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## Acoustic Measurements and Intelligibility of English Vowels Produced by Thai Speakers

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### Abstract

*Effective English communication across different languages and cultures has become increasingly important in a globalised world. To gain a deeper understanding of the segmental features of Thai speakers of English, this study aims to investigate the production of English monophthongs and diphthongs by Thai speakers and examine how intelligible their pronunciations are to others. Data were collected through two tasks: a production task and a listening task. For the production task, three Thai female speakers were chosen as the participants. They were recorded reading a passage consisting of all targeted vowels, and a total of 180 English tokens were analysed. For the listening task, thirty Malaysian listeners were asked to evaluate the speech intelligibility of the English sounds produced by the three speakers. The duration and formant frequencies of English vowels produced were measured to investigate the characteristics of the monophthongs and diphthongs. The findings show that there were significant differences in the durations between long and short vowels of the monophthongs, but there were no significant differences in the vowel quality produced. The ROC (rate of change) of*

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*formant frequencies (F1 and F2) indicates that there was no formant movement for the diphthongs /eɪ/, /əʊ/, and /eə/. The three diphthongs showed similar characteristics as other ASEAN Englishes that are monophthongal as /e:/, /o:/, and /ɛ:/, respectively. These findings confirm that speakers' L1 influences English vowel production. Although there were vowel variations in the characteristics of the vowels produced by the speakers, the intelligibility scores were high.*

**Keywords:** Acoustic measurement, English vowels, Thai speakers, speech intelligibility.

## 1. INTRODUCTION

Thailand was not colonised by the British or any other European force, unlike several other nations in the region, including Malaysia, Singapore, and Burma. The country has no history of British colonisation, and English is not an official language in Thailand. As a result, Thailand's history of interaction with the English language has been relatively short (Kirkpatrick, 2010). Thailand is often categorised as an "expanding circle" country (Kachru, 2000), where English is used for international communication. This classification reflects the fact that Thailand is a norm-dependent nation without using English for intracultural dialogue. Although the majority of Thais speak standard Thai as their mother tongue, English is used as a required subject in schools and universities, as a medium of instruction in programs for international education, as the language of international organisations and conferences, and across a variety of industries, including tourism, business transactions, science, and technology (Foley, 2005). According to Tarrayo et al. (2021), the fact that there is a Thai-specific form of English suggests that Thai English is a language that is just beginning to emerge.

Since English is not their native tongue, Thai learners find it challenging to converse or communicate in English (Nanthasiripol & Mahamontree, 2019). A prestige standard of spoken English requires that most Thai learners' English sound as native-like as feasible (Jindapitak & Teo, 2013). English as a Second Language (ESL) or English as a Foreign Language (EFL) learners who learned the language in adulthood produce phonetic segments and sequences markedly different from native-language patterns as accented (Flege, 1995). Foreign-accented speech is at least partially defined as a deviation from native speaker norms. At the phonetic level, L2 vowels were challenging to produce and presented an interesting opportunity for investigating foreign-accented speech (Bent et al., 2008). Escudero Neyra (2005) claims that second language (L2) adult learners always have "foreign-accented speech" characteristics when producing L2 sounds. Acoustic differences in native or first language (L1) vowel production led to differential second language (L2) vowel perception (Escudero & Williams, 2012). This difficulty arises because L2 learners perceive the L2 vowels in each contrast as a single native language phoneme. According to Flege (1995), in his Speech Learning Model (SLM), how successful the production of the L2 sounds depends on the degree of perceived cross-language L1-L2 phonetic dissimilarity. When an L2 sound is too similar to an L1 sound, learners cannot create a new category. The two sounds resemble one another. According to the

SLM, even when categories for an L2 sound are established, the L2 sound may not be produced as native speakers exactly produce it.

Numerous studies on the pronunciation of English vowels by non-native speakers have concentrated on the connection between vowel intelligibility and acoustic characteristics of vowels, such as formant frequencies (Jin & Liu, 2014; Koffi, 2019), the pattern of vowel duration across vowels (Pillai & Salaemae, 2012; Tsukada, 2009), and a current study on bilingual learners' perceptions of English vowel contrasts (Masykar et al., 2022). In this study, the Acehnese-Indonesian bilingual learners of English participated in the perception study. The similarities and differences between native and non-native vowels contribute to the learners' perception accuracy. The new vowels that do not exist in the vowel inventories of the native languages are perceived with low accuracy. According to Tsukada (2009), Thai speakers' vowel production is related to the Thai vowel inventory, and they tend to produce English vowels shorter than English native speakers. Thai speakers transfer their first language (L1) competence and performance to their second language (L2). The similarities and differences between Thai and English are found in consonant inventories and vowels. Thai speakers produce English vowels based on the features of Thai vowel pronunciation and substitute similar English vowels with Thai vowels (Tsukada, 2009).

An accent is a tool people use to communicate and connect with others. With a reasonable level of phonological fluency, the spoken conversation will succeed; hence, an accent is essential to communication (Moyer, 2013, p. 19). Although listeners will perceive some speakers' utterances as severely accented even though they are entirely understandable and intelligible, accentedness is frequently seen by native speakers as the main barrier to communication with non-native speakers (Munro & Derwing, 1995). However, there are three areas of productive approach for non-native English users to communicate effectively (Jenkins, 2009). The three areas include mutually intelligible segmental features, the primary stress in a word group, and voicing and vowel quality. When non-native learners are aware of the specific articulation of English and learn phonemes as a system, they can save time learning each utterance (Borissoff, 2012). To explore acceptability, native and non-native listeners judged the L2 pronunciation issues. L2 accents are frequently debated as an issue of intelligibility rather than accuracy. According to Gupta (2005), there is no advantage to having the same linguistic background in terms of intelligibility because unfamiliar accents are more intelligible than familiar ones. To pinpoint the features related to intelligibility, segmental production is one empirical priority. Shared 'nonstandard' pronunciation features among L2 Englishes should be identified (Deterding & Kirkpatrick, 2006).

Among the ASEAN Englishes, the shared vowel features between Expanding- and Outer-Circle Englishes are lack of tense and lax contrast, replacement of diphthongs with simple vowels, and absence of vowel reduction in unstressed syllables (Deterding, 2010; Kachru & Nelson, 2006). The shared features also appear in Outer Circle Asian Englishes in India, Hong Kong (Gardiner & Deterding, 2020), and in Bangladesh (Naher, 2018). The vowel features and variations used by Thai English speakers are, however, the subject of very few studies. Therefore, it is intriguing for this study to pinpoint the English vowel traits used by Thai speakers that contribute to speech intelligibility. This study aims to investigate Thai speakers' production of English monophthongs and diphthongs and examine how intelligible their pronunciations are to others. In an era where cross-cultural interactions are

commonplace, the ability to convey ideas clearly and comprehensibly is vital for effective communication. This study addresses the following questions:

1. How do Thai speakers produce English monophthongs and diphthongs?
2. To what extent is the production of monophthongs and diphthongs by Thai speakers intelligible to other speakers of English?

## **2. LITERATURE REVIEW**

Many researchers on Second Language Acquisition (SLA) concluded that the pronunciation among speakers of ESL tends to be foreign-accented, which is related to each speaker's language background. In order to investigate the influence of the speaker's L1, scholars have proposed a few models. This study used [Flege's Speech Learning Model \(1995\)](#) as the main framework.

