RHYTHM IN MALAYSIAN ENGLISH

ANUSSYIA A/P MUTHIAH

FACULTY OF LANGUAGES AND LINGUISTICS
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ANUSSYIA A/P MUTHIAH

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ABSTRACT

This study investigates the properties of rhythm in Malaysian English (MalE), which has been described as a syllable-timed language. However, studies have shown that instead of a binary distinction, languages can be more or less stress or syllable timed depending on factors like speaking context. This study set out to address the following questions: (1) To what extent do different speaking styles (read and informal conversational speech styles) affect the rhythmic properties found in MalE? (2) To what extent are there differences in the rhythmic properties among three ethnic groups (Malay, Chinese and Indian) in Malaysia? (3) To what extent are there differences in the rhythm of MalE based on different metrics (nPVI-V, rPVI-C and VarcoV)? The data comprised audio recordings of 12 fluent female Malaysian speakers ranging from 40-45 of age from three different ethnic groups (Malay, Chinese and Indian). The speakers were recorded in two speaking styles: reading and spontaneous speech. For each stretch of speech in both speech styles, the duration of consecutive syllables was obtained in order to derive a normalised Pairwise Variability Index (nPVI) and VarcoV. The results were compared across the three ethnic groups and between the two speaking styles. There is some evidence that the three ethnic groups were stress-timed in both read speech and spontaneous speech.

ABSTRAK

Kertas ini mengkaji sifat-sifat irama dalam Bahasa Inggeris di Malaysia (MalE) yang sering digambarkan sebagai bahasa "syllable-time". Walaubagaimanapun, kajian telah menunjukkan bahawa selain daripada perbezaan binari, bahasa boleh menjadi lebih atau kurang "stress-time" atau "syllable-time" bergantung kepada faktor-faktor seperti konteks pertuturan. Kajian ini dibentangkan untuk menjawab soalan-soalan berikut: (1) Sejauh manakah gaya pertuturan yang berbeza memberi kesan kepada ciri-ciri irama yang terdapat dalam MalE? (2) Sejauh manakah terdapat perbezaan dalam ciri-ciri irama antara ketiga-tiga kumpulan etnik (Melayu, Cina dan India) di Malaysia? (3) Sejauh manakah terdapat perbezaan dalam irama MalE berdasarkan metriks yang berbeza (nPVI-V, rPVI-C and VarcoV)? Data kajian ini terdiri daripada rakaman audio oleh 12 responden perempuan yang fasih berbahasa Inggeris dalam lingkungan umur 40-45 dari tiga kumpulan etnik yang berbeza (Melayu, Cina dan India). Rakaman audio dibuat untuk dua jenis gaya pertuturan iaitu gaya membaca and pertuturan spontan. Bagi setiap penghuluran ucapan dalam kedua-dua jenis gaya pertuturan, tempoh suku berturut-turut telah diperolehi untuk mendapatkan Indeks Kepelbagaian Berpasangan Normal (nPVI) dan VarcoV. Keputusan yang diperolehi digunakan untuk membuat perbandingan antara tiga kumpulan etnik antara dua gaya pertuturan Terdapat beberapa bukti bahawa kesemua responden daripada tiga kumpulan etnik didapati "stress-timed" dalam gaya membaca dan gaya pertuturan spontan.

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> “Life is not easy for any of us. But what of that?
>
> We must have perseverance and, above all, confidence in ourselves.
>
> We must believe that we are gifted for something, and that this thing,
>
> at whatever cost, must be attained.” *~ Marie Curie* ~

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

The vast spread of English around the world has resulted into the birth of many new Englishes. Amongst them is the Malaysian English (MalE) where it is a dominant and important language in Malaysia due to the colonial rule of Britain from the 18th century to the late 1950s.

Malaysian English (MalE) is considered as a nativized variety of English (Morais, 2001; Nair-Venugopal, 2000; Phoon & Maclagan, 2009; Schneider, 2007) because of its linguistic identity with significantly different linguistic features in the aspects of phonology, morphology and syntax (Baskaran, 2004; Preshous, 2001; Rajadurai, 2007; Schneider, 2003), particularly in the colloquial form (Baskaran, 2004; Kachru, 1986; Phoon & Maclagan, 2009; Wong, 1991). MalE comprises sub-varieties of English used in Malaysia (Pillai, Mohd. Don & Knowles, 2012). For example, Baskaran (1987) has identified the three levels of sociolects as acrolect, mesolect and basilect used by different groups of people in Malaysia.

Pillai et al. (2012) asserted in a study that information provided for the acrolectal dialect in most studies are inadequate as it is often assumed to have the same features on Standard English (SE) and its pronunciation is categorized approximately as Received Pronunciation (RP). Baskaran (2005), for example, assumes that there is a slight variation of Standard British pronunciation in the acrolectal form of MalE. Besides, Brown (1988a) also claims that the vowels of the acrolectal form of MalE speech are systematically identical to RP. Furthermore, less significance is given to acrolectal MalE because the phonology of MalE is assumed to not be a unique form (Pillai et al.,

2012). However, these assumptions leave room for the understanding of acrolectal form of MalE.

A number of studies have been carried out over the years on different phonological, prosodic and discourse features (Pillai et al., 2010; Phoon & Maclagan, 2009; Rajadurai, 2006; Tan & Low, 2014). All these studies point to one main finding: there is linguistic innovation in MalE. However, Pillai (2008) points out that most of these early studies carried out on MalE are more impressionistic. Besides, these studies (e.g. Brown, 1988a; Platt, Weber & Ho; 1983; Platt & Weber, 1980; Tongue, 1974; Tongue, 1979) tend to describe MalE together with Singapore English (SingE) due to the single geographical unit of both Malaysia and Singapore from 1957-1965 (Phoon & Maclagan, 2009). These studies were focussed more on colloquial and learner varieties, which have resulted into narrowed descriptions of MalE pronunciation (Pillai, 2008).

1.2 Statement of Problem

Previous studies on the pronunciation of MalE focused on a description of its vowels and consonants (e.g. Baskaran, 2004; Phoon & Maclagan, 2009; Pillai et al., 2012; Tan & Low, 2010), where the overviews of MalE's prosodic features were limited (e.g. Baskaran, 2004; Phoon & Maclagan, 2009). As pointed out by Phoon and Maclagan (2009), data from these studies were not analysed acoustically but was observed subjectively. For example, MalE was described as a syllable-timed language where all syllables occur at parallel intervals of time, stressed or unstressed (Tongue, 1974). Besides, he also describes MalE as having a "machine-gun rhythm" (see Pike, 1945). Furthermore, it was specified that these data were comprised of a small number of respondents (see Rajadurai, 2007; Tan & Low, 2014).

Besides, Tan and Low (2014) in a recent study suggested that MalE is syllable-timed where they compared the rhythm of MalE and Singapore English (SingE) using

the Pairwise Variability Index (PVI). The results obtained showed that MalE speakers were even more syllabled-timed compared to SingE speakers. Tan and Low (2014) suggested that this may due to the influence on Malay on MalE, which is generally described as syllable-timed (see Wan Aslynn, 2012). However, these results need to be treated carefully due to the size of sample and speaking context. There is, therefore, a gap on whether the same effect appears in the speech of Malaysians of other ethnic groups with different first languages.

There are also issues relating to the classification of rhythm in languages as syllable or stress timed. Apart from Tan and Low's (2014) study, there is a dearth of published work on patterns of rhythm in MalE. Hence, this study is concerned with the rhythmic patterns in MalE which will be investigated in two different speech styles. Previous studies on MalE have shown that MalE speakers are syllable timed in formal declamatory style or reading style (Baskaran, 2004 & Tongue, 1974). However, these studies were restricted to a more formal reading style (sentence and word level) and there is a lack of published findings on rhythm in spontaneous MalE speech which has not been examined. Hence, this study was conducted in order to analyse the rhythm in both reading and spontaneous speech style.

1.3 Purpose of the Study

The rhythm of MalE has always been described and classified impressionistically (syllable-timed or stress-timed) in several studies (see Lloyd James, 1940; Tongue, 1974 as cited in Pike, 1945). Besides, the latest study conducted by Tan and Low (2014) has described the rhythm of MalE acoustically. However, the respondents were all students of the same ethnic (Malay). Therefore, this study aims to investigate the properties of rhythm in high social dialect (acrolect) form of MalE in both reading and spontaneous speech styles among three different ethnic groups (Malay,

Chinese and Indian). Furthermore, this study aims to compare the patterns of rhythm among the three ethnic groups who have different first languages. The study will also examine the effect of using three different sets of measurements on the results of the rhythmic properties in MalE in order to determine the efficiency of these methods in measuring rhythm.

1.4 Research Questions

This study sets out to answer the following three research questions in relation to the rhythm in MalE:

(i) To what extent do different speaking styles (read and spontaneous speech styles) affect the rhythmic properties found in Malaysian English?

(ii) To what extent are there differences in the rhythmic properties among three ethnic groups (Malay, Chinese and Indian) in Malaysia?

(iii) To what extent are there differences in the rhythm of Malaysian English based on different matrices (nPVI-V, rPVI-C and VarcoV)?

1.5 Research Objectives

The objectives of this study are to understand:

(i) The effects of rhythmic properties in Malaysian English for different speaking styles (read and spontaneous speech styles).

(ii) The differences in rhythmic properties among three ethnic groups (Malay, Chinese and Indian) in Malaysia.

(iii) The differences in the rhythm of Malaysian English based on different matrices (nPVI-V, rPVI-C and VarcoV) used.

1.6 Scope of the Study

As it has been discussed in section 1.0, MalE has been identified by Baskaran (1987) of having three levels of dialects (acrolect, mesolect and basilect). This heterogeneity of MalE poses a problem where not all these three levels of dialects have been acoustically studied. The respondents of this study are speakers of English. The speech context represents a more acrolectal speech context where the spontaneous speech produced by the speakers does not show any of the features of colloquial English (e.g. Pillai et al., 2012). Furthermore, emphasis was given to the rhythmic pattern of MalE (syllable- or stress-timed) using different matrices (eg. nPVI-V, rPVI-C and VarcoV). Other supra-segmental features of rhythm (e.g. stress, tone, intonation) and matrices were not taken into consideration.

1.7 Organization of the Dissertation

This study is divided into five chapters. The first chapter discusses on the introductory issues of rhythm in MalE. Chapter two discusses on the relevant existing literature of rhythm in MalE. In chapter three, the methods used to analyze the data are discussed. Chapter four discusses on the data analysis. Lastly, chapter five concludes and summarizes the whole study by answering all three research questions.

CHAPTER 2

LITERATURE REVIEW

This chapter discusses on the existing literature on Malaysian English, rhythm and metrics. The first part of the chapter discusses on the notion of rhythm. The second part reviews the measurements of rhythm. The third part reviews the types of test materials used for read speech. The fourth part discusses the different studies which were carried respectively for read and spontaneous speech. Finally, the chapter concludes by reviewing the existing literature on rhythm in MalE.

2.1 The Notion of Rhythm

Over the years, studies on rhythm in languages have been a widely discussed topic where it has been given many forms of definitions. The early researchers have defined rhythm as "an effect involving the isochronous recurrence of some type of speech unit" (Pike, 1946 & Abercrombie; 1965, 1967 as cited in Grabe & Low, 2002:1). Besides, it is also been defined as "the regularities which govern grouping of elements in a language's phonological structure" where it is stated through factors (effects of timing, inconsistency of structure of syllable and role of accent) that differ across languages and structure of rhythm (Murty, Otake & Cutler, 2007: 78). However, Kohler (2009: 31) argued in his study that rhythm across languages cannot be defined either based on "a category of stress which determined by lexical phonology" nor based on 'category of accent which is determined by sentence level' because sentences are highly associated with its meaning. Furthermore, Nokes and Hay (2012: 1) argued that "speech rhythm is the patterning of prominent elements such as duration, intensity, intonation contours, and pitch in spoken language".

The foundation of phonetic research has been based on the presence of the two traditional rhythmic patterns which are the stress- and syllable-timing among many researchers (Abercrombie, 1967; Bertinetto, 1989; Bolinger, 1965; Lehiste, 1977; Nakatani et al., 1981 as cited in Arvaniti, 2009). Speech rhythm is commonly described using the stress-timed versus syllable-timed dichotomy, developed to categorize speech rhythm cross-linguistically (Abercrombie, 1967; Classe, 1939; Pike, 1946 as cited in Nokes & Hay, 2012). Based on the Rhythm Class Hypothesis proposed by Pike (1945) and Abercrombie (1967), every language belongs to a standard rhythm class, that is either syllable-timed, stress-timed or mora-timed (Oration, 2009). Abercrombie (1965) further explained that languages can be classified into two categories as "stressed-timed" and "syllable-timed" based on their durational intervals, with the former having approximately equal inter-stress intervals and the latter, syllables which are approximately similar durations. However, in his later study (Abercrombie, 1967), by measuring languages which were categorized having different speech rhythmic patterns (French, Telugu, Yoruba, English, Russian, and Arabic), Abercrombie reported that the syllable durations in these languages were nearly the same. Oration (2009) then asserted that if a language has a more complicated syllable structure (e.g. CCV, CVC, CCCV), then the duration of syllable is not so equal. This was approved by Dauer (1983) that syllable structure is one of the main influences on the rhythm of a language.

