Examples of Open Syllable Words For Word-Initial /ɔ/

MPC Word	Category	Meaning	Transcription
ola	n	palm thatching	/ɔlə/
onzi	num	eleven	/ɔnzi/
ofendeh	v	to offend	/ɔfende/
onradu	adj	honourable	/ɔnradu/
obrigasang	n	obligation	/ɔbrigasaŋ/

Although no words were found in word-final position, 130 words were in word-medial position in words like *moli* 'soft, tender' [mɔli], *diznovi* 'nineteen' [diznɔvi], *bérgonyuzu* 'shy' [bɛrgɔɲuzu] and *atorizasang* 'authorization, permission' [atɔrizəsaŋ].

Based on the findings, all four vowels are more likely to appear in open syllables than closed syllables. Nevertheless, /e/ reported the highest possibility of being in an open syllable with 77%, while /ɛ/, /o/ and /ɔ/ reported 52%, 54% and 57% respectively.

4.3.3 Consonant Clusters

From the four compiled word lists of /e/, /ɛ/, /o/ and /ɔ/, consonant clusters (C)CC were discovered preceding these four target vowels. With reference to their respective word lists (see Appendix B1 and Appendix B2), the target vowel /e/ succeeded a consonant cluster in 29 words (10%) out of 292 words, while the target vowel /ɛ/ recorded 25 words (9%) out of 282 words. The consonant clusters comprise of the following:

1) *fr* in words *frenti* 'front' [frenti] and *fré*sku 'fresh' [frɛsku].
2) *gr* in words *kanggrezu* 'crab' [kaŋgrezu] and *lagréza* 'lavishly' [lagrɛzə].
3) *pr* in words *pretu* 'black' [pretu] and *prényada* 'pregnant' [prɛɲadə].

The percentage of every consonant cluster preceding the target vowel /e/ or /ɛ/ is displayed in Table 4.32.

Table 4.32: Percentage of Consonant Clusters Preceding /e/ and /ɛ/

Consonant Cluster	**/e/**		**/ɛ/**	
	N	**%**	**N**	**%**
Voiceless Initial				
fr	2	8	2	8
kl	1	3	0	0
kr	0	0	1	4
pr	8	28	9	36
sk	0	0	1	4
sp	2	8	2	8
spl	0	0	1	4
spr	0	0	1	4
st	1	3	1	4
str	1	3	1	4
tr	5	17	1	4
Voiced Initial				
br	3	10	2	8
dr	3	10	0	0
gr	3	10	3	12

Based on the findings, the consonant cluster *pr* garnered the highest percentage for both /e/ and /ɛ/ with 28% and 36% respectively. Not only that, the occurrence *fr* and *sp* appeared twice in both /e/ and /ɛ/. In terms of voicing, both /e/ and /ɛ/ documented a total of 20 words that begin with a voiceless initial consonant cluster. However, these two vowels differ for words beginning with a voiced initial consonant cluster, where /e/ documented 30% and /ɛ/ documented 20%. While the combination *dr* exist for /e/ like *dretu* 'truly; correct, right, true' [dretu], such combination does not appear for /ɛ/.

Unlike /e/ and /ɛ/, there were not many consonant clusters preceding the target vowels /o/ and /ɔ/. The percentage of every consonant cluster preceding the target vowel /o/ or /ɔ/ is displayed in Table 4.33.

Table 4.33: Percentage of Consonant Clusters Preceding /o/ and /ɔ/

Consonant Cluster	**/o/**		**/ɔ/**	
	N	**%**	**N**	**%**
Voiceless Initial				
fl	1	14	0	0
fr	0	0	2	13
pl	1	14	0	0
pr	2	30	0	0
sk	0	0	4	27
sm	0	0	1	7
st	1	14	0	0
str	1	14	0	0
tr	0	0	5	33
Voiced Initial				
br	1	14	0	0
gr	0	0	1	7
gl	0	0	2	13

Based on their respective word lists (see Appendix B3 and Appendix B4), the target vowel /o/ only succeeded a consonant cluster in seven words (4%) out of 188 words, while the target vowel /ɔ/ recorded 15 words (6%) out of 252 words. However, it is worth noting that the consonant clusters preceding /o/ differ than the ones preceding /ɔ/. Further, the presence of a type of consonant cluster seems to exist either before /o/ or before /ɔ/. As shown in Table 4.33, the consonant cluster *pr* recorded the highest percentage (30%) for the target vowel /o/ with only two words, which are *propi*

'properly, deservedly; profit, capital' [propi] and *prostanti* 'protestant' [prostanti], while for /ɔ/, the highest percentage goes to *tr* with 33%, followed by *sk* with 27%.