### **2.1 The Speech Learning Model**

The Speech Learning Model (SLM) by [Flege \(1995\)](#) states explicitly that phonetic systems used in segment production and perception remain adaptive over the course of life and that they recognise sounds encountered in an L2 by adding new phonetic categories or by changing the L1. According to [Roach \(2016\)](#), British English listeners demonstrate a preference for spectral information when categorising the phonemes /ʊ/ and /u:/. On the other hand, Mandarin listeners of English exhibit a preference for temporal information, specifically vowel duration, in the categorisation process ([Edwards & Yavas, 2015](#)), and Arab speakers of English confuse the voiced bilabial /b/ and the voiceless bilabial /p/ ([Hassan, 2014](#)). The perceived relation of L1 and L2 sounds may change during naturalistic L2 learning ([Flege, 1995](#)).

Other L2 phonological models have also incorporated transfer heavily. In [Flege's](#) concept, the acquisition process starts with L1 perceptual categories, but as L2 experience increases, these categories may shift. In addition, L2 sounds can be distinguished from L1 sounds as being different, similar, or identical, with the degree of similarity or difference dictating whether new L2 categories or equivalence classifications between the L1 and L2 sounds can be developed.

[Masykar et al. \(2022\)](#) state that bilinguals can better discriminate vowels similar to their L1 than new ones. The analysis is derived from perception research conducted on five distinct sets of the English vowel contrast (i.e., 'bit-beat', 'bag-beg', 'foot-food', 'but-bard', 'pot-port') by Acehnese-Indonesian students. New English vowels for the bilinguals are /i/, /ʊ/, /æ/, and /ɑ:/. They revealed that the pairs 'bag-beg' and 'pot-port' were correctly perceived at the lowest percentage. In contrast, other pairs that were comparable to Acehnese and Indonesian were better differentiated. It is consistent with [Flege \(1995\)](#) in that a new category can only be created if the nearest L1 and L2 sounds can be distinguished clearly from one another.

According to SLM, L2 learners who comprehend the phonetic distance between L1 and L2 sounds and the features of L2 sounds can generate L2 sounds appropriately. SLM predicts that L2 learners will find it challenging to acquire these sounds when there are audible differences between L1 and L2 sounds, indicated by similar IPA symbols ([Flege, 1997](#)). The absence of a distinct phonetic category arises due to the pronounced closeness of the L1 and L2 sounds. On the other hand, L2 learners could

hear unfamiliar sounds (Flege, 1997). According to Flege (1997), it is possible for learners to generate novel L2 categories by employing L2 sounds that are dissimilar to L1 categories and do not possess a corresponding phonetic equivalent in L1.

**Table 1.** Comparison of English (Roach, 2016) and Thai (Tingsabadh & Abramson, 2001) based on Flege's (1995) framework.

SLM Category	Vowel	
	English	Thai
Similar	/ɪ/	/i/
Identical	/i:/	/i:/
Identical	/e/	/e/
Similar	/æ/	/ɛ/
Similar	/ʌ/	/a/
Similar	/ɑ:/	/a:/
Similar	/ɒ/	/ɔ/
Identical	/ɔ:/	/ɔ:/
Similar	/ʊ/	/u/
Identical	/u:/	/u:/
Similar	/ɜ/	/ɿ:/
New	/eɪ/	-
New	/əʊ/	-
New	/eə/	-

Cross-linguistic evaluations have been conducted on the impact of the sound systems of an L1 on the process of acquiring an L2. Table 1 illustrates a comparison of vowels between English (Roach, 2016) and Thai (Tingsabadh & Abramson, 2001) that are categorised into three groups based on Flege's (1995) SLM. The highlighted English monophthongs /ɪ, æ, ʌ, ɑ:, ɒ, ʊ, ɜ:/ show a similar IPA symbol to Thai monophthongs /i, ɛ, a, a:, ɔ, u, ɿ:/, respectively. The IPA symbols /i:, e, ɔ:, u:/ of English are identical to Thai. On the other hand, the English diphthongs /eɪ, əʊ, eə/ do not appear in the Thai vowel system; therefore, these English diphthongs are categorised as 'new'. Based on Flege's (1995) SLM, early bilinguals establish new categories for vowels found in L2 in the case of no vowels in the native language. When the number of vowels in English and Thai is compared, it is clear that Thai has more vowels than English. However, Thai speakers have variations of problematic vowels. This leads to the goal of this study, which is to investigate vowels acoustically and their intelligibility to listeners.

## 2.2 A Comparison between English and Thai Vowels

Vowels of the English language can be produced in many different ways (Ladefoged & Johnson, 2014, p. 89), depending on accents, such as General American English (GA) and British English or Received Pronunciation (RP). The distinguishing features of the level of phonology between American English and British English can be found in various sources, such as The International Phonetic Association (1999), Ladefoged (2003), Deterding (2004), and Roach (2016). The examination of English vowels in this current study is based on British English (RP: Received Pronunciation), which has twenty vowels, including twelve monophthongs /ɪ, i:, e, æ, ʌ, a:, ɒ, ɔ:, ʊ, u:, ə, ɜ:/, five closing diphthongs /eɪ, aɪ, ɔɪ, əʊ, aʊ/, and three centring diphthongs /ɪə, eə, ʊə/. These twenty British English vowels are widely used in phonetic transcriptions



and pronouncing dictionaries (Jones et al., 2003). The vowels examined in this study include eleven monophthongs and three diphthongs /eɪ/, /əʊ/, and /eə/. The schwa /ə/ is excluded in this study.

The English monophthongs consist of tense and lax pairs. Thai monophthongs have the lexical contrast of short and long vowels (Abramson, 1993), while English monophthongs differ in length and quality (Ladefoged & Johnson, 2014). According to the experiments of Abramson and Ren (1990) and Roengpitya (1999) on Thai vowel length, Thai long vowels exhibit a duration that is 1.9 times greater than that of short vowels. Furthermore, it is essential to note that there is no temporal overlap between short and long vowels in the Thai language. However, Thai speakers need clarification on the tense and lax vowels of English (Tsukada, 2008). They tend to produce tense or lax English vowels with length contrast. According to Celce-Murcia et al. (1996), the distinction between tense and lax vowels causes confusion among non-native speakers. For example, they use the tense vowel /u:/ where the lax vowel /ʊ/ should be produced in the words ‘good’ and ‘wood.’ In a study by Tsukada (2008), a comparison was made between the acoustic characteristics of English monophthongs and diphthongs produced by Thai and Australian English speakers. She found that Thai speakers have a shorter duration for monophthongs /ɪ, æ, ʊ, ʌ/ than do Australian English speakers. As a result of excluding the English monophthongs in the Thai vowel system, Thai speakers assimilate the English monophthongs /ɪ, æ, ʊ, ʌ/ into Thai monophthong equivalence /i, ε, u, a/, respectively (Tingsabath & Abramson, 2001). Although Thai speakers are familiar with vowel durational contrast, the extent to which the speakers can differentiate the vowel contrast will be investigated in this study.

A diphthong is a vowel sound that moves from one vowel to another (Roach, 2016). Thai has twenty diphthongs consisting of six opening diphthongs ending in /a/ including /ia/, /i:a/, /ɯa/, /ɯ:a/, /ua/, /u:a/, seven closing diphthongs ending in /i/, including /ai/, /a:i/, /ɔi/, /ɔ:i/, /ɯi/, /o:i/, /ui/, and seven closing diphthongs ending in /u/ including /au/, /a:u/, /ɛu/, /ɛ:u/, /eu/, /e:u/, /iu/. English has eight diphthongs consisting of three centring diphthongs ending in /ə/ including /ɪə/, /eə/, /ʊə/, three closing diphthongs ending in /ɪ/, including /eɪ/, /aɪ/, /ɔɪ/, and two closing diphthongs ending in /ʊ/ including /əʊ/, /aʊ/. Roach (2016) states if a diphthong is produced as a monophthong by a learner of English, it can create a foreign accent.