The study of rhythm was then expanded to include a third category of rhythm, exemplified by Japanese as mora-timed (Ladefoged, 1975), with each successive morae assumed to be roughly equal durations although it has been found that different types of morae in Japanese are likely to be of different durations (Warner & Arai, 2001). Other languages such as Maori (Bauer, 1993) and Telugu (Cutler & Otake, 1994; Murty et al., 2007; Otake et al., 1993) were also categorised as having mora-timed rhythm. These languages that are based on this rhythm have a plain structure of syllable (e.g. V, CV,

CCV) where any syllable is less than 330ms (Oration, 2009). Oration (2009: 2) also explained that:

> … in a syllable timed language, the difference between the successive intervocalic duration is high and that between successive vocalic duration is low. But in mora-timed language the difference between both the successive intervocalic and vocalic duration is low.

Similarly, Ramus et al. (1999) warned that the focus on isochrony may be misleading citing studies which have shown that the influence of factors like the number, type and position of syllables.

However, there are studies conducted that have shown that speech rhythm of a language cannot be separately categorised. Mitchell (1969) and Roach (1982: 73) argued that no language is strictly "syllable-timed" or "stress-timed" because all languages display both types of timing but differ in which type of timing it predominates. Besides, different types of timing will be exhibited by the same speaker on different occasions and contexts. The other rhythmic effects of a language mentioned by Dauer (1983) are also the existence or non-existence of vowel reduction and the stress patterning of a language where in stress-timed languages, the tendency to have more complex syllable structures is common; however, syllable-timed languages tend to have the absence of vowel reduction (as cited in Tan & Low, 2014). Another factor affecting rhythm is the mother tongue of the speaker (Crystal, 1967: 174). Dauer (1983), Miller (1984) and Roach (1982) explained that the languages examined turned out to range from a more syllable timed to more stress-timed languages.

Subsequently, Dauer (1983) highlighted the fact that there are also languages that exhibit one or more rhythmic patterns (as cited in Nokes & Hay, 2012). Hence, the failure to validate languages by having stress-, syllable-, or mora-timed rhythmic pattern has driven to the understanding that languages fall on a scale between the two extremes (Dauer, 1983; Grabe & Low, 2002; Roach, 1982, as cited in Nokes & Hay, 2012), and to have more refined metrics to index rhythmic timing (Nokes & Hay, 2012).

Tongersen and Szakay (2012) asserted that various metrics have been suggested to measure speech rhythm focusing on phonological structure of vowels and syllables in different languages in order to determine whether any local structures in speech can be examined. Knight (2011: 271) further supports this by saying:

> … the foundation of all rhythm metrics lies in the observation that there are phonological differences between languages impressionistically defined as 'stress-timed' and 'syllable-timed'… 'stress-timed' languages exhibit vowel reduction … than in 'syllable-timed' languages… permit several different syllable types… there will also be more variation between consonantal stretches than in 'syllable timed' languages …

Hence, the variations in phonological aspects of languages are leading to the variation in rhythmic patterns through rhythm metrics (Knight, 2011). However, Loukina, Kochanski, Rosner, Keane and Shihet (2011) asserted that none of the metrics applied are able to determine which rhythmic pattern a language solely belongs to. Furthermore, Grabe and Low (2002) presented that for a same language, different metrics measures can produce different categorization of rhythmic patterns and hence lead to unsuccessfulness of the usage of metrics for categorization of non-prototypical languages (as cited in Arvaniti, 2009). At the same time, Knight (2011) was of the opinion that a reliable measure is needed and should be developed so that it will show similar results in a similar context and the results obtained by the measure can be strong and valid.

Due to the limitations of attaching the concept of isochrony to rhythm, an alternative view was proposed which linked rhythm to the phonological properties in a language. These properties include the type of syllable structure and the extent of vowel reduction in a particular language (Ramus et al., 1999). Stress-timed languages, such as English, typically have more syllable types and complex syllables (e.g. CCV, CCCV), and also allow vowel reduction (e.g. *extemporize* /ɪkˈstempəraɪz/), with stress tending to fall on heavy syllables. Ramus et al (1999: 268) explained that:

> …these features combine with one another to give the impression that some syllables are far more salient than others in stress-timed languages, and that all syllables tend to be equally salient in syllable-timed languages. This in turn, creates the impression that there are different types of rhythm.

However, it must be borne in mind that there will be languages that have some but not all of the properties typical of stressed- or syllable-timed languages (Nespor, 1990), and thus, attempts to classify languages on such a binary distinction need to be treated with caution.

2.2 Measurements of Rhythm

The durational variability of consonants and vowels, which are affected by language-specific characteristics, like vowel reduction and type of 'allowable' consonant clusters and syllable structure, are considered to be indications of a language being more "stress-" or "syllable-" timed. Based on this premise, Ramus et al (1999: 271-272), measured vocalic (from the onset to the offset of vowels or vowel cluster) and consonantal intervals (from the onset to the offset of consonants or consonant cluster), and then obtained the standard deviations for each of their test sentences (ΔV & ΔC). They also measured the percentage of total vocalic intervals over the entire duration of a sentence (%V).

$$\%V = 100 \times \left[\sum_{k=1}^{m-1} \right] \text{duration of utterance}$$

Their results indicate that both ΔC and %V best align with the notion of stress- and syllable-timed rhythm. For example, languages which are typically classified as stressed-timed, like English, tend to have a higher ΔC because they have more syllable variety, and therefore more variety in the number of consonant, which in turn leads to a longer consonantal interval. In such cases, a bigger C/V ratio can be expected leading to a lower %V. Thus, based on the phonological properties of a language, the rhythmic differences between languages can be examined.

Besides, ΔV and either ΔC or %V was good in measuring the relation between the rhythm in languages. However, Low et al. (2000) notes that the drawback of ΔC and ΔV is that only the differences of overall interval is taken into consideration and not the differences of successive interval. Wagner & Dellwo (2004) also criticised that %V and ΔC is not good at measuring speech rate as it could be a metric that measure the complexity of syllable rather than measuring rhythm.

So, Dellwo (2006) suggested that by using VarcoC (normalised standard deviation of consonantal interval durations divided by the mean consonantal duration) and VarcoV (normalised standard deviation of vocalic interval durations divided by the mean vocalic duration and multiplied by 100), speech rate will be controlled. This metrics is similar to ΔC and ΔV, but what make it slightly different is the standard deviation is divided by the duration of mean. Besides, VarcoC was better than Δ*C* at discriminating stress-timed languages, such as English and German from syllable-timed language, such as French for all speech rates. White and Mattys (2007) also used VarcoV and VarcoC in his study. It was studied that the influence of the rhythm of one's first language on the second language spoken was discriminated by VarcoV; however, it was not for VarcoC. VarcoV is calculated as: standard deviation of vocalic interval duration divided by mean vocalic interval duration and then multiplied by 100. The index of VarcoV is expressed as below,

$$\text{VarcoV} = \frac{\Delta V}{\bar{v}} \times 100$$

where ΔV is standard deviation of the vocalic interval and v̄ refers to the mean duration of the vocalic intervals.

Low, Grabe and Nolan (2000), however, felt that the measurements proposed by Ramus, Nespor and Mehler (1999) were not good indicators of rhythm, particularly in data where the speech rate may not be as controlled as in the latter's study. The former

proposed the normalised Pairwise Variability Index (nPVI) as a better measure of rhythm. In this metrics, "the mean absolute difference between successive pairs of vowels in an utterance combined with a normalisation procedure for speaking rate" is obtained (Low et al., 2000: 382-383):

$$nPVI = 100 \times \left[\sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{(d_k + d_{k+1})/2} \right| / (m-1) \right]$$

where m = number of vowels in utterance; d = duration of the k^{th} vowel.

Low et al. (2000) used the nPVI-V scores to make a comparison for vocalic intervals (nPVI-V) for BrE and SingE where the findings showed that SingE was slightly more syllable-timed than BrE. However, the findings obtained reflected on the usage of %V suggested by Ramus et al. (1999) where it did not reflect in the differences between the accents of aforementioned Englishes. A lower nPVI values would indicate lower variability between successive pairs of vowels and suggest a tendency towards syllable-timing.

Furthermore, Low et al. (2000) also suggested a consonantal PVI by analogy with ΔC especially for the use of cross-linguistic comparisons in which languages may possess both properties of stress-time and syllable-time. In addition, Grabe and Low (2002) also proposed that overall variation between languages in consonantal interval duration should be measured by rhythm metrics than normalized way. Hence, the formula for raw Pairwise Variability Index (rPVI) suggested by Low et al. (2000) is the mean of the differences between successive intervals,

$$\mathrm{rPVI} = \left(\sum_{k=1}^{m-1} |d_k - d_{k+1}| \right) \Big/ (m-1)$$

where m = number of vowels in utterance; d = duration of the k^{th} vowel.

Another version of the PVI was used by Deterding (2001), who measured whole syllables in spontaneous speech rather than vowels and normalized based on the entire

utterance (compared to a pairwise normalization). He used this variability index metrics as he felt that the PVI metric was more suitable to read data and not to conversational data where a succession of syllables may be produced at different speaking rates. Deterding (2001) also explained that he did not include the final syllables because of difficulties in determining where the syllable actually ends, and also to counter the effect of syllable final lengthening, which is a characteristic of Singapore English. The formula for the VI is as follows, where *dk* is the k^{th} syllable, and *n* is the number of syllables in an utterance:

$$\mathrm{VI} = \frac{1}{n-2} \sum_{k=1}^{n-2} |d_{k+1} - d_k|$$

Arvaniti (2009), however, argued that metrics like the nPVI and ΔC and %V are affected by whether the data comprises read or spontaneous speech. Besides, Arvaniti (2009: 51) also pointed out that the materials used in research can also affect the rhythmic style of a language being examined where she stated that 'more stress-timed materials can yield scores that are closer to those of stress-timed languages and more syllable-timed materials can yield scores closer to those of syllable-timed languages' (see also White & Mattys, 2007). Thus, she calls for an examination of other factors apart from duration in the study and classification of rhythm (2009). Similarly, Nolan and Asu (2009: 75) also cautioned against relying solely on duration, which they said "cannot be assumed to be either the exclusive correlate of perceived rhythm or to act independently of other cues in perception".

2.3 Studies on Speech Rhythm

Various studies on rhythmic patterns of different languages have been carried out in order to categorize each language into a certain category of rhythmic structure using different metrics (see section 2.2). Hence, it is interesting to see by applying different metrics on languages which has initially been classified or has an absolute description as stress- or syllable-timed, language can exist at a different scale.

Read materials have been used in most of the earlier studies of rhythm (Low et al., 2000; Low, 1994, 1998) and others on spontaneous speech (Deterding, 2001; Nokes & Hay, 2012; Rourke, 2008; Tongerson & Szakay, 2011**;** Tan & Low, 2014). The advantage of using read text is because those sentences in the text are carefully designed to be focused on different areas of prosodic features and also to abstain from sequences that are difficult to be segmented (Deterding, 2001) while the advantage of using spontaneous speech is it enables one to see the colloquial speech of a variety of English. Besides, these studies have particularly used certain matrix or perhaps all metrics to measure the rhythm in variety of English. The advantage of using different metrics is to see which suits the different context used.

2.3.1 Types of Metrics used for Rhythmic Studies among the L1 Speakers

PVI is a matrix which is commonly used while measuring speech rhythm of L1 speakers using read text because PVI is known as a measure that normalizes speaking rate (Arvaniti, 2009). For example, Low et al (2000) conducted a study in order to examine the acoustic nature of British English (BrE) and Singapore English (SingE). Besides, a comparison of the PVI and other rhythmic measures were carried out on the data as well in order to show which metrics is successful in capturing rhythmic differences. Ten BrE and SingE speakers were recorded reading a list of ten sentences that was divided into two where the first set was a combination of full and reduced

vowels and the second set was full vowels. Two experiments were conducted in this study. The first experiment was to compare the vowel duration of BrE and SingE while the experiment was to examine the spectral patterns in vowels of BrE and SingE. The results showed that for experiment 1, the PVI values of SingE were smaller compared to BrE which showed that SingE is moving towards the syllable-timed language whereas BrE is moving towards stress-timed language. As for experiment 2, the results showed that the reduced vowels were more marginal in SingE compared to BrE in the F1/F2 formant spaces. Lastly, a comparison of set of measure was carried on the data. It was concluded that the PVI measure was a better indicator for rhythmicity.

The PVI was also used by Szakay (2006) in her study where she studied on the rhythm and pitch of New Zealand English (NZEng). 36 male and female speakers, aged between 18 and 65, where 24 speakers were of Maori and 12 were of Pakeha were recorded reading a passage from the book entitle The Little Prince and were also asked to talk about rugby or other sports of their choice. Only the first 3 sentences of the reading passage and the first 10-15 minutes of spontaneous speech were taken for each speaker to be analysed. nPVI was used for the measurement of rhythm. The writer followed the methods used by Grabe and Low (2002) to conduct the measurement where firstly, the diphthongs and the neighbouring vowels were treated as one vocalic segment. Secondly, initial glides were treated as consonants and lastly, exclusion of pauses and hesitations. The results of the study were analysed in five different parts. Firstly, rhythm and ethnicity: Maori English was more syllable-timed compared to Pakeha English. Secondly, rhythm and age: Younger speakers of both Maori and Pakeha English were more syllable-timed compared to the older speakers where this clearly shows that NZ Eng is becoming a syllable-timed language. Thirdly, rhythm and Maori Integration Index (MII): Speakers who are more integrated into Maori Society are more syllable-timed due to the higher MII. Fourthly, rhythm and passage: For both

Maori and Pakeha speakers, they were more syllable-timed in read speech compared to spontaneous speech. Lastly, rhythm and gender: Maori female speakers were less syllable-timed compared to Maori male speakers whereas Pakeha female speakers were slightly more syllable-timed than male speakers. Overall, it was concluded that PVI was able to distinguish that Maori English is more syllable-timed than Pakeha English.