In terms of voicing, 86% of the seven words for /o/ is preceded by a voiceless initial consonant cluster, for example, *floris* 'flower' [floris] and *plontu* 'proposal' [plontu], while only one word (14%), *sabrozu* 'delicious, tasty' [sabrozu] sees /o/ preceded by a voiced initial consonant cluster. Similarly, out of the 15 words, /ɔ/ is succeeded by a majority of 12 words (80%) with a voiceless initial consonant cluster. Examples include *fronya* 'pillow case' [frɔɲə], *skopa* 'chisel' [skɔpə] and *trokah* 'to vomit' [trɔkə]. Meanwhile, only three voiced initial consonant cluster (20%) precede /ɔ/, which are *groséra* 'lecherous, discourteous' [grɔsɛrə], *gloria* 'glory, heaven' [glɔriə] and *glorifikah* 'to glorify' [glɔrifika].

Findings revealed that /e/ and /ɛ/ are more likely to succeed consonant clusters compared to /o/ and /ɔ/. Findings also revealed that the target vowels /e/ and /ɛ/ share many similarities. First, the consonant cluster *pr* occurred the most before both /e/ and /ɛ/. Second, *fr* and *sp* occurred twice each before the two target vowels. Lastly, /e/ and /ɛ/ both had a total of 20 words with a voiceless initial consonant cluster. Although not many consonant clusters precede /o/ and /ɔ/, the majority of those that do are voiceless. Further, consonant clusters that appear before /o/ do not appear before /ɔ/ and vice versa.

4.3.4 Borrowings

As mentioned in Chapters 1 and 2, the mixture of heritage due to unions between the Portuguese and locals, as well as influences from local languages due to the multilingual setting of Malacca resulted in continuous changes to the lexicon and

grammar of MPC. As a result, borrowings from Malay and English can be found in its lexicon today. From the data, a total of 37 words containing the vowel /e/ (n=16), /ɛ/ (n=4), /o/ (n=12) and /ɔ/ (n=4) were found. One word however, contained both the /e/ and /ɛ/ vowels (see Table 4.34). This MPC word is *sén/sen*. The /e/ and /ɛ/ vowel is used interchangeably depending on a speaker's preference because of the influence of either English or Malay. A speaker is influenced by Malay if she opts for the /e/ vowel and conversely, influenced by English if she picks the /ɛ/ vowel. Having said that, findings showed MPC speakers following the Malay pronunciation for the word *tiket* 'ticket' [tiket] instead of the English pronunciation (see Table 4.35).

Table 4.34: Borrowings of MPC Words For /ɛ/

MPC	Transcription	Borrowed Word	Transcription	Word Origin	Meaning
béndi	[bɛndi]	bendi	[bɛndi]	Malay	lady's' finger
caléndar	[kalɛndar]	calendar	[kalɛndə]	English	calendar
éla	[ɛlə]	ela	[elə]	Malay	measurement unit for an area
sén/sen	[sɛn], [sen]	cent	[sɛnt]	English	cent
téléfon	[tɛlɛfon]	telephone	[tɛlɪfəʊn]	English	telephone

Upon inspection, most MPC words use the same vowels as Malay. For example, *memang* 'certainly' [memaŋ], *senget* 'lopsided' [seŋet] and *seret* 'drag' [seret], as well as *changkol* 'hoe' [tʃaŋkol], *dodol* 'glutinous rice with coconut and sugar' [dodol] and *tochang* 'plaits' [[totʃaŋ]. However, this was not the case for the four words containing diphthongs. For the word *sampe* 'reach, arrive' [sampe], it is observed that the final /ai/ from the Malay word *sampai* is pronounced with a final /e/ instead (see Table 4.35)