Thai vowel phonemes are nearly equivalent to the English ones, /i:a/-/ɪə/, /u:a/-/ʊə/, /a:i/-/aɪ/, /ɔ:i/-/ɔɪ/, and /a:u/-/aʊ/ (Iadkert & Tan, 2016). These characteristics are consistent with the study of Bowman (2000). He points out that Thai learners pronounce English diphthongs as Thai ones. Three English diphthongs /eə/, /eɪ/, /əʊ/ were found to be produced as Thai long monophthongs /ɛ:/, /e:/, and /o:/, respectively (Bowman, 2000; Swan & Smith, 2001). This diphthong variation also occurs in the pronunciation of Singaporean speakers who pronounce /eɪ/ and /əʊ/ as /e:/ and /o:/, respectively (Brown, 1986; Deterding, 2000). Moreover, Thai speakers of English can have pronunciation difficulties due to their L1 interference with the different phonetic features of Thai and English (Isarankura, 2018). However, either a native or non-native learner of English who does not have a mastery of pronunciation can have difficulties (Brown, 2014, p. 210). In conclusion, the phonemic similarities and differences between Thai and English vowels, as well as the observed diphthong variations in pronunciation, highlight the potential challenges Thai speakers face when learning English pronunciation. These challenges are not unique to Thai learners but are shared by non-native English learners in general. The influence of one’s native language, such

as Thai, can result in pronunciation difficulties, as pointed out by various researchers. However, it is important to note that achieving pronunciation mastery in English can be a challenge for both native and non-native speakers alike. Thus, effective pronunciation instruction and practice are essential for all learners striving to improve their spoken English skills.

### 2.3 Foreign Accent and Intelligibility

A foreign accent is a fascinating aspect of linguistics, phonetics, and phonology. When individuals learn a second language, they often carry over the phonetic patterns and speech sounds of their native language, resulting in a distinct foreign accent. The production of sounds, the rhythmic patterns of speech, and the variation of intonation can exhibit substantial variations across different languages and cultures (Major, 2001, as cited in Moyer, 2013). According to Isaacs and Thomson (2013, p. 141), a foreign accent can be defined as “how different the speaker sounds from an NS.” It focuses on how L2 speech deviates from a target language. The majority of EFL learners’ intelligibility problems are attributed to the mispronunciation of several segmental phonemes in the English and learners’ L1 sound systems (Younus, 2020).

Foreign accents can be influenced by a range of circumstances, such as the age at which an individual commences acquiring an L2, their level of exposure to the target language, and their linguistic background (Moyer, 2013). Generally, individuals who start learning a new language at an early age have a higher chance of acquiring native-like pronunciation and reducing the impact of their native accent. However, even with extensive exposure and practice, traces of a foreign accent may persist.

One interesting aspect of a foreign accent is how it affects communication and perception. People who speak with a foreign accent may encounter challenges in being understood by native speakers, as the unfamiliar pronunciation patterns can make certain sounds or words difficult to decipher. Additional effort is required from the speaker and the listener to ensure the communication does not cause misunderstandings or miscommunication. Moreover, the degree of comprehensibility and accentedness in the target language is interconnected with the speaker’s ability level. According to van Maastricht et al. (2016), a positive correlation exists between a speaker’s proficiency level and their comprehensibility, whereas inversely, their accent level decreases. However, Tergujeff (2021) found that significant correlations between proficiency and comprehensibility or accentedness were small in a group of L1 Finnish speakers. A speaker’s L1 affects how they acquire L2 speech (Schlechtweg et al., 2023).

Nevertheless, a foreign accent should not be seen as a limitation or a negative aspect. Linguistic identity is a fundamental component of an individual’s overall identity, encompassing their cultural and linguistic heritage. Foreign accents are a testament to the richness and diversity of human languages, adding a unique flavor to speech and reminding us of our global linguistic tapestry.

Researchers in linguistics, phonetics, and phonology study foreign accents to gain insights into the complex interplay between language, culture, and identity. They investigate the phonetic and phonological characteristics of different accents, analyse the challenges faced by second language learners, and explore ways to improve intelligibility and communication across linguistic boundaries. Understanding foreign accents not only helps us appreciate the diverse linguistic landscape but also promotes

empathy and inclusivity. Jeong et al. (2021), in their study on listener intelligibility (LI), listener comprehensibility (LC), accentedness perception (AP), and accentedness acceptance (AA) of global Englishes speakers with diverse accents, also contend that in order to be prepared for globalised English use, English language learners must expand their conception of the language as a global contact language. It promotes embracing and celebrating diverse accents, fostering an inclusive society that values and respects cross-cultural communication.

Intelligibility is necessary for L2 learners to have; on the other hand, perfect pronunciation in L2 is unnecessary for everyone but spies and teachers (Abercrombie, 1949, as cited in Thomson, 2017). Munro (2011, p. 7) defines intelligibility as “the extent to which utterances are understandable to a speaker’s audience”. One alternative definition of intelligibility in the literature states that it should only be used to produce and recognise the phonetic characteristics of speech signals, leaving the interpretation of meaning to more advanced speech analysis. For instance, word or utterance recognition is how Smith and Nelson (1985, p. 334) define intelligibility. Field (2005) states that intelligibility can be defined as the extent to which a listener can recognise the acoustic-phonetic content of a message. The researchers’ data collection and evaluation in their study indicate a predominant focus on the formal aspects of intelligibility. The researchers predominantly utilised decontextualised stimuli in their experiments, believing their findings should primarily pertain to phonological aspects. The term “intelligibility” in this study refers to a level of English pronunciation that allows Thai EFL learners to produce and be recognised by listeners.

### **3. METHODS**

This section outlines the methodologies and research approaches employed to analyse phonetic features of English vowels produced by Thai speakers and their implications for language acquisition.

#### **3.1 Participants**

Three Thai learners (TH1, TH2, and TH3) were selected as the informants of the study to record the utterances for the acoustic measurement. They were female undergraduates studying for a Bachelor’s degree in English at a publicly funded educational institution in the southern region of Thailand. On average, these students achieved a TOEIC score of 460. To maintain consistency in gender and age, the participants in this study consisted exclusively of female college students who were 21 years old. Each of the speakers was from provinces in the southern region and exhibited proficiency in the Southern Thai dialect. Chomphan (2010) asserts that Thailand encompasses four primary dialects, namely Pak Tai (Southern Thai), Isaan (Northeastern Thai), Lanna (Northern Thai), and Royal or Standard Thai. The analysis focused on a specific group of participants, namely Thai native students who speak Southern Thai to account for dialect features. All participants were subjected to individual interviews followed by completing a questionnaire. The brief interviews were conducted to collect preliminary information and ascertain whether the participants had any difficulties in hearing or speaking – additionally, the interviews aimed to acquaint the participants with the audio recording process.



In the present study, intelligibility refers to the utterance recognition level. For the intelligibility test, thirty Malaysian undergraduates in English Language and Linguistics department were selected as the listeners for the study. This number constitutes the sample size for the intelligibility test. The listeners' role in the study was to assess the intelligibility of English vowels produced by the Thai speakers. They were asked to listen to a recorded passage read by one of three Thai speakers. They listened to the passage, sentence by sentence. This controlled listening process ensures that all listeners have the same exposure to the speech samples and minimises the effects of repeated exposure. Before the intelligibility test, the listeners had some familiarity with Thai-accented English, likely from exposure to the media. The main task assigned to the listeners was to transcribe or write down the passage they heard. This task directly measures their ability to recognise and understand the English vowels produced by the Thai speakers.