However, there are studies which also argued that PVI is not the best matrix for measuring read speech as it is not as reliable and as valid as the other metrics due to the lack of controlled data in their studies (Ramus et al., 1999). For example, Knight (2011) conducted a study in order to investigate temporal stability of rhythm metrics in order to have good test-retest reliability in a task where speakers will be able to produce the same material on successive occasions. Four Southern British English speakers of which three were female, and one male, aged 21–43 years, were recorded reading the passage on NWS. The author conducted an informal auditory analysis before conducting the acoustic analysis in order to have a controlled production of speech and to examine if the speakers were using a typical English rhythm throughout the sessions. All seven metrics (nPVI-V, rPVI-C, ΔV, ΔC, VarcoV, VarcoC and %V) were applied on the data analysed. The results showed that the vowel based metrics %V is more reliable and valid, especially %V compared to those that based on consonant based metrics.

Based on the three studies mentioned previously, it can be concluded that the measurement that best suits or commonly used for the analysis of read speech among L1 speakers of English is PVIs (as suggested by Low et al., 2000). However, Knight (2011) feels that the vowel based metrics are better compared to consonant based metrics as the former metrics are more reliable and is a valid one compared to the latter.

Similarly, PVI was also said to be a good measure to determine the speech rhythm of L1 speakers using spontaneous speech. For example, Tongerson and Szakay

(2011) conducted a study on rhythm in London English to analyse whether syllable-timing was a feature of Multicultural London English (MLE). Young and old speakers from both Hackney and Havering (inner and outer London respectively) were used in this study. These speakers were born in London and had backgrounds of working-class. The young Hackney speakers used in this study were 36 teenagers of Anglo and non-Anglo backgrounds. They were born between 1985 and 1988 and their ages were ranging from 16 to 19. Also, 11 elderly speakers were used in this study (7 born 1918-1938, 4 born 1874-1892). The step taken in this study as suggested by Arvaniti (2009) was to control the variation in the speaking style so that the speech rhythm will not be affected. The author recorded personal narratives such as fights, police incidents and family issues. The duration for each recorded speech for each speaker varied from 45 to 180 seconds. The speech was then segmented (see Tongerson & Szakay, 2011: 168) and was measured using PVI as suggested in Grabe and Low (2002). There was only a small difference in the nPVI values between the adolescent speakers as well. Overall, the speakers of Hackney were more syllable-timed compared to the speakers of Havering.

Nokes and Hay (2012) conducted a study in a large scale among the New Zealand Speakers in order to investigate the timing of NZE that leads to the changes in rhythmic structure. The data was taken from three corpora [the Mobile Unit (MU), the Intermediate Archive (IA) & Canterbury Corpus (CC)] in the Origins of New Zealand English project. 500 citizens of New Zealand (born 1851-1988) were interviewed and the recorded interviews were examined in this study using the Hidden Markov Model Toolkit. PVI was applied on the segmented data to measure the duration for mean variation, intensity, and pitch of successive vowels in the speech. The results clearly showed that the nPVI-Vs for duration have deteriorated over time and has led to the changes in speech rate. It supports the existing findings that by compared to other

varieties of English, duration of modern NZE less differentiates the stressed and unstressed vowels.

However, Deterding (2001) argued that VI would be a better measure in measuring a speech rhythm of L1 speakers. He conducted a comparison study of the 'High' variety of English based on spontaneous speech of Singapore English (SgE) and British English (BrE). L2 female speakers were used to conduct the analysis. 6 female speakers were of SgE, aged between 18 and 20 years, ethnically Chinese and have just started their Diploma in Education programme. All 6 SgE speakers speak clear and fluent English. The other 6 female speakers were of BrE, aged between 35 and 45 and are all academicians at National Institute of Education, Singapore. Although they are from different parts of Britain, due to their long teaching experience in Singapore, they all speak standard Southern British English. Interviews were conducted by the author on different topics ranging from languages used at home to future plans (see Deterding, 2001). First 50 utterances of each speaker were analysed with no pauses or hesitations. VI was then used to calculate the differences in the duration of neighbouring syllables. Some issues on measurement were taken into consideration during the study. Firstly, the number of syllable was determined in a stretch of speech due to merging of words such as "we are" and "we're" where it is often unclear in a spontaneous speech. It was then assumed by the author that there are lesser syllables due to the conversational style. Secondly, final syllables were excluded due to the interference of syllable-timing measurement. Thirdly, syllables were measured as a whole and not based on vowel durations (Low 1994, 1998). Fourthly, syllabification: maximal onset principle was applied for the measurements of the consonants. Deterding (2001: 221-222) argued that

> … there is no universally accepted algorithm for syllabifying polysyllabic words. According to the *maximal onset principle*, intervocalic consonants are assigned to the following syllable so long as that does not violate the phonotactic constraints of syllable onsets (for example, according to this principle, "sister" would be /siste/…

Lastly, the speech for each speakers were normalized where duration of each syllables were divided by the average duration of all syllables of the utterance (excluding the last syllable). The results showed that all 6 speakers of each SgE and BrE demonstrated a wide range of speaking rates and little proofs were found on the influences of speaking rate on the rhythm measured but the reduced syllables in BrE did exhibit influence on the variation in rhythm. So, it is not advisable to describe or categorize both SgE and BrE as "stress-" or "syllable-" timed language because they exist at different place along the scale but not at extreme positions.

Based on the three studies mentioned above, it can be concluded that the measurement that best suits or commonly used for the analysis of spontaneous speech among L1 speakers of English are PVIs (as suggested by Low et al., 2000). Through this measurement, the characteristic of a language is able to be captured (Low et al., 2000).

2.3.2 Metrics Used for Rhythmic Studies among the L2 Speakers

As for the rhythmic studies among the L2 speakers, most of the studies carried out have used PVI to determine the rhythm of a language. In their study, Low et al. (2000) conducted a study in order to examine the acoustic nature of British English (BrE) and Singapore English (SingE). Besides, a comparison of the PVI and other rhythmic measures were carried out on the data as well in order to show which metrics is successful in capturing rhythmic differences. Ten BritE and SingE speakers were recorded reading a list of ten sentences which was divided into two where the first set was a combination of full and reduced vowels and the second set was full vowels. Two experiments were conducted in this study. The first experiment was to compare the vowel duration of BritE and SingE while the experiment was to examine the spectral patterns in vowels of BritE and SingE. The results showed that for experiment 1, the

PVI values of SingE were smaller compared to BritE which showed that SingE is moving towards the stress-timed language whereas BritE is moving towards stress-timed language. As for experiment 2, the results showed that the reduced vowels were more marginal in SingE compared to BritE in the F1/F2 formant spaces. Lastly, a comparison of set of measure was carried on the data. It was concluded that the PVI measure was a better indicator for rhythmicity because it may be able to capture the characteristic of languages.

Besides, Grabe and Low (2002: 4) took duration measurements on 18 different languages which are "British English, German, Dutch, Thai, Tamil, Spanish, French, Singapore English, Japanese, Polish, Catalan, Estonian, Greek, Luxembourg, Malay, Mandarin, Rumanian and Welsh". Each speakers were recorded reading the passage on "The North Wind and the Sun (NWS)" in their respective languages. Each speaker were recorded under different circumstances and places (see Grabe & Low, 2002) and were also given time to read the text once before being recorded by the authors. Measurements on data were done accordingly based on generally accepted criteria for identification of vowels (Fischer-Jorgensen & Hutters, 1981; Peterson & Lehiste, 1960; as cited in Grabe & Low, 2002). For example, Grabe & Low (2002: 5) mentioned that

> … in fricative-vowel sequences, the onset of the vowel was taken to be the onset of the second formant …vowel-voiceless fricative sequences, the vowel was considered terminated where the noise pattern began …vowel-voiced fricative sequences, we considered the vowel terminated at the onset of high frequency energy. Nasal-vowel sequences were segmented by observing the fault transitions between nasal and vowel.

Besides, glides were not identified phonetically or phonologically but based on acoustic criteria. The formant movements for initial glides were on-going from glide to vowel. Glides were included in the vocalic portion. However, if there were evident changes in formant structure or amplitude of the signal, initial glides from vocalic portions were excluded from the analysis. Furthermore, pauses between intonation phrases and hesitations were also excluded. nPVI was used for the measurement of the data. In the

authors' previous study, nPVI was only applied for vocalic intervals; however, for this study nPVI was also applied for the measurements of intervocalic as well in order to further support the application of normalisation. The results of the study were analysed based on the predictions set. . It was noted in their study that languages that are stress-timed would display high vocalic nPVI and high intervocalic rPVI values while languages that are syllable-timed would display low vocalic nPVI and low intervocalic rPVI values. Besides, it was also noted that "mixed language with complex syllable structure and no vowel reduction would have lower vocalic nPVI value than stress-timed languages but a relatively high intervocalic rPVI value or to have a relatively high vocalic nPVI value combined with a low intervocalic rPVI" (Grabe & Low, 2002: 6). Besides, classification of rhythmic pattern of languages were carried out based on the metrics scores where languages that fall below 50 was classified as syllable-timed language whereas languages that fall above 50 was classified as stress-timed language. The results showed that British English, Dutch and German were classified as languages that are stress-timed whereas Spanish and French were classified as languages that are syllable-timed. The results for the five languages mentioned were as expected and were based on the traditional classification. Languages like Greek, Malay, Romanian, Singapore English, Tamil, Welsh, Catalan, Estonian and Polish appeared to have mixed rhythmic pattern and was unclassified to have a specific rhythm. The other four languages were explicitly classified where Thai as stress-timed language and Japanese, Luxembourgish, and Mandarin as syllable-timed languages. The authors then concluded that there is a significant overlap between the stress- and syllable-timed group and the unclassified languages.

Furthermore, there were also studies that were carried out for Tamil Language. Keane (2006) conducted a study on the characteristics of rhythm for colloquial and formal Tamil. The respondents used in this study were five Indian Tamil speakers

(native speakers) and also five southern British English speakers, age ranging from 22 to 37 were recorded. For most of the Tamil speakers, although Tamil was used at home, it was used for education as a second language and English was treated as their first language. The speakers were recorded reading the passage on NWS either in English or Tamil. The Tamil speakers were recorded reading a formal version first and then a colloquial version using Tamil script. This study followed closely to the rhythmic measures used by Ramus et al. (1999) and Grabe and Low (2002) and also other rhythmic measures by Low and Grabe (1995), Low et al. (2000) and Deterding (2001). These measures of rhythm were employed in order to validate the reliability and the advantages of different measures used. The range of differences between colloquial Tamil and formal Tamil and also the variation between the two varieties mentioned and British English data were also examined. The results showed that the application of different rhythmic measures has shown some important differences between the formal and colloquial Tamil and British English. Based on the analysis, both forms do not vary significantly in nPVI-V values from each other where they were closer to the languages that are stress-timed compared to the languages that are syllable-timed. However, the consonantal PVI values were significantly different because formal Tamil is more or less placed with languages that are stress-timed whereas the colloquial Tamil is placed further from the languages that are syllable-timed. Hence, both formal and colloquial Tamil have minimal grounds to be assigned to any of the traditional categories which are either "stress-" or "syllable timed".

In a study of other Indian languages, Oration (2009) who conducted a study on speech rhythm of twelve Indian languages, which are Assamese, Bengali, Gujarathi, Hindi, Kashmiri, Marathi, Oriya, Punjabi, Kannada, Malayalam, Tamil and Telugu. He recorded 20 speakers (10 female, 10 male) reading a 100 word passage in each language and the PVIs were then later calculated. The results showed that among all the

languages mentioned above, Hindi was the only language which was syllable-timed whereas the other 11 languages were mora-timed.

Based on the discussion of two studies above (Keane, 2006; Oration, 2009), it is clearly seen that the results obtained are different for Tamil language. Keane (2006) argues that it is difficult to categorized Tamil to either "stress" or "syllable-timed". However, surprisingly, Oration's (2009) findings were totally different from Keane (2006). He argues that Tamil falls in the category of mora-timed. Hence, it can be concluded that even-though the matrix used to analyse the Tamil language is the same, however, external factors such as subjects, first language of the subject, reading materials that are used to analyse speech rhythm may have affected the results obtained by both researchers.

Deterding (2011) also used PVI in a comparison study between Malay and Standard BrE. In his study, he examined 12 speakers (6 Malay speakers, 6 BrE speakers) reading the text on NWS. The NWS text was translated to Malay language for the Malay speakers to read while the BrE speakers read the text in English. He then used PVI to measure the rhythm of Malay language to be compared with BrE. The results showed that the Malay speech had lower PVI scores compared to the BrE speech. This shows that Malay speech may be more syllable-timed which contradicted the study of Low and Grabe (2002).

However, Wan Aslynn (2012) found that Malay was more of a syllable-timed language. She conducted a study to validate the claim made by Zuraidah, Knowles, and Yong (2008) that there is no stress in Malay language since the latter did not consider factors such as the morphological features of Malay language. Therefore, this study concentrated on the 'duration and intensity of the vowels in the target words from three morphological environments as possible correlates of stress in Malay' (p71). Three native speakers of Malay were recorded reading a list of sentences with target words

embedded in it (for example, *'kemukakan, membidakan'*). Metrics such as ΔC, ΔV and %V, rPVI and nPVI were used to measure the data of this study. The author followed Deterding (2001)'s measurement criteria where the final syllable of the last words were excluded in order to avoid the effect of final lengthening. The results showed that Malay language was a syllable-timed language as it was traditionally classified. Hence, she concluded that it is not effective to categorize a language based on the scores obtained as different metrics yield different results on different speaking styles.