Table 4.35: Borrowings of MPC Words For /e/

MPC	Transcription	Borrowed Word	Transcription	Word Origin	Meaning
chubek	[tʃubeʔ]	cubit	[tʃubet]	Malay	to pinch
ingres	[(i)ŋgres]	Inggeris	[iŋgres]	Malay	English
catek	[kateʔ]	katik	[kateʔ]	Malay	short
kelek	[kələʔ]	kelip	[kəlep]	Malay	to blink
ketal	[ketəl]	kettle	[kɛtᵊl]	English	kettle
klengkeng	[kleŋkeŋ]	kelingking	[kəleŋkeŋ]	Malay	little finger
corek	[koreʔ]	korek	[koreʔ]	Malay	to dig
lenyek	[leɲeʔ]	lenyek	[leɲeʔ]	Malay	to mash
memang	[memaŋ]	memang	[memaŋ]	Malay	certainly
relwe	[relwe]	railway	[reɪlweɪ]	English	railway
sampe	[sampe]	sampai	[sampai]	Malay	until
senget	[seŋet]	senget	[seŋet]	Malay	lopsided
seret	[seret]	seret	[seret]	Malay	to drag
sombeng	[sombeŋ]	sumbing	[sumbeŋ]	Malay	harelip
tetek	[teteʔ]	tetek	[teteʔ]	Malay	breast
tiket	[tiket]	ticket	[tɪkɪt]	English	ticket

On the other hand, the word *kachoh* 'to disturb, to be a nuisance, to stir liquid' [katʃo] from the Malay word *kacau* is pronounced with a final /o/ instead of the final /au/. In addition, the diphthong /eɪ/ had undergone a process called monophthongisation as mentioned in Chapter 2.4.2, whereby it is reduced to a single vowel, /e/ in the word *relwe* 'railway' [relwe]. Similarly, the diphthong /əʊ/ in 'telephone' is reduced to /o/ as seen in the MPC word *téléfon* [tɛlɛfon].

Like Malay, the end of an MPC word will be glottalised if /e/ is in word-final position, for example, *lenyek* 'mash' [leɲeʔ], *corek* 'dig' [koreʔ], *catek* 'short' [kateʔ]. Glottalisation also occurs when /o/ is in word-final position, for example, *ketoh* 'to

knock' [kətoʔ], *pesoh* 'to pierce' [pəsoʔ] and *tengkoh* 'nape of neck' [təŋkoʔ] (see Table 4.36).

Table 4.36: Borrowings of MPC Words For /o/

MPC	Transcript-ion	Borrowed Word	Transcript-ion	Word Origin	Meaning
baroá	[baroa]	barua	[barua]	Malay	pimp, procurer
changkol	[tʃaŋkol]	cangkul	[tʃaŋkol]	Malay	hoe, to hoe
chinchalok	[tʃintʃaloʔ]	cencaluk	[tʃəntʃaloʔ]	Malay	Fermented shrimp with cooked rice
dodol	[dodol]	dodol	[dodol]	Malay	glutinous rice with coconut and sugar
goni	[goni]	guni	[guni]	Malay	sack made from jute
cachoh	[katʃo]	kacau	[katʃau]	Malay	to disturb, to be a nuisance, to stir liquid
ketoh	[kətoʔ]	ketuk	[kətoʔ]	Malay	to knock
pesoh	[pəsoʔ]	pesuk	[pəsoʔ]	Malay	to pierce
sarong	[saroŋ]	sarung	[saroŋ]	Malay	skirt of Malay origin worn by older Kristang women
tengkoh	[təŋkoʔ]	tengkuk	[təŋkoʔ]	Malay	nape of neck
tochang	[totʃaŋ]	tocang	[totʃaŋ]	Malay	plaits
tompol	[tompol]	tumpul	[tumpol]	Malay	blunt

Similar to Malay, three English borrowings followed the original English words by retaining the /ɛ/ vowel (see Table 4.34). However, a notable difference in pronunciation is apparent for the English borrowing *dokta* 'doctor' [dɔktə]. As explained in Chapter 2.4.2, Malaysian English has a smaller vowel inventory because of a lack of vowel contrast, which results in the production of homophones. In this case, the /ɒ/ vowel is realized as /o/. The English borrowing 'kettle' also presents a notable difference in pronunciation, which is *ketal* [ketəl], where the vowel /ɛ/ is replaced by the vowel /e/.