### 3.2 Materials and Procedures

For the acoustic measurement, the researchers selected the 'Boy Who Cried Wolf' passage as the material for the study. The passage readings were recorded using a Zoom H4n Handy recorder. This recording equipment is commonly used for high-quality audio capture. The selected 'Boy Who Cried Wolf' passage contained 216 words that had specific targeted vowels and consonants chosen for measurement. These targeted linguistic elements are essential for phonological analysis. PRAAT software version 6.2.06, as developed by [Boersma and Weenink \(2022\)](#), was employed to analyse the recorded utterances. PRAAT is a widely recognized tool in linguistics for acoustic analysis. Measurements of formant frequencies were conducted. Vowel duration measurements were taken to explore the distinction between short and long vowels. This analysis aimed to investigate whether vowel length played a significant role in intelligibility.

To prevent the influence of nearby consonants, vowels that are preceded by the approximants /j, w, r/ or that are followed by the lateral /l/ and velar nasal /ŋ/ were removed ([Deterding, 2003](#); [Salbrina, 2012](#); [Tan & Low, 2010](#); [Yusuf et al., 2022](#)). Averages of vowel duration and quality were calculated from a total of 180 English tokens (60 tokens x 3 speakers), including eleven monophthongs (/ɪ/, /i:/, /e/, /æ/, /ʌ/, /ɑ:/, /ɒ/, /ɔ:/, /ʊ/, /u:/ and /ɜ:/), and three diphthongs (/eɪ/, /əʊ/, and /eə/). These tokens were recorded by the three speakers. The data was transcribed to identify instances where they deviate from standard English pronunciation, resulting in vowel substitution. This study further employed the orthographic word transcription method proposed by [Munro \(2011\)](#) for the intelligibility test. The thirty listeners were asked to listen to the recordings of the passage read by the three Thai speakers and transcribe the words heard orthographically.

### 3.3 Data Analysis

Vowel lengths and the first two formant frequencies were measured in Hertz and seconds. Based on the methods described in [Deterding \(2003\)](#), the values for vowel quality were derived from the average F1 and F2 values for each speaker and inverted into a Bark scale. Vowel height has an adverse effect on F1, while tongue backness and lip rounding have an impact on F2. For monophthong measurements, the average

F1 and F2 values at the halfway point (50%) were retrieved. The rate of change (ROC) was calculated for the English diphthong analysis to assess vowel quality (Deterding, 2000; Salbrina, 2006; Tsukada, 2008). The average values of F1 and F2 for each speaker were extracted at the midpoint for the monophthongs. In terms of the diphthong measurement, F1 and F2 values were chosen for 20% and 80% of the diphthong vowel spectrum, respectively. The authors used instrument measurements to conduct an auditory and visual evaluation that served as the foundation for the acoustic analysis of vowels. An ANOVA (Analysis of Variance) and a paired t-test were used in the descriptive and inferential statistical analyses of the data. According to Deterding (2000), the F1 ROC is sufficient for conducting thorough acoustic modelling of closing diphthongs because the F1 ROC values can show formant movements. However, the present study examined closing diphthongs and centring diphthongs. Regarding the F2 ROC, a negative value presents a backward movement. Two closing diphthongs, /eɪ/ and /əʊ/, and a centring diphthong, /eə/, were examined for formant movement in this present study.

The transcribed data were gathered to identify instances of vowel substitution for the three speakers, at least two of three speakers. The percentage of each vowel of substitution was calculated. The results of the intelligibility test were calculated based on the correct words written. A total of 180 tokens produced by the three speakers were analysed. Descriptive statistics, such as frequencies and percentages, were calculated to summarise the overall intelligibility scores. The scores could include the percentage of correct transcriptions for each vowel type.

## 4. RESULTS

The primary objective of this study is to examine the phonetic properties of English vowels produced by Thai speakers when they read a passage. Sixty words were selected from each of the three Thai speakers; 180 tokens were analysed for their production of fourteen English vowels. Vowel duration in milliseconds and formant frequency (F1 and F2) in Hertz were analysed to determine whether the vowel categories were conflated.

### 4.1 Vowel duration

Table 2 presents the mean duration of the fourteen vowels analysed in the current investigation. An ANOVA examination revealed a non-significantly different duration for monophthongs and diphthongs for the speakers ( $p > 0.05$ ). It can be observed in Figure 1 that the vowel /eə/ had the longest duration (234.7 ms), the shortest vowel was /ɪ/ (87.0 ms), and the longest monophthong vowel was /ɔ:/ (200.9 ms). The monophthong-to-diphthong ratio is 0.64. This indicates that the duration of diphthongs is longer than that of monophthongs.

**Table 2.** The average duration (ms) of English vowels produced by three Thai learners.

Vowels	n	TH1		TH2		TH3		F-test	P-value
		Average	Std	Average	Std	Average	Std		
/ɪ/	6	96.6	36.84	72.3	20.09	92.0	27.35	1.192	0.331
/i:/	4	127.5	59.30	135.1	36.39	201.3	49.73	2.703	0.120

Table 2 continued ...

/e/	4	83.7	32.60	105.7	22.37	98.2	31.26	0.590	0.574
/æ/	4	135.7	19.91	120.3	70.21	118.3	24.09	0.185	0.834
/ʌ/	5	112.8	34.99	98.6	31.65	145.2	38.95	2.284	0.144
/ɑ:/	3	130.4	25.02	139.3	33.92	176.9	52.91	1.195	0.366
/ɒ/	4	89.9	27.59	92.7	21.53	115.7	41.90	0.807	0.476
/ɔ:/	5	188.3	80.55	176.1	89.85	238.5	116.83	0.581	0.574
/ʊ/	3	76.0	9.52	100.1	16.12	96.6	32.63	1.078	0.398
/u:/	3	162.8	27.56	215.2	113.50	214.9	86.14	0.388	0.694
/ɜ:/	3	115.8	5.39	122.4	7.86	131.1	11.39	2.382	0.173
/eɪ/	8	157.5	61.10	153.0	48.74	186.1	64.77	0.752	0.484
/əʊ/	5	208.1	86.42	219.1	99.59	208.4	70.61	0.026	0.974
/eə/	3	212.7	71.86	211.3	71.20	280.2	151.57	0.420	0.675

\* $\alpha = 0.05$ 

## 4.2 Vowel Quality

The vowel quality examined in this study was separated into monophthongs and diphthongs. The average values of F1 and F2 for each speaker were extracted at the midpoint for the monophthongs. The F1 and F2 were selected in 20% and 80% of the vowel spectrum for the diphthongs.