Another study on rhythm was carried out by Sarmah, Gogoi & Wiltshire (2009) for Thai English using %V and nPVI. This research is conducted to investigate the rhythm and vowel system of Thai language in order to compare each to the substrate language Thai, two New Englishes in Asia and also to target the varieties of English. 12 Thai speakers were used in this study ranging from 23 to 32 years old with fairly homogenous years of English background and likely to be speaking central Thai at home or adopted while studying in Bangkok. The speakers were recorded reading English words, sentences and a short paragraph for measures of Thai English and after which they were interviewed on their language background in order to gather the spontaneous speech. The data collected was then measured using %V (Ramus, Nespor & Mehler, 1999) and nPVI (Grabe & Low, 2002). The results for the measurement of Thai English show that the value for nPVI is near to stress-timed whereas the value for %V shows a high value of syllable-timed. It was also reported that regardless of read text or spoken speech, the nPVI values for Thai English are higher than Thai language itself but lower than what Grabe and Low (2002) had reported. It was then concluded that Thai language indeed appears to be having a mixed characteristic of rhythm – "stress-" or "syllable-timed".

However, it is no longer the same matrix (PVI) used for spontaneous speech. There are also studies which were conducted using more than one metrics and speech

context to determine the speech rhythm of a language. This is to prove that different metrics used may produce different results for different speech styles. For example, Lin and Wang (2007) in their study measured the rhythm of Mandarin language. Mandarin was always categorized as syllable-timed language based on auditory impression and also based on traditional analyses. The writer used the metrics suggested by Ramus et al. (1999) and Grabe and Low (2002) in this study to validate the auditory impression and traditional analyses of Mandarin language. They used six Mandarin speakers (three men and three women) who originated from Northern China speaking Standard Mandarin. A read speech (NWS in Mandarin) was given to all speakers to read and also a casual conversation was carried out among all the speakers individually based on their topic of interest. Measurements such as vowel quantity (%V) and the mean consonant standard deviation (ΔC) by Ramus et al. (1999) and the nPVI and the rPVI by Grabe and Low (2002) were used in this study. Overall, their results showed that the average value for ΔC and the two PVIs were consistently larger for spontaneous speech than read speech. The results also showed that the spontaneous speech generates more differences in consonantal and vocalic durations than read speech. Besides, ΔC value for every subject is constantly higher in spontaneous speech than read speech. Thus, it clearly showed that different rhythmic measure yield different results (especially ΔC) for different speaking styles.

Also, a recent study by Tan and Low (2014) compared the Pairwise Variability Index (PVI) and VarcoV between MalE and Singapore English (SingE). The subjects were ten males and ten females Malay undergraduates of both MalE and SingE in their respective countries. They were also speakers of both English and Malay. The average age for MalE and SingE speakers were 21.1 and 26 respectively. The speakers were recorded for both read speech and spontaneous speech. As for the read speech, the speakers were recorded reading the passage on “The Boy who Cried Wolf”. As for the

spontaneous speech, the speakers were recorded speaking on a given topic "My most memorable holiday" for about 5 minutes. For both sets of data, besides using Pairwise Variability Index (PVI) to measure, VarcoV was also used to measure these sets of data. Significant differences were found for PVI and VarcoV in read text. As for spontaneous speech, significant results were found for PVI and not significant for VarcoV. Tan and Low (2014) also reported that there was no significant difference between the average PVI values for the sentences comprising only full vowels and the ones containing both full and reduced vowels, further suggesting the syllable-timed nature of MalE.

Based on the comparison of metrics done for all studies mentioned above regardless of different speaking styles for L1 or L2 speakers, it can be seen that PVI is a matrix which commonly used as it is a measure that normalizes all speaking rates (see section 2.4.1 and 2.4.2). However, it is can also be clearly seen that other metrics such as %V and normalized ΔC, VI and Varco are also used to get a comparative result between different speech styles in order to yield a significant results. Therefore, it can be concluded that different metrics does produce different sets of results in determining a rhythm of a language. It is difficult to determine which metrics suits most for which speaking styles or even which type language speakers (L1 or L2 speakers).

2.4 Effects of L1 on Rhythmic Properties of L2

There has always been discussion on whether the rhythmic patterns in the L1 of a speaker have an effect on L2 rhythm. Some studies show that L1 rhythm influences L2 rhythm. For example, L2 speakers of English (L1 is Mandarin) were found to employ their L1's rhythmic pattern (syllable-time) on their L2 by Mok and Dellwo, 2008. Similarly, Sarmah et al. (2009) who conducted a study to evaluate the rhythm of L2 speakers of American English whose L1 was Thai found out that L1 speakers had rhythmic values (based on PVI-V and %V values) that were very different from those of

native English speakers although they had spent time in the United States. This may be indicative of the influence of their L1 rhythm.

Gut (2012), however, cautioned that different speakers may yield different results when it comes to distinguishing native and non-native varieties of the same language. Gut (2012) says that speakers who are acquiring an L2 may or may not use the same rhythmic pattern as their L1 because they may or may not positively transfer the rhythmic patterns of L1 on L2. For example, Low et al. (2000) and Deterding (2001) examined the rhythmic pattern of SingE and BrE. It was found that SingE was regarded as a syllable-timed language because the speakers of SingE positively transferred the rhythmic pattern of their L1 (Mandarin) on their L2 (SingE). These findings are similar to what was reported in the previous paragraph. However, there is little evidence of a non-transfer of L1 rhythm on L2.

In fact, Li and Post (2014) pointed out that research in L2 prosody fails to give consistent evidence for rhythmic differences in L2 speech. This may be in part due to the metrics used. For example, White and Mattys (2007) found that PVI (consonantal and vocalic) did not distinguish between native and non-native English or native and non-native Spanish rhythm. Hence, assumptions about the influence of L1 rhythm on L2 rhythm, (for example, if L1 and L2 rhythm are different, the L2 is likely to show influences of the L1 rhythm) may not always be straightforward.

2.5 Test Materials

In phonetic research, varieties of texts have been used to examine a language acoustically across different types of languages. The text "Arthur the Rat" was used to describe the different types of Englishes in the nineteenth century (Deterding, 2006). However, Abercrombie (1964) pointed out that this passage was quite long with 361 words in order to carry out measurements acoustically. Hence, from 1912, the

International Phonetic Association came out with a much compact version of a text, "North Wind and the Sun" (NWS) with 133 words in different languages and dialects. Deterding (2006) asserted that NWS has proved to be a remarkably valuable resource where it has allowed researchers to do comparison studies on pronunciation across languages.

The text on "The North Wind and the Sun" as it occurs in the *Handbook of the IPA* (IPA 1999: 39) is as follows:

> The North Wind and the Sun were disputing which was the stronger, when a traveller came along wrapped in a warm cloak. They agreed that the one who first succeeded in making the traveller take his cloak off should be considered stronger than the other. Then the North Wind blew as hard as he could, but the more he blew the more closely did the traveller fold his cloak around him; and at last the North Wind gave up the attempt. Then the Sun shone out warmly, and immediately the traveller took off his cloak. And so the North Wind was obliged to confess that the Sun was the stronger of the two.

Although this text has worked quite well for many studies, there are also criticisms of this text. There are some disadvantages of using this text. Deterding (2006) thoroughly discussed these in his study. These included the absence of some sounds of English in the text, such as '/ʒ/, medial and initial /z/, initial /θ/, word-final /l/, word-final consonant clusters ending in /s/ or /z/, and the diphthongs /ɔɪ/ and /eə/' (see Deterding 2006:188-190). Besides, Tan and Low (2014: 7) have also highlighted that there are 11 words that are problematic which are "*wind, were, which, was, when, warm, one, stronger, traveller, wrapped* and *around*" has resulted in measurement problems for vowel duration due to the presence of initial /w/ or /r/ referring to the discussion in Deterding (2006). There is also an instance of dark /l/ as in /foʊld/. Further, there are also repetitions of a few lexical words in the text. There are total of 113 words in the NWS passage. Deterding (2006) points out those 49 words which are being repeated and only 64 words are different words. Therefore, he suggested an alternative passage, which is the *Wolf.* The text on "Wolf" as suggested by Deterding (2006) is as follows:

> 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.

In comparison to the NWS text, the Wolf passage is almost twice as long as the NWS text (216 words). Thus, the time taken to read the Wolf passage is longer compared to the NWS (Deterding, 2006). The writer also explained that the words repeated are a little bit lesser compared to the NWS.

However, Tan and Low (2014: 7) asserted that the passage on *The Wolf* is no better due to the same issues faced in NWS which is in the acoustic measurement. Besides, they have also observed words that are problematic (*was, once, water, wolf, with, were, away, forest, raising, run, rushed, tried, tricked, threaten, racing, cried, trying, used and usual)* in *The Wolf* text which are lesser found in NWS.

2.6 Summary of Chapter 2

In this chapter, the notion and measurements of rhythm were discussed. Previous studies on the different metrics and test materials used to examine the rhythm of L1 and L2 speakers were also discussed. The following chapter presents the methods used in the present study.

CHAPTER 3

METHODS

This chapter discusses on the methods used to carry out this study which includes the explanation of the research design, selection of speakers and their background information, source of data (COSME Project), instruments and materials used and data analysis.

3.1 Research Overview

This study is designed to acoustically analyse the rhythmic properties of Malaysian English in relation to the influence of different speaking styles and metrices used among three different ethnic groups in Malaysia. Table 3.1 presents an overview of the research in this study.

Table 3.1: Research outline

Research Questions	Source of Data	Methods of Data Collection	Methods of Data Analysis
1. To what extent do different speaking styles (read and informal conversational speech styles) affect the rhythmic properties found in MalE? 2. To what extent are there differences in the rhythmic properties among three ethnic groups (Malay, Chinese and Indian) in Malaysia? 3. To what extent are there differences in rhythm of MalE by using different metrices (nPVI-V, rPVI-C and VarcoV)?	1. 12 female speakers (average age 43 years old) – 4 Malays – 4 Chinese – 4 Indians [Corpus of Spoken Malaysian English (COSME)] 2. All fluent speakers 3. Fairly homogenous - Educational background - Profession (English language lecturers)	1. Read Speech - *North wind and the Sun* 2. Spontaneous Speech - sharing information about themselves and their families	1. 1. Praat version 5.3.82 (Boersma & Weenink, 2014) 2. 2. Measurements - nPVI-V - rPVI-C - VarcoV 3. Statistics - Averages, Means & Standard Deviations - T-tests - Anova

3.2 Speakers

Female Malaysian speakers from three different ethnic groups were selected for this study: four Malays, four Chinese and four Indians. The average age of the speakers was 43 years. Speakers from these three different ethnic groups were selected in order to analyse the similarities or differences in rhythm across these groups. All 12 speakers are fluent L2 speakers of English Language (as annotated in the metadata of COSME). All four Malay speakers claimed Bahasa Melayu or Malay as their L1, four Chinese speakers claimed Cantonese, Hokkien and Mandarin respectively as their L1 whereas three Indian speakers claimed English as their L1 and 1 speaker claimed Tamil as her L1 (see Table 3.2a). As for the Indian speakers, except for Speaker 1, although they had different heritage languages as their L1, English was their home dominant language. They grew up speaking English rather than their heritage languages. Besides, all these Indian speakers are not fluent in their heritage languages. All twelve speakers of this study are fairly similar in terms of educational background and profession. Besides, all of them are English language lecturers who had more than 10 years of experience of teaching English at the time of recording. The number of tokens measured for vocalic and consonantal intervals for both read speech and spontaneous speech are reported in Table 3.2 (b). The total number for vocalic and consonantal intervals for read speech is 1368 and 1459 respectively, and 2602 and 2683 respectively for spontaneous speech.

Table 3.2(a): The speakers and their home language

Speakers	Malay	Chinese	Indian
1	Bahasa Melayu	Cantonese	Tamil
2		Cantonese	English
3		Hokkien	English
4		Hokkien	English

Table 3.2(b): The number tokens for vocalic and consonantal intervals for both read and spontaneous speech

		Read Speech		Spontaneous Speech	
Ethnicity	**Speaker**	**Vocalic Interval**	**Consonantal Interval**	**Vocalic Interval**	**Consonantal Interval**
Chinese	1	99	114	176	193
	2	107	117	199	201
	3	115	122	156	163
	4	116	124	215	227
Indian	1	113	118	228	229
	2	114	121	112	121
	3	121	127	262	264
	4	121	124	277	290
Malay	1	111	120	292	303
	2	111	121	253	256
	3	120	124	292	298
	4	120	127	140	138
	Total	1368	1459	2602	2683

3.3 Data

This study's data was taken from the Corpus of Spoken Malaysian English (COSME). It comprises both read speech and spontaneous speech. The subjects were recorded reading the text on *North Wind and the Sun* (NWS) passage (Handbook of the International Phonetic Association, 1999) for read speech. There are differences in terms of prosodic features between read speech and informal conversational speech (Howell & Kadi-Hani, 1991; Johns-Lewis, 1986). Hence, this study analysed rhythm in both speaking contexts to identify if there were differences in rhythmic properties. The informal conversational speech style consisted of short interviews with the speakers. Each speaker was recorded sharing information about themselves and their families.

3.4 Procedure

All recordings were carried out in a quiet room. KayElemetrics *Computerized Speech Lab (CSL) Model 4500 was used* at a sampling rate of 44 000 Hz with a high-quality dynamic microphone placed a few inches from the mouth of the speakers (Pillai et al., 2012). These data were then transferred onto a computer to be analysed. Identical instructions were given each time to every speaker regardless of read text or informal interview. As for the read text, before each recording session was carried out, speakers were provided with the passage to read through once in order for them to be familiarised with the text. This was carried out in order to minimize factors that might affect the speech annotations. As for the informal interview, questions were posed to the speaker spontaneously during the interviews.