Based on the findings, there is also a tendency for MPC words to replace the vowels from the words they borrow. For example, the vowel /u/ in Malay is replaced by the vowel /o/ in words like *baroá* 'pimp, procurer' [baroa], *goni* 'sack made from jute' [goni] and *tompol* 'blunt' [tompol]. Additionally, the vowel /o/ in Malay is replaced by /ɔ/, for instance, *biola* 'violin' [biɔlə] and *bisol* 'boil, ulcer' [bisɔl]. However, this is an exception for the word *chobah* 'to try' [tʃɔba] since the vowel /ɔ/ replaced by /u/ (see Figure 4.37).

Table 4.37: Borrowings of MPC Words For /ɔ/

MPC	Transcription	Borrowed Word	Transcription	Word Origin	Meaning
biola	[biɔlə]	biola	[biola]	Malay	violin
bisol	[bisɔl]	bisul	[bisol]	Malay	boil, ulcer
chobah	[tʃɔba]	cuba	[tʃubə]	Malay	to try
dokta	[dɔktə]	doctor	[dɒktə]	English	doctor

From the data, out of the 37 borrowed words, 30 originated from Malay. Findings also show that there is a tendency for MPC words to follow Malay vowels. However, there are examples where the vowels in MPC words are different from the original. Besides that, the glottal sound is apparent when /e/ or /o/ occurs in word-final position. In cases where a diphthong appears in the original word, it will be realized as a single vowel in MPC. For English borrowings, a difference in pronunciation can be detected. Further, the influence of Malay or English determines a speakers' preference to adopt either a Malay pronunciation or an English pronunciation.

4.4 Summary

This chapter presented the findings of the acoustic analysis of all five MPC speakers in order to determine the vowel quality between /e/ and /ɛ/, and between /o/ and /ɔ/.

Even though overlaps are apparent in the generated scatter plots, results from t-tests and ANOVA determined that [e] and [ɛ] as well as [o] and [ɔ] are distinct vowels. Besides that, examination of the sounds preceding and following /e/, /ɛ/, /o/ and /ɔ/ was conducted to discover possible emerging patterns. Although there is evidence supporting Baxter's (1988) theory of vowel harmony for /e/ and /o/, the same cannot be said for /ɛ/ and /ɔ/. The next chapter provides a summary of the findings in addition to answers to the three research questions posed in chapter one.

CHAPTER FIVE

CONCLUSION

5.0 Introduction

Salient findings of the present study will be summarised in this chapter according to the three research questions posed in chapter one. Limitations of the present study will also be discussed in addition to suggestions on directions future research should undertake.

5.1 Research Question 1:

To what extent are /e/ and /ɛ/ contrasted based on their average F1 and F2 values of the vowels?

According to the overall vowel chart of [e] and [ɛ] (see Figure 4.1), the placement of both vowels prove that they are distinct and are in line with Klein (2006) and Baxter (1988). Despite considerable overlaps between the two vowels in a generated scatter plot (see Figure 4.2), results from a two-tailed independent sample t-test still maintain that [e] and [ɛ] are two separate vowels. However, F1 reported a large effect size (d = 2.29), while F2 reported a small effect size, which means that the key difference between the two vowels is in vowel height rather than vowel fronting. A comparison between all the five LCs average F1 and F2 values of [e] and [ɛ] respectively suggest the possibility of speaker variation due to the great contrast between minimum and maximum values of each LC (see Table 4.2 and Table 4.3). This was further proven when considerable variation in the production of both vowels by all five LCs was found in generated scatter plots (see Figure 4.3 and Figure 4.4).

Although results from individual examinations of each LCs production of [e] and [ɛ] all reported that the two vowels are distinct, overlaps are still apparent. This may indicate that [e] and [ɛ] are being used interchangeably by some LCs for certain words. An example would be *peladu* 'bald' where three LCs pronounced it as [pɛladu] while two LCs pronounced it as [peladu]. Also, inspection on the average F1 and F2 values of LC1, LC3 and LC4 discovered that both vowels differ more in height than in fronting. As for LC2 and LC5, their production of [e] and [ɛ] differ in height as well as in fronting. This is clearly represented in their respective scatter plots whereby both vowels are centrally concentrated and uniform unlike the ones produced by LC1, LC3 and LC4 (see Figure 4.6 and Figure 4.9).

5.2 Research Question 2:

To what extent are /o/ and /ɔ/ contrasted based on their average F1 and F2 values of the vowels?