### 4.2.1 Monophthongs

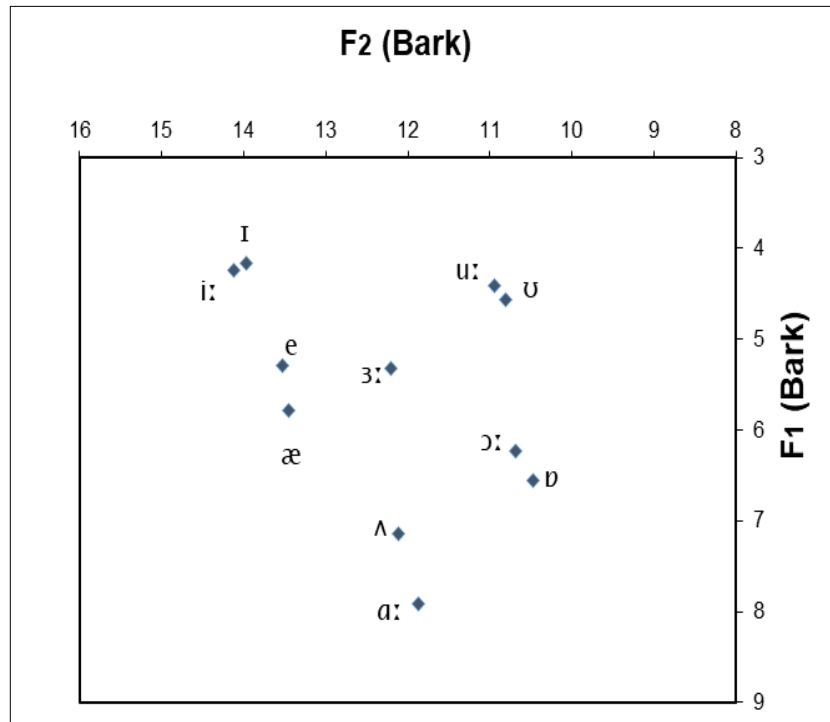
Average values of F1 and F2 for each speaker were submitted to a one-way ANOVA. Table 3 illustrates the average of F1 and F2 formant frequencies for the English monophthongs /ɪ/, /i:/, /e/, /æ/, /ʌ/, /ɑ:/, /ɒ/, /ɔ:/, /ʊ/, /u:/, and /ɜ:/ produced by three Thai learners.

**Table 3.** Average formant frequencies (F1 and F2) for Thai English vowels.

Target vowels	F1 (Hz)	P values	F critical	F2 (Hz)	P values	F critical	F1 (Bark)	F2 (Bark)
/ɪ/	435	0.00	3.68	2293	0.75	3.68	4.16	13.97
/i:/	444	0.76	4.26	2350	0.72	4.26	4.25	14.13
/e/	565	0.31	4.26	2135	0.43	4.26	5.29	13.52
/æ/	624	0.97	4.26	2109	0.57	4.26	5.78	13.45
/ʌ/	800	0.03	3.89	1719	0.16	3.89	7.14	12.11
/ɑ:/	910	0.00	5.14	1656	0.33	5.14	7.91	11.86
/ɒ/	723	0.01	4.26	1347	0.74	4.26	6.56	10.47
/ɔ:/	680	0.21	3.89	1389	0.15	3.89	6.23	10.68
/ʊ/	480	0.28	5.14	1416	0.32	5.14	4.57	10.81
/u:/	463	0.37	5.14	1444	0.82	5.14	4.41	10.94
/ɜ:/	568	0.38	5.14	1743	0.07	5.14	5.32	12.20

There was no statistically significant difference observed in the formant values of any vowel generated by the three speakers, except the F1 values of vowels /ɪ/, /ʌ/, /ɑ:/ and /ɒ/ ( $F(2,15) = 3.68$ ;  $F(2,12) = 3.89$ ;  $F(2,6) = 5.14$ ;  $F(2,9) = 4.25$ , respectively;  $p < 0.05$ ). The highest tongue position was /ɪ/ which had the lowest F1 value (F1 = 435 Hz), and the lowest tongue position was /ɑ:/ which had the highest F1 value (F1=910 Hz). The tongue position was the most back, and the lips were the most open for the vowel /ɒ/ with the lowest F2 value (1347 Hz). The highest tongue position was for the

front vowel /i:/, with the greatest F2 value (2350 Hz). The tongue position was the most centre for vowel /ɜ:/ with the average values of F1 and F2 (568 and 1743 Hz, respectively). From the plots in Figure 1, it also shows that the short and long vowels are close to each other, including /ɪ/-/i:/, /e/-/æ/, /ʌ/-/ɑ:/, /ɒ/-/ɔ:/, and /ʊ/-/u:/. These paired vowels are discussed for the contrast in the following section.



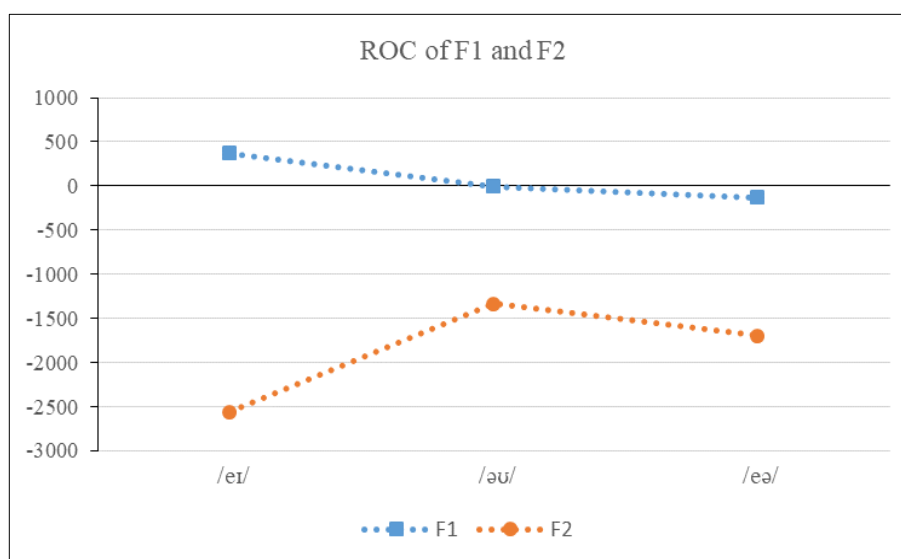
**Figure 1.** A formant plot for average Thai English vowels.

#### 4.2.2 Diphthongs

Table 4 shows the average ROC and standard deviation for each of the diphthongs for each speaker. It reveals that the ROC of F1 for TH3 was non-significantly more negative than for the other two speakers /eɪ/:  $F(2,21) = 3.47$ ; /eʊ/:  $F(2,12) = 3.89$ ; /eə/:  $F(2,6) = 5.14$ ;  $p > 0.05$ . Comparing the three different diphthongs on average for all three speakers, the ROC differences of F1 were not significant ( $F(2,45) = 3.20$ ,  $p > 0.05$ ), whereas there was a significant difference in the ROC of F2 ( $F(2,45) = 3.20$ ,  $p < 0.05$ ) as presented in Figure 2. A decrease in F1 and a negative ROC indicate the degree of diphthongisation. The vowel /eɪ/ (F1 ROC = 369) was significantly more positive than the other two diphthongs, /əʊ/ (F1 ROC = -9) and /eə/ (F1 ROC = -129). The vowel /eɪ/ was also less diphthongised than the two diphthongs /əʊ/ and /eə/. These ROC values were much lower than those found by Deterding (2000). Deterding (2000) revealed that the BBC British vowels /eɪ/ and /əʊ/ had great negative values of -1392 and -1387, respectively. Based on their small negative F1 ROC values, the diphthongs /eɪ/, /əʊ/, and /eə/ were claimed to be monophthongal for this study, auditorily discerned as /e:/, /o:/, and /ɛ:/, respectively.

**Table 4.** Means and standard deviations of ROC (Hz/sec) for the English diphthongs /eɪ/, /əʊ/ and /eə/ for each speaker.