3.5 Acoustic Analysis

3.5.1 Read text

The passage *The North Wind and the Sun* consists of five sentences, 113 words and an average of 142 to 143 syllables. All five sentences were analysed from the read text of each speaker. These recordings which are transcribed orthographically were examined and annotated using Praat version 5.3.82 (Boersma & Weenink, 2014). The recordings for each speaker were segmented in text grids using Praat, into the following elements: text, vocalic and consonantal units. Tier 1 shows the text and tier 2 and 3 show the segmented elements as in consonantal and vocalic elements respectively (see Figure 3.1). The location of boundaries for vocalic and consonantal units were identified and labelled based on the formant structure of speech waveforms and wideband spectrograms (White & Mattys, 2007a). The duration was first measured from left-to-right for vocalic and intervocalic intervals. Vowels were identified following

closely to the criteria used by Grabe and Low (2002) where applicable and is discussed as below.

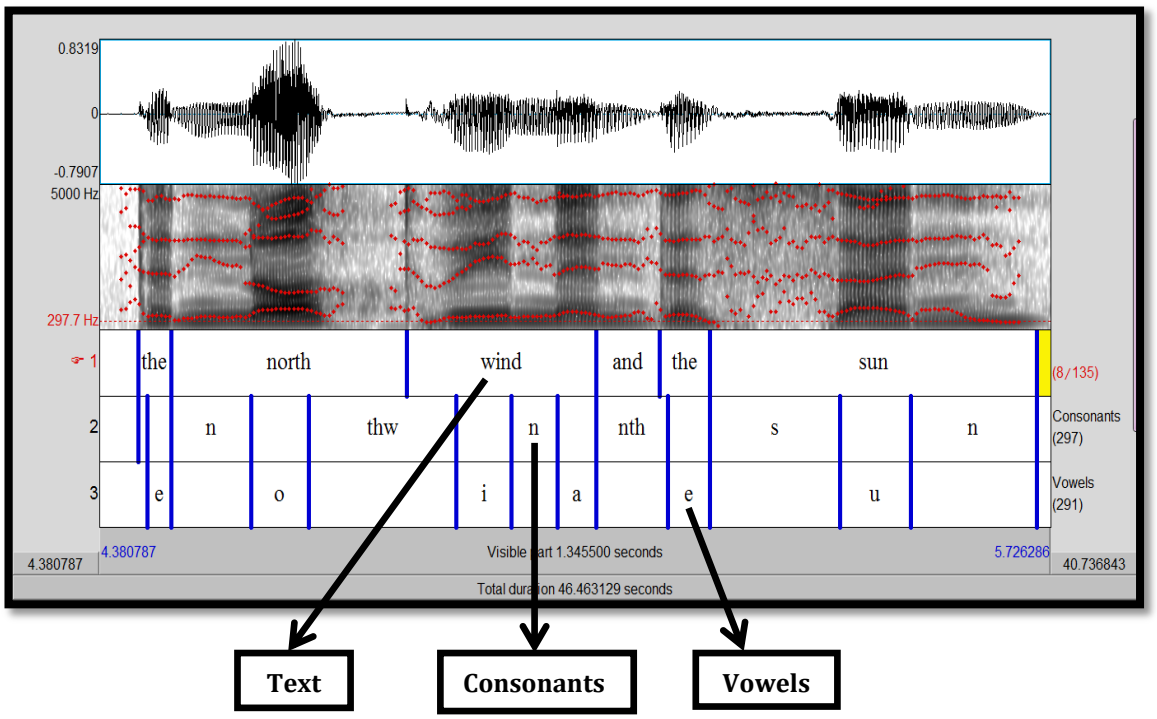

Figure 3.1: Screenshot of annotations in Praat for read speech

In fricative-vowel sequences, e.g. **"TRAVELLER"**, the vowel was considered terminated in order to standardise the measurement for every speaker. This is because the word **"TRAVELLER"** was commonly pronounced as TRA**VL**E by the majority of the speakers (see Figure 3.2).

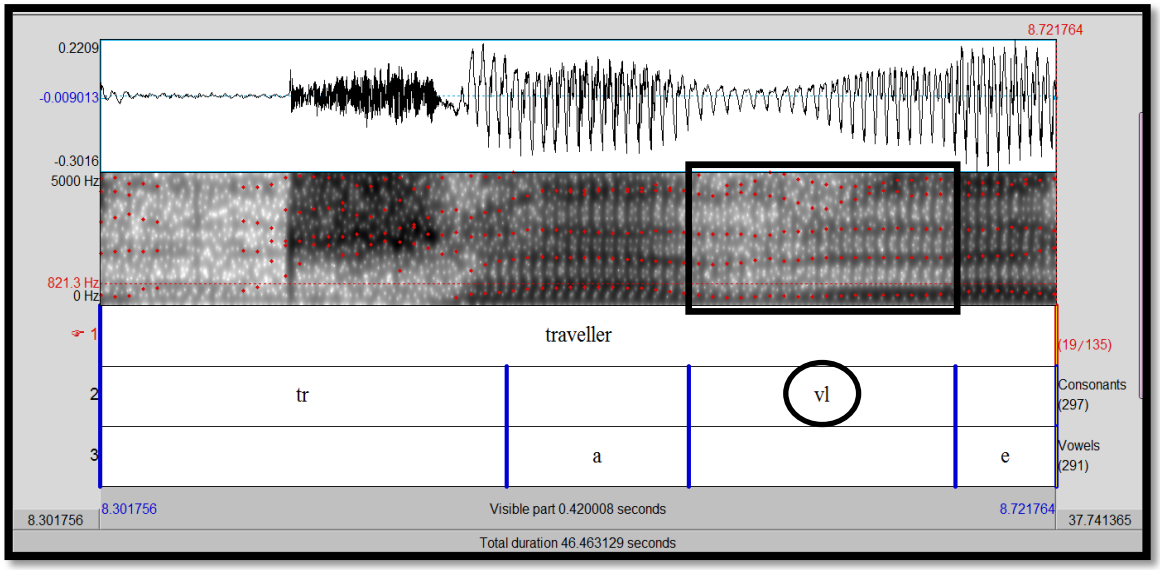

Figure 3.2: Screenshot of fricative-vowel sequences

Secondly, nasal-vowel sequences (e.g. stronger) and vowel-nasal sequences (e.g. disputing) were segmented by observing the formant movement of both the nasal and vowels (see Figure 3.3(a) & 3.3(b) respectively).

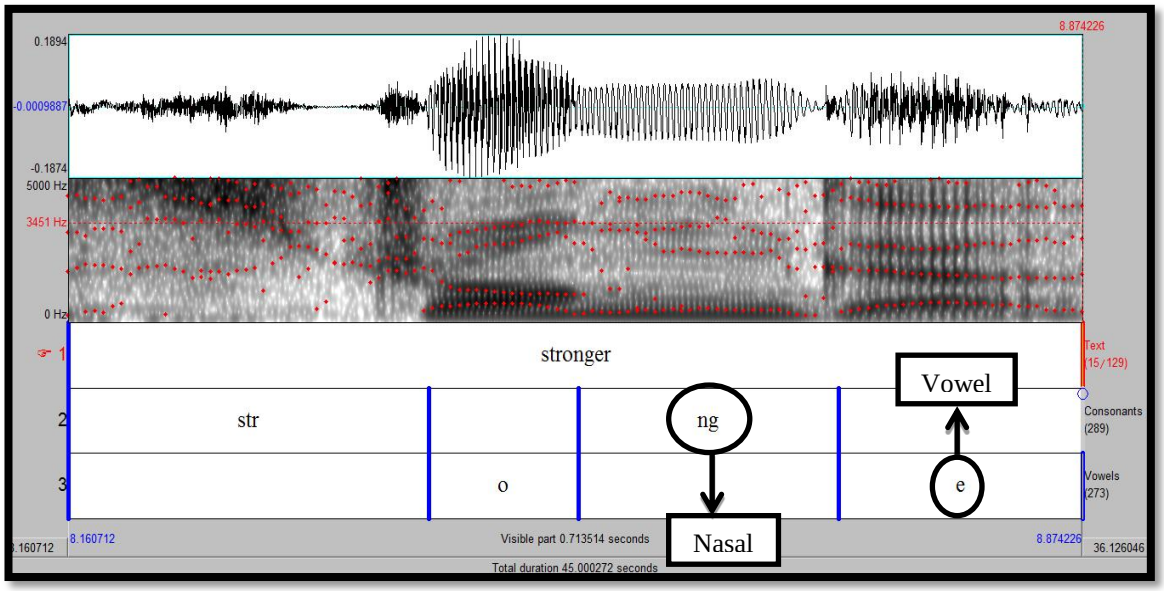

FIGURE 3.3(a): Screenshot of nasal-vowel sequences

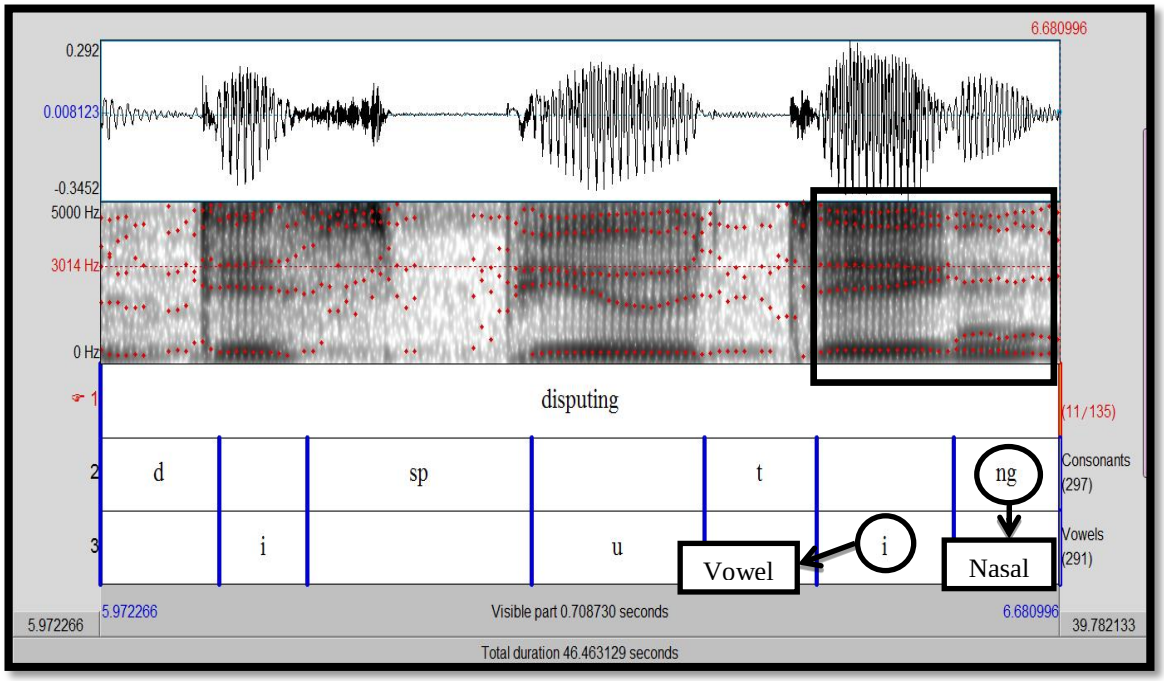

Figure 3.3(b): Screenshot of nasal-vowel sequences

Thirdly, in voiceless fricative-vowel sequences, e.g. **"SUN"**, the vowel **"U"** was considered measured when the noise pattern of voiceless fricative **"S"** ends (see Figure 3.4).

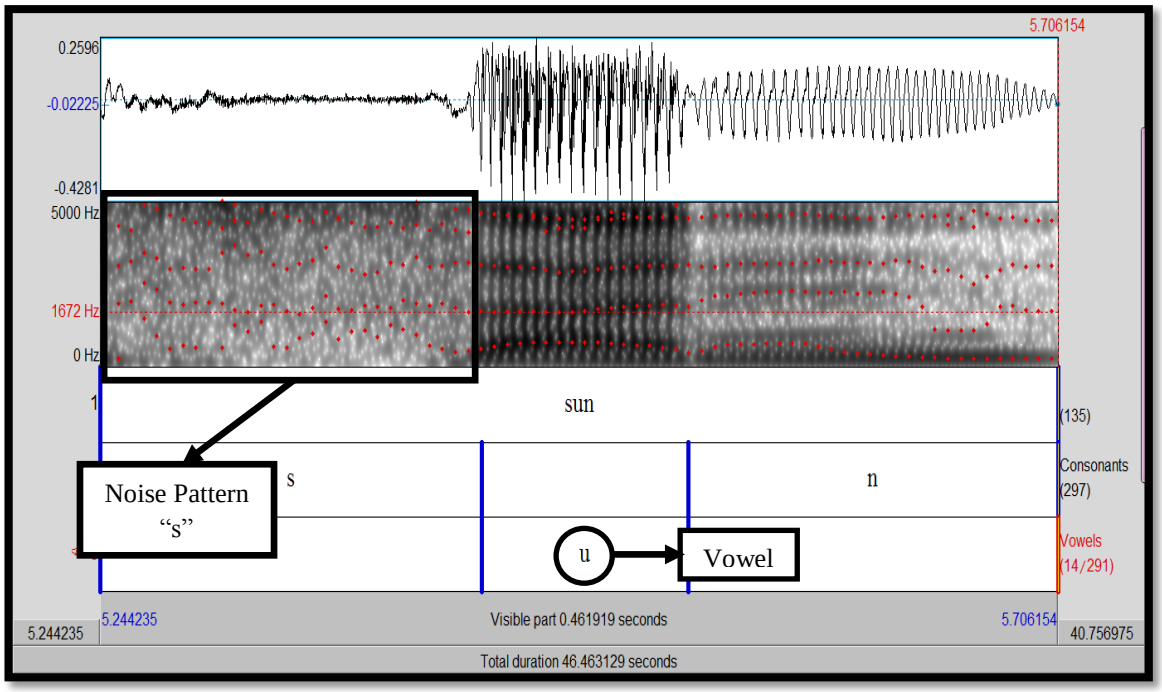

Figure 3.4 Screenshot of voiceless fricative-vowel sequences

Maximal onset principle was applied for the current study. Firstly, the final consonant of word that ends mostly with a glide /r/ is considered terminated in order to standardize the measurements. This is also because majority of the speakers in this study pronounced words such as **"STRONGER"** and **"TRAVELLER"** as **"STRONGE"** and **"TRAVELE"** respectively (see Figure 3.2 and Figure 3.5).