While the placement of [o] follows Klein (2006) and Baxter (1988), [ɔ] appears to be more fronted in the vowel chart (see Figure 4.10). Unlike [e] and [ɛ], the distribution of [o] and [ɔ] by all five LCs are focused at the centre of the vowel space (see Figure 4.11). However, the generated scatter plot still revealed considerable overlaps. Having said that, a two-tailed independent sample t-test concluded that both [o] and [ɔ] are distinct. Similar to [e] and [ɛ], comparisons between the five LCs average F1 and F2 values of [o] and [ɔ] respectively show that the minimum and maximum values of each LC greatly vary from one another (see Table 4.10 and Table 4.11). However, the distribution of [o] and [ɔ] produced by all five LCs are centrally concentrated in the vowel space (see Figure 4.12 and 4.13).

Interestingly, further inspection of the average F1 and F2 values of [o] and [ɔ] of each LC still report that both vowels are distinct. With regards to the overlaps, four inter-raters were brought in to increase validity of the assignment of target vowels. However, analysis of the recordings show that the overlaps were largely due to the interchangeable use of [o] and [ɔ]. For example, the word *bigodi* 'moustache' was realized as [bigɔdi] by LC1, LC2 and LC3, while LC4 and LC5 pronounced it as [bigodi]. Additionally, it was discovered that MPC speakers tend to pronounce the [ɔ] sound differently from one word to another, thus highlighting individual variation. Take LC1's pronunciation for example, the words *boka* 'mouth' [bɔkə], *moli* 'soft, tender' [mɔli] and *conta* 'account' [kɔntə] were all pronounced with the [ɔ] sound but with varying degrees of quality.

5.3 Research Question 3

What is the phonological status of /e/, /ɛ/, /o/ and /ɔ/ in Malacca Portuguese Creole?

Baxter's (1988) claim of vowel harmony for the distribution of /e/ and /ɛ/ as well as /o/ and /ɔ/ may be true to a certain extent. Findings of the present study discovered evidence supporting Baxter's (1988) claim that high vowels would succeed /e/ and /o/ in the following syllable. However, findings show that a schwa is more likely to follow /ɛ/ and /ɔ/ in the following syllable compared to low vowels.

Besides that, the majority of words with /e/ and /o/ appear to be in open syllable. Further, there are no instances of /ɛ/ and /ɔ/ in word-final position but the two vowels can be found mostly in word-medial position. Another pattern that emerged is that there is a higher probability of consonant clusters to occur after the vowels /e/ and /ɛ/ compared to /o/ and /ɔ/. Even so, it is important to note that the consonant clusters

preceding /o/ differ than the ones preceding /ɔ/. Additionally, the majority of consonant clusters totaling 20 words for each /e/ and /ɛ/ occur in a voiceless (C)CC environment. While *tr* recorded the highest occurrence for /e/, the consonant cluster *pr* occurred the most for /ɛ/.

A total of 37 borrowed words were identified, out of which 30 originated from Malay. Considering that the LCs are multilingual speakers of MPC, Malay and English, the tendency of MPC words following Malay vowels is not surprising. Nevertheless, there is evidence that show MPC vowels replacing the vowels of words they borrow. For instance, the Malay vowel /u/ is replaced with /o/, while the Malay vowel /o/ is replaced with /ɔ/. Also, like Malay, MPC words will be glottalised when the vowels /e/ or /o/ is in word-final position. In cases where a diphthong is in the original word, it will be reduced to a single vowel via monophthongization. It appears that a speaker's preference of pronouncing the word 'cent' depends on her influence of Malay or English. If a speaker is influenced by Malay, the pronunciation [sen] is used but [sɛn] will be used if a speaker is influenced by English. Even though there are English borrowings in MPC, there is a notable difference in pronunciation whereby the vowel /ɒ/ is realized as /o/ for the word 'doctor' and the vowel /ɛ/ is replaced by /e/ for the word 'kettle'. Table 5.1 shows the summary of the findings for research question 3.