Vowels	Speakers	ROC (Hz/sec)			
		F1	std	F2	std
/eɪ/	TH1	390	749.47	-2284	3848.41
	TH2	453	836.26	-1947	3337.88
	TH3	263	1150.21	-1189	2719.22
	Average	369	97.04	-1807	790.32
/əʊ/	TH1	6	335.85	-1013	3296.59
	TH2	-31	594.82	-320	2936.26
	TH3	-1	900.19	-1097	2943.68
	Average	-9	19.74	-810	884.95
/eə/	TH1	557	351.77	-3453	2706.10
	TH2	-139	741.95	-1736	2434.60
	TH3	-805	1071.95	-2176	1660.31
	Average	-129	681.049	-2455	494.06

**Figure 2.** ROC of F1 and F2 values for the diphthongs /eɪ/, /əʊ/ and /eə/.

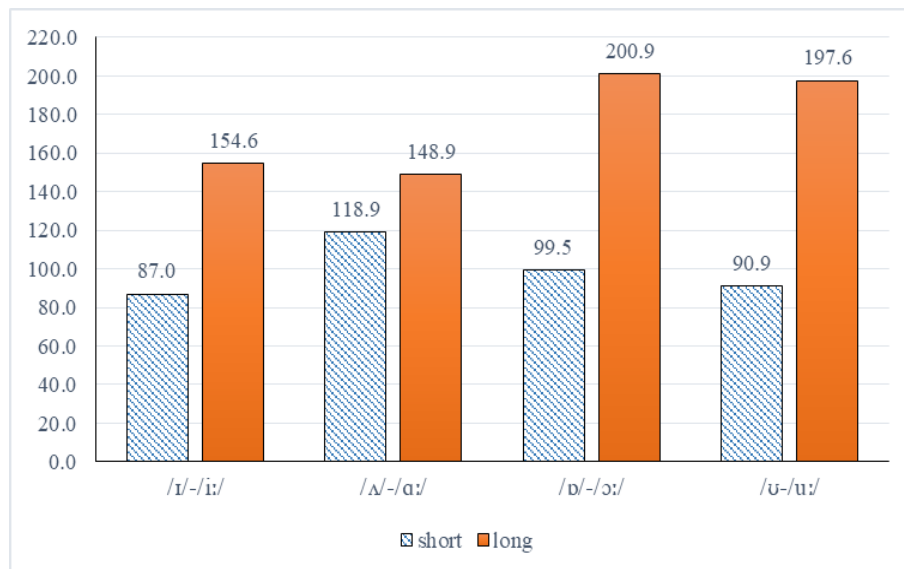
### 4.3 Vowel Contrast

#### 4.3.1 Duration contrast

Each pair of short and long vowels was significantly produced with a difference in average length based on the durational measurements of the short and long vowels, which were determined using paired t-test ( $t = 4.25$ ,  $df = 4$ ,  $p < 0.05$ , one-tailed). Short vowels /ɪ/, /ʌ/, /ɒ/, and /ʊ/ were shorter than long vowels /i:/, /ɑ:/, /ɔ:/, and /u:/ as seen in Figure 3. The differences in vowel durations on average among the three speakers were significant ( $F(2,21) = 3.47$ ,  $p < 0.05$ ). The ratio of long and short vowel duration on average was 1.77. The obtained average vowel duration values in this research align with those reported in prior studies (e.g., Tsukada, 2008, 2009) and are comparable to the duration ratio observed in Thai vowel pronunciation, where long vowels were found to be 1.9 times longer than short vowels (Abramson & Ren, 1990). A larger ratio corresponds to an increased contrast in the durations between long and short vowels.



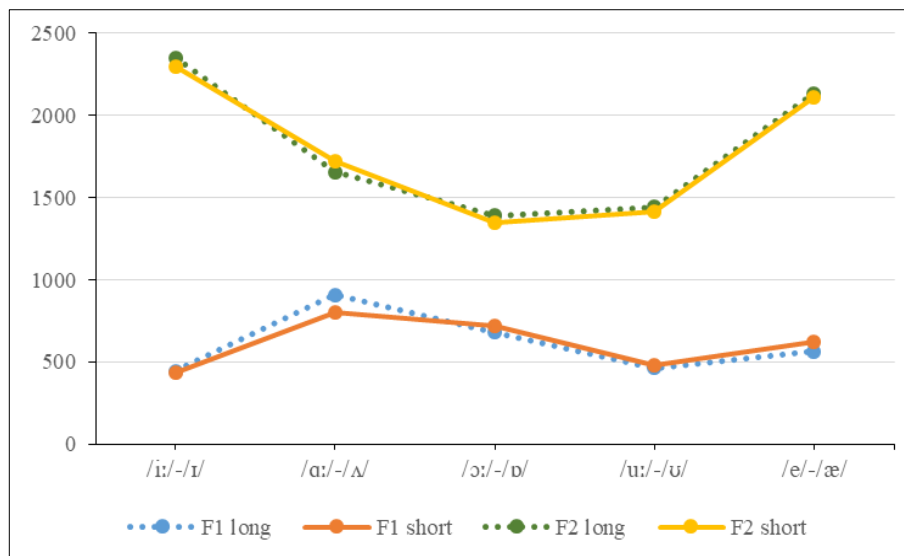
Based on these results, it can be summarised that each of the four vowel pairs had different lengths; the short monophthongs were shorter than the long ones.



**Figure 3.** An average duration (ms) of four pairs of short and long vowels produced by Thai learners ( $p < 0.05$ ).

#### 4.3.2 Quality contrast

A paired t-test was used to analyse the importance of each pair of vowels (long and short) using the average values of F1 and F2 in Hertz. Figure 4 illustrates the average formant frequency values of F1 and F2 for the four English vowel pairs: /i:/-/ɪ/, /ɑ:/-/ʌ/, /u:/-/ɒ/, and /u:/-/ʊ/. The statistical analysis revealed that these values were not statistically significant ( $p > 0.05$ ). The similar F1 and F2 frequencies resulted in frequent mutual confusion and low intelligibility (Hillenbrand et al., 1995).



**Figure 4.** An average formant frequency (Hz) of five paired vowels produced by Thai learners ( $p > 0.05$ ).

#### 4.4 Vowel Substitution

Table 5 shows the vowel substitution produced by two of the three speakers. Regarding monophthongs, the long vowels were pronounced as their counterparts, for example, ‘feast’ /fi:st/ pronounced as [fis], ‘short’ /ʃɔ:t/ pronounced as [ʃɒt], and ‘dark’ /dɑ:k/ pronounced as [dʌk]. A short vowel /ʊ/ was substituted with a long vowel /u:/, for example, in words ‘foot’ /fʊt/ pronounced as [fu:d], ‘good’ /gʊd/ pronounced as [gu:d], and ‘full’ /fʊl/ pronounced as [fu:l]. The word ‘full’ was not acoustically measured, but the speakers were confused it with the word ‘fool’. Concerning the diphthongs, the speakers pronounced /eɪ/, /əʊ/, and /eə/ as long monophthongs /e:/, /o:/, and /ɛ:/, respectively.

**Table 5.** Vowel substitution.

Vowel	Substituted with	Words
Monophthongs		
/i:/	/ɪ/	feast
/ɔ:/	/ɒ/	short
/ʊ/	/u:/	foot, good, full*
/ɑ:/	/ʌ/	dark
Diphthongs		
/eɪ/	/e:/	same, change, gave
/əʊ/	/o:/	so, homes, don’t
/eə/	/ɛ:/	there, their

#### 4.5 Production Intelligibility

To identify which vowels are the most intelligible for the listeners, the words for each vowel that were correctly identified by 30 Malaysian listeners were calculated. The results related to the intelligibility of English vowels by Thai speakers are shown in Table 6. Considering the total of 180 tokens involved, the average percentages<sup>32</sup> of intelligibility scores across three categories – similar, identical, and new – were 77.28, with 71.25 and 73.88, respectively. On average, the intelligibility of the 14 vowels was high at 74.83%. Based on the SLM (Flege, 1995), L2 learners have more difficulty with similar sounds than with new sounds. On the other hand, the intelligibility scores of similar vowels are higher than the new ones. It shows that Thai speakers could produce similar vowels more intelligibly than the new ones. Interestingly, only one monophthong /ɜ:/ demonstrated the best intelligibility rate at 100%, whereas a monophthong /ʊ/ demonstrated the lowest intelligibility rate with a score of 41.67%. Both /ɜ:/ and /ʊ/ were in a similar category; they were similar to Thai monophthongs /ɤ:/ and /u/, respectively. The lowest intelligibility score of the vowel /ʊ/ is as a result of the substitution to the long monophthong /u:/ from the words ‘foot’ to ‘food’, full to ‘fool’.