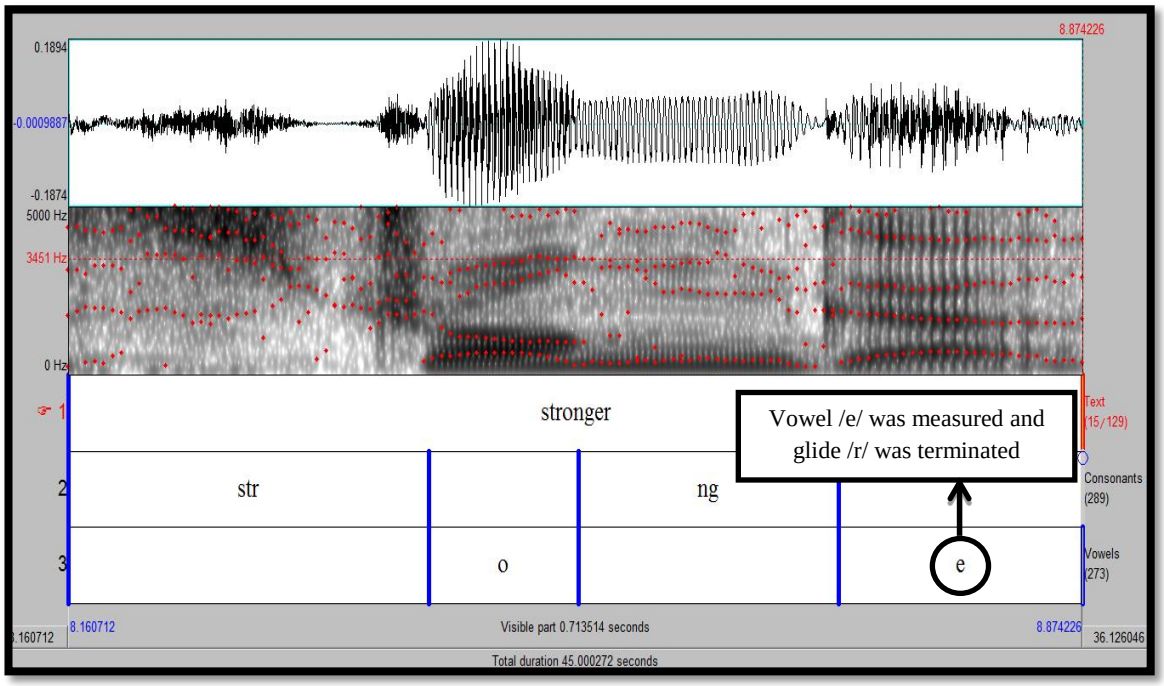

Figure 3.5: Screenshot of termination of final consonant

Secondly, words that end with voiced alveolar stop consonant /d/ were treated as silent. This is because in most cases of the read text, for example, **"FOLD HIS"**, **"AROUND HIM"**, **"WIND GAVE"**, **"OBLIGED TO"**, the speakers have pronounced those phrases as **"FOL HIS"**, **"AROUN HIM"**, **"WIN GAVE"**, **"OBLIGE TO"**.

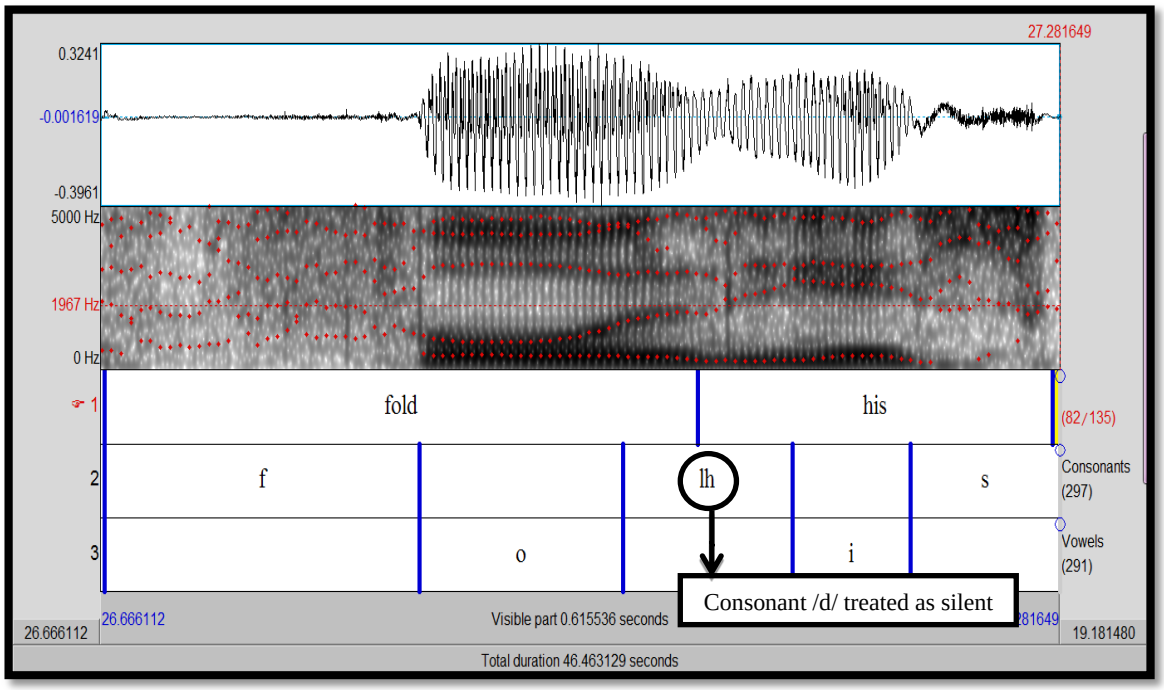

Figure 3.6: Screenshot of silenced voiced alveolar consonant

Thirdly, word that proceeds with approximants, for example **"WRAPPED"**, were segmented based on the transitions between approximants and vowels (see Figure 3.7).

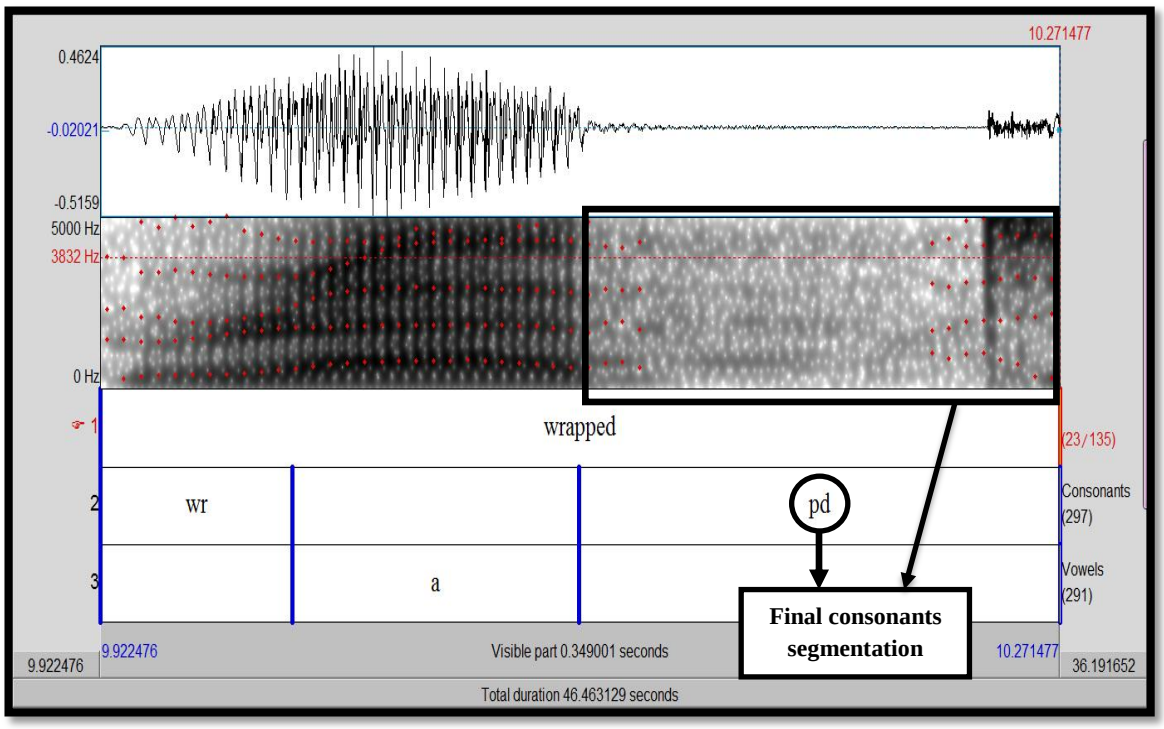

Figure 3.7: Screenshot of segmentation of words that proceed with approximants

Lastly, pauses between intonation phrases were excluded from the analysis (see Figure 3.8).

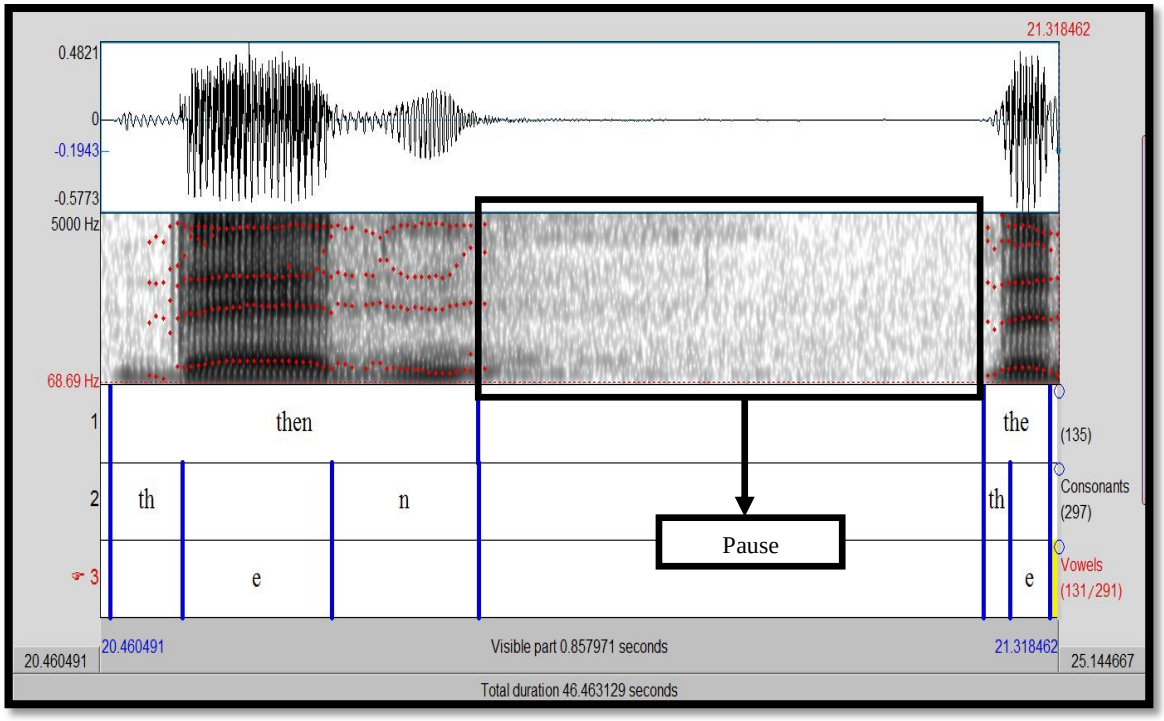

Figure 3.8: Screenshot of exclusion of pauses

3.5.2 Spontaneous Speech

The interviews recorded consisted of 33 utterances. These utterances were determined from the time the speaker starts her speech until when the point where she pauses or keeps silence. The utterances can be a word, a short phrase, or a sentence. The whole interview was analysed since these interviews are short with an average of 1 minute and 49 seconds. The recordings for each speaker were also segmented as read speech (see section 3.5.1 and Figure 3.9).