Table 5.1: Summary of The Findings For Research Question 3

No	Pattern	Findings	Example
1	Vowel Harmony	• 51% of words containing /e/ were followed by high vowels /u/, /i/, /e/ or /o/. • 40% of words containing /o/ were followed by high vowels /u/, /i/, /e/ or /o/. • However, /ə/ is more likely to follow/ɛ/ and /ɔ/ in the following syllable compared to low vowels.	• i) *besu* 'lip' /besu/. ii) *leti* 'milk' /leti/. iii) *fetor* 'ugly' /fetor/. • i) *choru* 'crying' /tʃoru/. ii) *pochiteh* 'teapot' /potʃite/. iii) *tontong* 'tortoise' /tontoŋ/. • i) /ə/ following /ɛ/: *anéla* 'ring' /anɛlə/. ii) /ə/ following /ɔ/: *anzola* 'hook' /anzɔlə/.
2	Open Syllable	• The majority of words with /e/ and /o/ occurred in open syllable.	• i) /e/ in open syllable: *ampe* 'jellyfish' /ampe/. ii) /o/ in open syllable: *grago* 'shrimp' /grago/.
3	Consonant Clusters	• Consonant clusters appear more with /e/ and /ɛ/ compared to /o/ and /ɔ/. • Consonant clusters for /e/ and /ɛ/ occur in voiceless (C)CC environment.	• *gr* in words: i) *kanggrezu* 'crab' [kaŋgrezu] ii) *lagréza* 'lavishly' [lagrɛzə] • *fr* in words: i) *frenti* 'front' [frenti] ii) *fré*sku 'fresh' [frɛsku]
4	Borrowings	• 30 out of 37 words originated from Malay. • Glottalization occurs when vowels /e/ or /o/ is in word-final position. • Diphthongs will be reduced to a single vowel. • There is a notable difference in pronunciation for English borrowings in MPC.	• i) *memang* 'certainly [memaŋ]. ii) *senget* 'lopsided' [seŋet]. • i) *corek* 'to dig' [koreʔ]. ii) *lenyek* 'to mash' [leɲeʔ]. • /eɪ/ becoming /e/ in the word *relwe* 'railway' [relwe]. • i) /ɒ/ is realized as /o/ for the word 'doctor'.

Based on the findings of the present study, it can be concluded that the vowels /e/, /ɛ/, /o/ and /ɔ/ are distinct phonemes in Malacca Portuguese Creole.

5.4 Limitations

The present study encountered three main limitations. The first limitation is the availability of fluent MPC speakers since MPC is an endangered language. Currently, fluent MPC speakers are aged 40 and above, with the majority of them belonging to the senior age group. However, this existing number of fluent speakers may not be suitable for recordings due to old age and issues that can hamper speech clarity. Furthermore, fluent MPC speakers may not have the time to record due to work or family commitments.

The second limitation is regarding the use of word lists. Although MPC is a spoken language, the decision to use word lists was to ensure that all LCs used the same words for systematic examination of /e/, /ɛ/, /o/ and /ɔ/. The word list used in the present study is a compilation of two dictionaries Baxter & de Silva, 2004; Scully & Zuzarte, 2004), and the glossary in Singho et al. (2016). However, all five LCs had trouble pronouncing certain words either because they have never heard of the word before or due to the unfamiliar orthography. Also, the LCs revealed that certain words are obsolete and are replaced with new ones, for example, *trigera* 'tigress' for *trigi*.

The third and biggest limitation is time. The recording sessions of the present study is very much dependent on the cooperation of LCs and the Portuguese community to allocate time. Besides that, data collection and data analysis can be time consuming due to the large number of words. Since recording sessions can be long and arduous for the LCs, breaks are also needed. In order to increase reliability and validity, extra time was

needed for the four inter-raters to examine and rate all the target vowels in the word list. This too, contributed to the total time spent on data collection and data analysis.

5.5 Suggestions for Future Studies

Although the present study did prove that the vowels /e/, /ɛ/, /o/, /ɔ/ are distinct, considerable variation among the speakers still exist. This was demonstrated when the vowels were used interchangeably among the five LCs. Also, the existence of individual variation in terms of vowel quality for the vowels /o/ and /ɔ/ especially, calls for more research in the area. Besides that, speakers of varying age groups should be included in future studies to determine the extent of language loss.

5.6 Summary

Considering that existing work on the MPC sound system is largely impressionistic, findings from the present study help increase awareness on MPC sounds, specifically on the vowels /e/, /ɛ/, /o/, /ɔ/, since it is analysed instrumentally. Suggestions on future studies were also made based on the findings of the present study to allow a more systematic and consistent description of MPC sounds, which in turn will aid in revitalisation efforts of MPC.

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