Based on the SLM, L2 learners may have challenges while attempting to acquire sounds in their L1 and L2 that have audible differences, as denoted by similar International Phonetic Alphabet (IPA) symbols (Flege, 1997). The lack of differentiation between the L1 and L2 sounds inhibits the development of a distinct phonetic category. In contrast, second language (L2) learners would not have difficulty perceiving foreign auditory stimuli (Flege, 1997). According to Flege (1997), the presence of new L2 sounds that deviate from L1 categories and lack a phonetic

equivalent in the L1 enables learners to establish novel L2 categories. According to the analysis of variance (ANOVA) test, the findings indicate the variations among the means of the three categories were not significantly significant ( $F(2,11) = 0.196, p = 0.83$ ). It shows that the three categories, i.e., similar, identical and new, are equally intelligible to the listeners even though the diphthongs (/eɪ, əʊ, eə/) of the new category were substituted with the long monophthongs (/e:, o:, ε:/), as presented in Table 6.

**Table 6.** Percentages of production intelligibility.

SLM Category	Vowels	Intelligibility scores (%)
Similar	/ɪ/	67.78
	/æ/	95.24
	/ʌ/	88.1
	/ɑ:/	66.67
	/ɒ/	81.48
	/ʊ/	41.67
	/ɜ:/	100
	<b>Average</b>	<b>77.28</b>
Identical	/i:/	75
	/e/	76.67
	/ɔ:/	66.67
	/u:/	66.67
	<b>Average</b>	<b>71.25</b>
New	/eɪ/	73
	/əʊ/	65.3
	/eə/	83.33
	<b>Average</b>	<b>73.88</b>

## 5. DISCUSSION

This research presents empirical data on Thai learners' production of English monophthong and diphthong vowels. The study includes the examination of vowel durations, vowel quality, and the differentiation between long and short vowels. Regarding vowel duration measurements, no significant difference was observed among the speakers in their production of monophthongs and diphthongs. The shortest and the longest monophthongs were /ɪ/ and /ɜ:/, respectively, and the longest to shortest diphthongs were /eə/, /əʊ/, and /eɪ/, respectively. The comparable vowel length between monophthongs and diphthongs reflects a large durational difference; the diphthongs were longer than the monophthongs, which is consistent with the study by Tsukada (2008). Four out of eleven monophthongs (/ɪ/, /ʌ/, /ɑ:/, and /ɒ/) had different qualities across speakers. The values of F1 and F2 reflect the tongue height position and the tongue backness, respectively. The vowels /ɪ/ and /ɑ:/ had the lowest and the highest values of F1, respectively, that did not significantly differ across the speakers. The characteristics of the vowel /i:/ with the least F1 value and the vowel /ɑ:/ with the greatest F1 value can be found in most ASEAN Englishes, such as Singapore English (Deterding, 2003; Tan & Low, 2010), Brunei English (Salbrina, 2006), Malaysian English (Phng, 2017; Pillai et al., 2014; Tan & Low, 2010), and Indonesian English (Masykar et al., 2022). As for the tongue backness, the frontness vowel had the highest F2 value, which is also for Brunei English (Salbrina, 2022), Malaysian English (Pillai et al., 2014), and British English, Singapore English (Deterding, 2003).

Regarding the diphthong quality, the average ROC for /eɪ/, /əʊ/, and /eə/ across the three speakers was not significantly different. The value of F2 ROC reflecting a forward tongue movement was much more negative than the F1 ROC, indicating an upward tongue movement. F1 ROC of diphthongs obtained was less negative, reflecting an unchanged tongue position for Thai learners, which is consistent with the closing diphthongs (/eɪ/ and /əʊ/) of Singapore English (Brown et al., 2000) and the vowel /eɪ/ of Brunei English (Salbrina, 2006). Tsukada (2008) believes that the English closing diphthongs /eɪ/ and /əʊ/ equate to the long Thai vowels /e:/ and /o:/, respectively, for Thai learners. In detecting a change in the quality of /eə/, a small negative amount of F1 ROC was obtained, and the F2 ROC was less negative than the /eə/. It can be assumed that the /eə/ does not change in the tongue movement and is assimilated to a Thai long vowel /e:/. This is no longer a diphthong but rather a 'long low-mid vowel' /e:/ in rhotic accents such as General American English (Davenport & Hannah, 2010, p. 45). The results are in line with Bowman's (2000) and Swan and Smith's (2001) reports, which show that Thai learners pronounce the three English diphthongs /eɪ/, /əʊ/, /eə/ as Thai long monophthongs, /e:/, /o:/, and /ɛ:/, respectively. The three vowels /e:/, /o:/, and /ɛ:/ are phonetically similar to Thai vowels (Tingsabhad & Abramson, 2001).

For acoustic-phonetic characteristics of vowel length contrasts for Thai learners, means of vowel duration and the first formant frequencies were analysed. The measurement of vowel duration for four paired monophthongs, /i:/-/ɪ/, /ɑ:/-/ʌ/, /ɔ:/-/ɒ/, and /u:/-/ʊ/, indicate that there are considerable disparities between long and short vowels. Nevertheless, the stability of vowel quality remains consistent across paired vowels, with no discernible distinction in vowel quality observed between long and short vowels, as well as between the pair of /e/ and /æ/. The lack of contrast in the vowel quality is similar to the results in Malaysian English (Pillai et al., 2014; Tan & Low, 2010), Brunei English (Salbrina, 2022), Singapore English (Tan & Low, 2010), Bangladeshi English (Naher, 2018), and Indonesian English (Masykar et al., 2022). According to Hillenbrand et al. (1995), similar frequencies resulted in frequent mutual confusion and low intelligibility.

As mentioned in a previous section, a comparison between Thai and English inventories expresses that some vowels are common to both languages. Although Thai monophthongs have the lexical contrast of short and long vowels (Abramson, 1993), the vowel quality of the vowel counterpart is not different, while English monophthongs are different in both length and quality (Ladefoged & Johnson, 2014, p. 89). In detecting monophthong characteristics in this study, the vowel production differs only in vowel duration but not in vowel quality. It is suggested that Thai learners assimilate the English monophthongs into Thai monophthong equivalence.

There were vowel substitutions of short and long monophthongs in words such as 'feast', 'short', 'foot', 'good', and 'dark'; even though the speakers could produce these four vowel pairs, /i:/-/ɪ/, /ɔ:/-/ɒ/, /ʊ/-/u:/, /ɑ:/-/ʌ/, differently in length. In the light of these substitutions, the learners might be confused with word counterparts, for instance, 'feat-fist', 'foot-food', and 'dark-duck'. However, these vowels had high intelligibility scores. Comparing the intelligibility scores, the highest and lowest scores between the monophthongs /ɜ:/ and /ʊ/ resulted from the influence of word spelling. All three speakers pronounced the words 'good' as [gu:d] and 'foot' as [fu:t]. In the light of mispronunciation, some listeners transcribed these words into other words, and some omitted them.