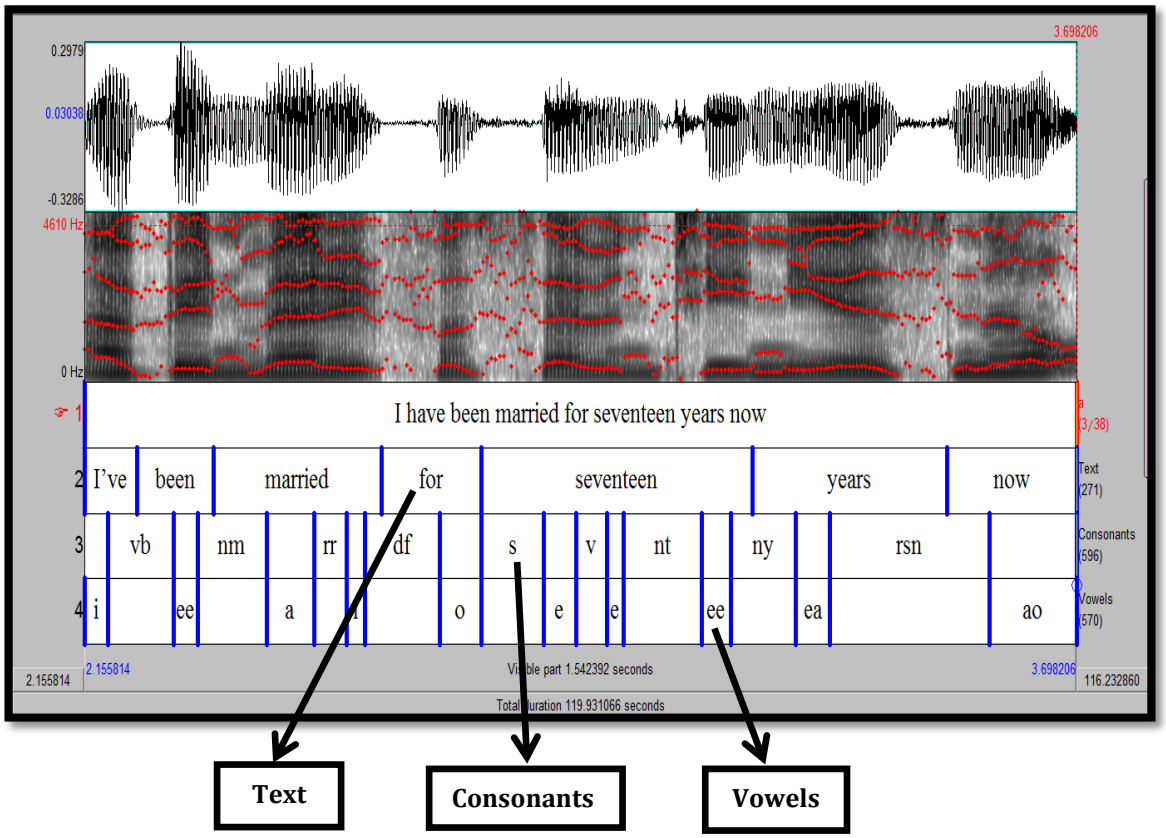

Figure 3.9: Screenshot of annotations in Praat for spontaneous speech

In order to analyse spontaneous speech, a few measures were applied to make the data more representative. Firstly, number of syllables was identified in a given stretch of speech (Deterding, 2001). For example, the contracted forms in merging of the words such as **"THEY ARE"** to **"THEY'RE"** are most of the time unclear and it is difficult to measure acoustically (see Figure 3.10).

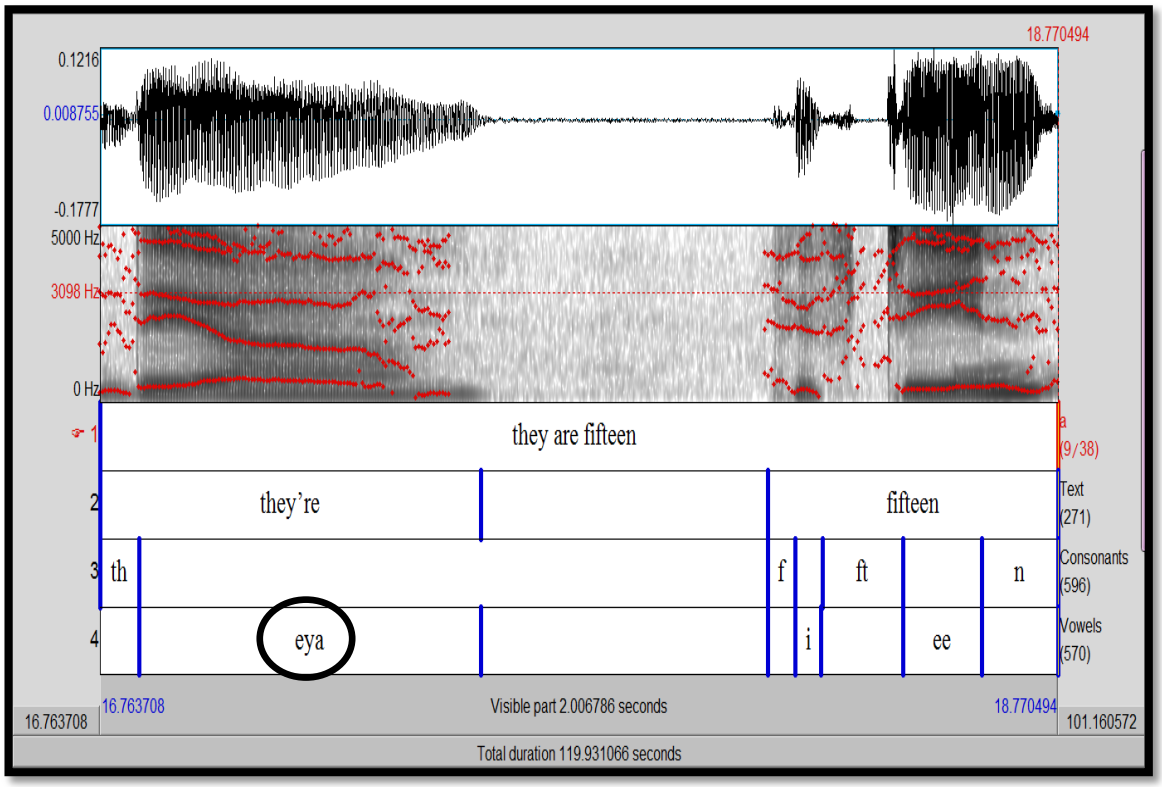

Figure 3.10: Screenshot of merging of words to contracted forms

Besides, there are also words with different pronunciations, for example **"BASICALLY"** (see Figure 3.11), which can be treated as having three or four syllables depending partly on the speaking rate (see Hartman, Roach & Jones, 1997).

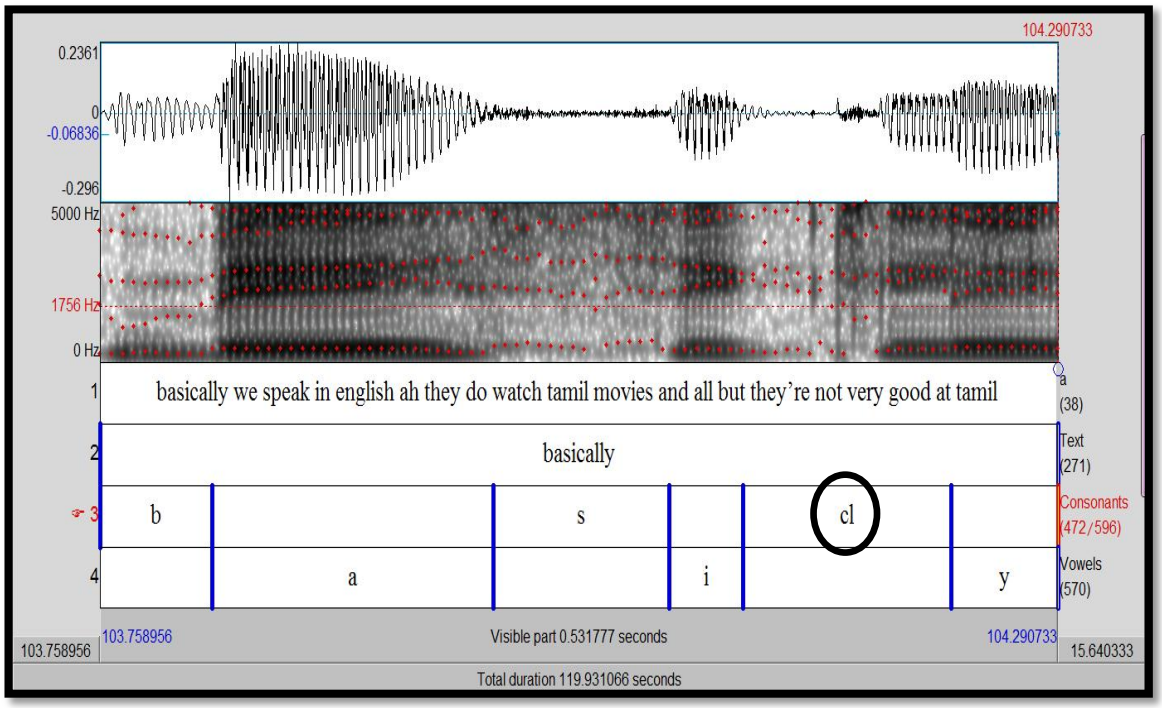

Figure 3.11: Screenshot of identification of syllables based on speaking rates

Deterding (2001) ignored the duration of the final syllable of each utterances due to the difficulty encountered in identifying the exact end of the syllable in final position and that interference could occur during the measurement of syllable-timing. However, Low (1998) included the final syllable in the measurement of her study because there was no problem in identifying the exact end of the syllable in final position. Hence, in the study, both types of measurement mentioned above were carried out where the final syllable is included in the first measurement and the second one is without. However, the measurement without the inclusive of final syllable were reported in chapter 4 as the measurement with the inclusive of final syllable showed relatively high reading which was out of the norm of MalE speakers.

In spontaneous speech, it is common for speakers to use hesitation in order to allow them to pause for a moment without giving up their turn in saying what they have not finished. Similarly, in this study, hesitations were very much used by all the speakers such as “ahm”, “em”, “ah” and other forms of hesitations were not measured (see Figure 3.12).

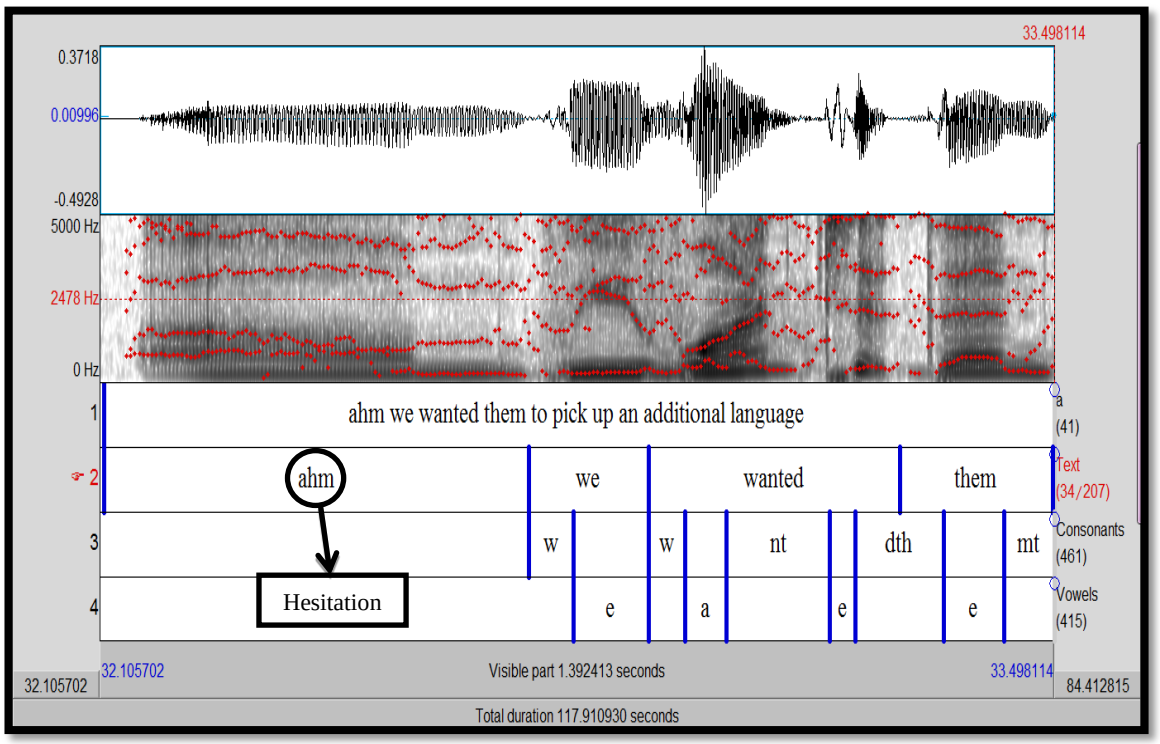

Figure 3.12: Screenshot of exclusion of hesitations

Fourthly, repetitions of lexical items in a stretch of speech were excluded from the analysis of the current study. The correct lexical item said by the speaker was taken into considerations (see Figure 3.13).