It is important to acknowledge that the correlation between spelling and phonology in the English language poses a considerable challenge in differentiation (Kaefer, 2016). Certain words that often have identical spellings can exhibit variations in their pronunciation. For example, the words spelt with ‘\_ood’ have three ways of pronunciations such as ‘food’ /fu:d/, ‘good’ /gʊd/, and ‘blood’ /blʌd/. As stated by O’Connor (2009), individuals who have not yet mastered these words rely on visual cues from their spelling and are anticipated to mispronounce them. Vowel substitution was also used for the diphthongs. According to Tsukada (2008), Thai speakers usually use Thai-style pronunciation to produce English phonemes. The three diphthongs /eɪ/, /əʊ, and /eə/ were pronounced as Thai long monophthongs, /e:/, /o:/, and /ɛ:/, respectively; nonetheless, the intelligibility scores were high. It confirmed that the monophthongal diphthongs were intelligible. As previous studies have suggested, the intelligibility of L2 vowels seems to be affected by the similarity between L1 and L2 vowel inventory (Flege, 1995). That is, for certain L2 vowels, if there are no phonetic counterparts or allophones in L1, it is more difficult to produce them correctly. Among the 14 vowels, the three diphthongs, /eɪ/, /əʊ, and /eə/, have no phonetic counterparts in the Thai vowel system. Based on the SLM (Flege, 1997), new L2 sounds that differ from L1 categories and have no phonetic counterpart in the L1 allow learners to develop new L2 categories. Although the English vowel /ʊ/ shares phonetic similarity with the Thai vowel /u/, when Thai speakers produced it, its intelligibility was low. That could be because the listeners frequently misidentified it as a long vowel, /u: /.

Based on the significant results of the intelligibility scores, there were no differences among the three categories, and the vowel variations were intelligible to the listeners. The new category of monophthongal diphthongs was especially intelligible. The vowels produced by Thai speakers can be characterised as shared features of ASEAN Englishes and contribute to speech intelligibility.

## 6. CONCLUSION

Previous studies demonstrated that the acoustic characteristics of English vowels, such as the F1 and F2 formant frequencies and vowel lengths, varied between native speakers and non-native speakers. This study revealed that Thai speakers could distinguishably produce the vowel length but not the vowel quality of English monophthongs. The diphthong production, especially, shows characteristics of ASEAN Englishes: monophthongal without formant movement. Even though there were vowel confusion patterns such as /i:/ with /ɪ/, /ɔ:/ with /ɒ/, /ʊ/ with /u:/, /ɑ:/ with /ʌ/, /eɪ/ with /e:/, /əʊ/ with /o:/, and /eə/ with /ɛ:/, the intelligibility scores were high, except the vowel /ʊ/. Mispronunciation of vowel counterparts is common among Thai English speakers, and it can lead to misunderstanding among listeners. The English monophthongs and diphthongs may be compared to Thai short and long counterparts. The more specific point of the language transfer will be investigated for future research. The confirmation of monophthongal diphthong variations supports the concept proposed by SLM researchers that when second language (L2) sounds deviate from the categories of the first language (L1) and lack a phonetic equivalent in the L1, learners can establish new categories for these L2 sounds (Flege, 1997). Nevertheless, the newly introduced L2 sounds exhibit a high level of intelligibility.



In terms of limitations, this study focused on only three Thai female participants. While their contributions provided valuable insights, a larger and more diverse participant pool could enhance the generalizability of the findings. The study enlisted thirty Malaysian listeners to evaluate the intelligibility of the Thai speakers' English pronunciation. It would be beneficial to include participants from a broader range of linguistic backgrounds to assess potential variations in intelligibility perception. Further research could explore the factors contributing to high intelligibility scores despite phonetic variations, including listener attitudes, familiarity with different accents, and the context of communication. Addressing these limitations and exploring these suggested areas for further research would contribute to a more comprehensive understanding of the intricacies of pronunciation challenges faced by Thai speakers learning English and inform effective strategies for enhancing their pronunciation skills.

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## APPENDICES

### APPENDIX A

#### 'Boy Who Cried Wolf'

There was once a poor shepherd boy who used to watch his flocks in the fields next to a dark forest near the foot of a mountain. One hot afternoon, he thought up a good plan to get some company for himself and also have a little fun. Raising his fist in the air, he ran down to the village shouting 'Wolf, Wolf.' As soon as they heard him, the villagers all rushed from their homes, full of concern for his safety, and two of his cousins even stayed with him for a short while. This gave the boy so much pleasure that a few days later he tried exactly the same trick again, and once more he was successful. However, not long after, a wolf that had just escaped from the zoo was looking for a change from its usual diet of chicken and duck. So, overcoming its fear of being shot, it actually did come out from the forest and began to threaten the sheep. Racing down to the village, the boy of course cried out even louder than before. Unfortunately, as all the villagers were convinced that he was trying to fool them a third time, they told him, 'Go away and don't bother us again.' And so, the wolf had a feast.

### APPENDIX B

#### The phonetic transcription from Phonetiblog-Jack Lewis Phonetic Blog (2012)

ðə 'bɔɪ | hu 'kraɪd ,wʊlf

1. ðəə wɪz 'wʌns | ə 'pɔː `ʃepəd , bɔɪ | hu 'wɒtʃd ɪz , flɒks |
2. ɪn ðə 'fɪldz | nekst tu ə `dɑːk ` , fɒrɪst | nɪə ðə 'fʊt əv ə , maʊntɪn.
3. 'wʌn 'hɒt | aftə ` , nʌn , | hi 'θɔːt 'lʌp | ə 'ɡʊd , plæn |
4. tə get sm `kʌmpəni fr ɪm , self | ən 'ɔːlsəʊ 'hæv ə ɪtl , flʌ.
5. `reɪzɪŋ ɪz `fɪst ɪn ðɪ ` , eə , | hi 'ræn 'daʊn | tə ðə ` , vɪlɪdʒ |
6. ʃaʊtɪŋ `wʊlf , `wʊlf ! ə `sʌn əz ðeɪ `hɛd , ɪm | ðə 'vɪlɪdʒəz
7. 'ɔːl 'rʌft frɪm ðeə ` , hæʊmz | `fʊl əv kn ` , sɜːn | fər ɪz ` , seɪftɪ ,
8. ən `tu əv , ðm | 'steɪd `wɪð ɪm fər ə waɪl . ðɪs `geɪv ðə , bɔɪ
9. `səʊ mʌtʃ ` , plezə | ðæt ə `fju deɪz ` , leɪtə | hi traɪd ɪɡ `zækli
10. ðə seɪm , trɪk | ə `gen , ən 'wʌns , mɔː | hi wɪz sæk `sesfl .
11. haʊ `evə , 'nɒt 'lɒŋ , aftə | ə 'wʊlf | wəz 'lʊkɪŋ fər ə `tʃeɪndʒ
12. ɪn ɪts juːz | , daɪət | əv tʃɪkɪn ən , dʌk | səʊ ɪt 'æktʃli
13. `dɪd kʌm `aʊt | frɪm ðə `fɒrɪst | n bɪɡən tə `θreɪn ðə , ʃɪp .
14. 'reɪzɪŋ 'daʊn tə ðə , vɪlɪdʒ , | ðə ` , bɔɪ | əv , kɔːs | 'kraɪd `aʊt
15. `ɪvŋ ` , laʊdə | ðən bɪ `fɔː , bət `æz `ɔːl ðə ` , vɪlɪdʒəz |
16. wə kn `vɪnst ðæt ɪ wɪz `traɪɪŋ , tə `fʊl ðm ə `θɜːd ` , taɪm , |
17. `nəʊbɒdi ` , bʊðəd | tə 'kʌm ən `help ɪm . ən 'səʊ | ðə ` , wʊlf | hæd ə `fɪst .