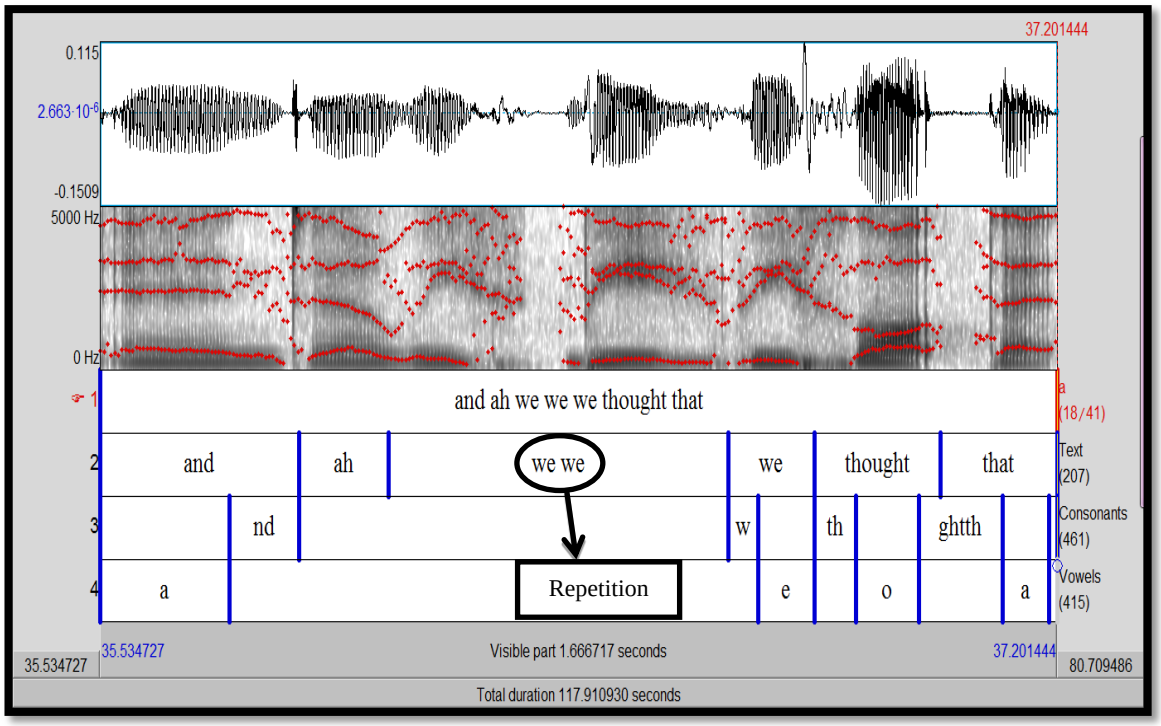

Figure 3.13: Screenshot of exclusion of repetitions

Besides, other interruptions, such as speaking while laughing and also silent pauses, were also excluded from the analysis because laughter and sounds like the clearing of the throat acts as external noise which interrupts or influences the clarity of the lexical items spoken by the speaker (see Figure 3.14). Besides, pauses of three milliseconds and above were not considered (see Figure 3.15). Other measures were taken accordingly (where applicable) based on the measurements carried out for read speech.

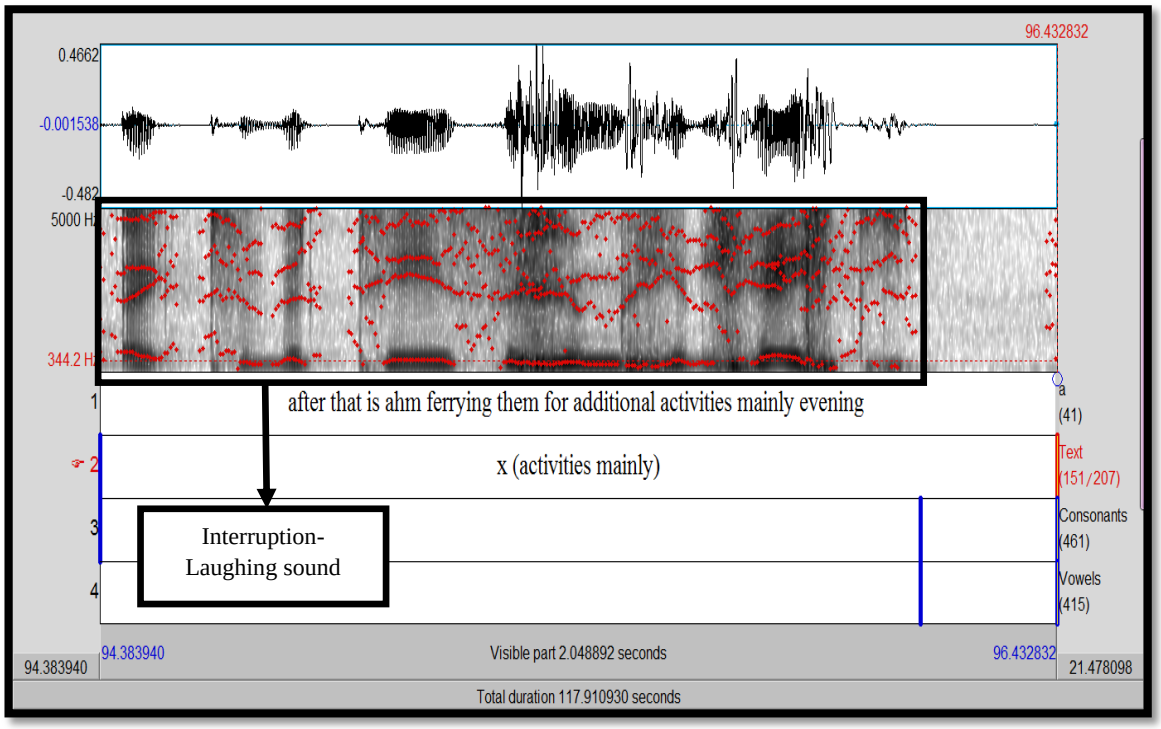

Figure 3.14: Screenshot of exclusion of interruptions

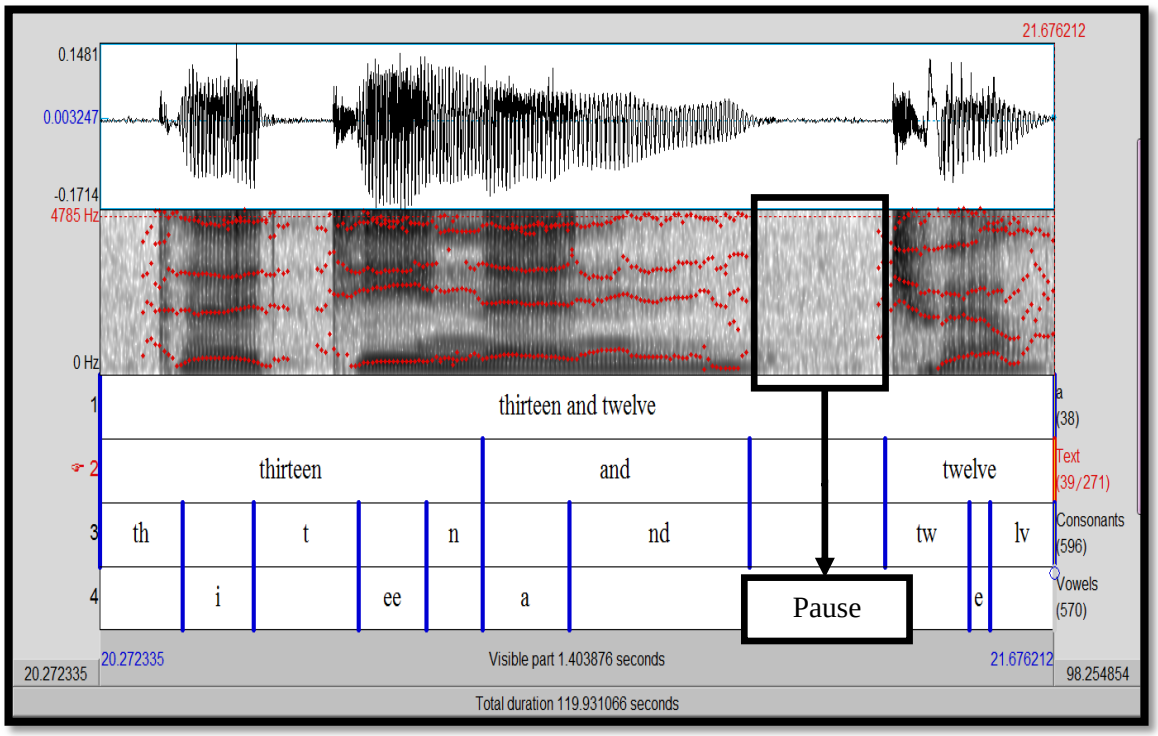

Figure 3.15: Screenshot of exclusion of pauses

3.6 Measurements of Rhythm

The intervals for vowels and consonants, and syllable durations were measured based on the spectrograms and auditory examination. The minimal duration for each interval measure was 30ms. Besides, nPVI-V, rPVI-C and VarcoV were calculated and tabulated. The Pairwise Variability Index (PVI) suggested by Low et al. (2000) was used to measure utterances in order to assess the degree of rhythmic difference. Besides, VarcoV which was suggested by White and Mattys (2007) is good for speech rate variation and hence it was used to discriminate the influence of the rhythm of one's first language on the second language spoken. The formulas for each metrics are expressed as below:

i. nPVI-V

$$nPVI = 100 \times \left[\sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{(d_k + d_{k+1})/2} \right| / (m-1) \right]$$

where m = number of vowels in utterance; d = duration of the kth vowel.

ii. rPVI-C

$$\mathrm{rPVI} = \left(\sum_{k=1}^{m-1} |d_k - d_{k+1}| \right) \Big/ (m-1)$$

where m = number of vowels in utterance; d = duration of the kth vowel.

iii. VarcoV

$$\mathrm{VarcoV} = \frac{\Delta V}{\bar{v}} \times 100$$

where ΔV is standard deviation of the vocalic interval and v̄ refers to the mean duration of the vocalic intervals

The results were compared based on how they appear to categorize rhythm in different speaking styles and among the three ethnic groups, and also how the results differs using different metrics.

The results were analysed based on the predictions given by Grabe and Low (2002: 5) where "stress-timed languages would exhibit high vocalic nPVI and high intervocalic rPVI values whereas syllable-timed languages would have low vocalic nPVI and low intervocalic rPVI values". As for "mixed language with complex syllable structure and no vowel reduction would exhibit lower vocalic nPVI value than stress-timed languages but a relatively high intervocalic rPVI value" (Grabe and Low, 2002: 5).

3.7 Validity of Data

The data of this study was measured twice based on the criteria set in section 3.5. This is to validate the measurements and results obtained. Three speakers (Speaker 1 of Malay, Chinese and Indian ethnic group) were selected and the data for these three speakers was re-measured. The results obtained for each metrics (nPVI-V, rPVI-C and Varco-V) showed only minimal differences compared to the first measurement. An Anova test showed that there were no significant differences among nPVI-V (df = 1, p = 0.04), rPVI-C (df = 1, p = 0.22) and Varco-V (df = 1, p = 0.69) for both speech styles.

3.8 Summary of Chapter 3

In this chapter, an overview of speakers' profile and data was given and also how the data for both speech styles were measured. In addition, the types of metrics used were also discussed and the results for validity of data were provided. In chapter 4, the results of the measurements will be presented and discussed.

CHAPTER 4

RESULTS AND DISCUSSION

In this chapter, the results of the measurement of rhythm carried out on all 12 speakers (four Chinese, four Indians and four Malays) will be analyzed respectively based on nPVI-V, rPVI-C and VarcoV for both read speech and spontaneous speech. A total of

4.1 Overall Average nPVI-V and Standard Deviation Scores

As discussed in Chapter 2, the PVI is used to measure the differences in duration of successive intervals. The nPVI is the mean of the differences between successive intervals divided by the sum of the same intervals where nPVI-V is the normalized Pairwise Variability Index for vocalic intervals.

Table 4.1 below shows the overall average nPVI-V and standard deviation scores among Chinese, Indian and Malay speakers. The overall average nPVI-V for all speakers of MalE for read speech style is 56.46 and the standard deviation is 54.96. For spontaneous speech style, the overall average nPVI-V for all speakers of MalE is 54.48 and the standard deviation is 66.08. An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among all speakers for nPVI-V ($t = 1.08$, $df = 11$, $p = 0.30$).

Table 4.1: Overall average nPVI-V and standard deviation scores for read and spontaneous speech

		Read Speech		Spontaneous Speech	
Speakers	**Ethnicity**	**nPVI-V Score**	**Standard Deviation**	**nPVI-V Score**	**Standard Deviation**
1	Chinese	53.56	55.83	50.39	73.34
2	Chinese	56.00	50.51	57.09	52.41
3	Chinese	55.62	56.36	56.82	69.20
4	Chinese	51.25	53.61	56.83	86.67
5	Indian	57.68	51.40	43.88	38.56
6	Indian	59.22	66.88	59.88	74.36
7	Indian	60.46	57.09	54.40	72.35
8	Indian	61.30	52.58	58.03	59.76
9	Malay	56.38	53.30	50.87	62.45
10	Malay	54.28	52.73	48.41	59.08
11	Malay	53.84	53.94	52.59	57.32
12	Malay	57.92	55.31	64.61	87.47
	Average	56.46	54.96	54.48	66.08

4.1.1 nPVI-V Scores among Chinese Speakers for Read and Spontaneous Speech

Table 4.1.1 below shows the results of nPVI-V scores among the four Chinese speakers for read and spontaneous speech styles. For read speech style, the nPVI-V score for Speaker 1 to 4 are 53.56, 56.00, 55.62 and 51.25 respectively. Among the four speakers, the highest nPVI-V score is from Speaker 2 while the lowest nPVI-V score is from Speaker 4.

As for the spontaneous speech style, the nPVI-V score for Speaker 1 to 4 is 50.39, 57.09, 56.82 and 56.83 respectively. Among the four speakers, the highest

nPVI-V score is from Speaker 2 while the lowest nPVI-V score is from Speaker 1 (see Table 4.1.1).

Table 4.1.1: nPVI-V scores among Chinese speakers for read and spontaneous speech

Speakers	Read Speech (nPVI-V Score)	Spontaneous Speech (nPVI-V Score)
1	53.56	50.39
2	56.00	57.09
3	55.62	56.82
4	51.25	56.83
Average	54.11	55.28

The average nPVI-V score for both speech styles among Chinese speakers does not show any vast difference as the average score differ by 1.17. However, there is a difference worth noting for speaker four while comparing the nPVI-V scores for both contexts as the scores differ by 5.58. As for the other speakers, there is no difference for both speech styles (see Figure 4.1.1). An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among the Chinese speakers for nPVI-V (t = 0.6, df =3, p = 0.57).

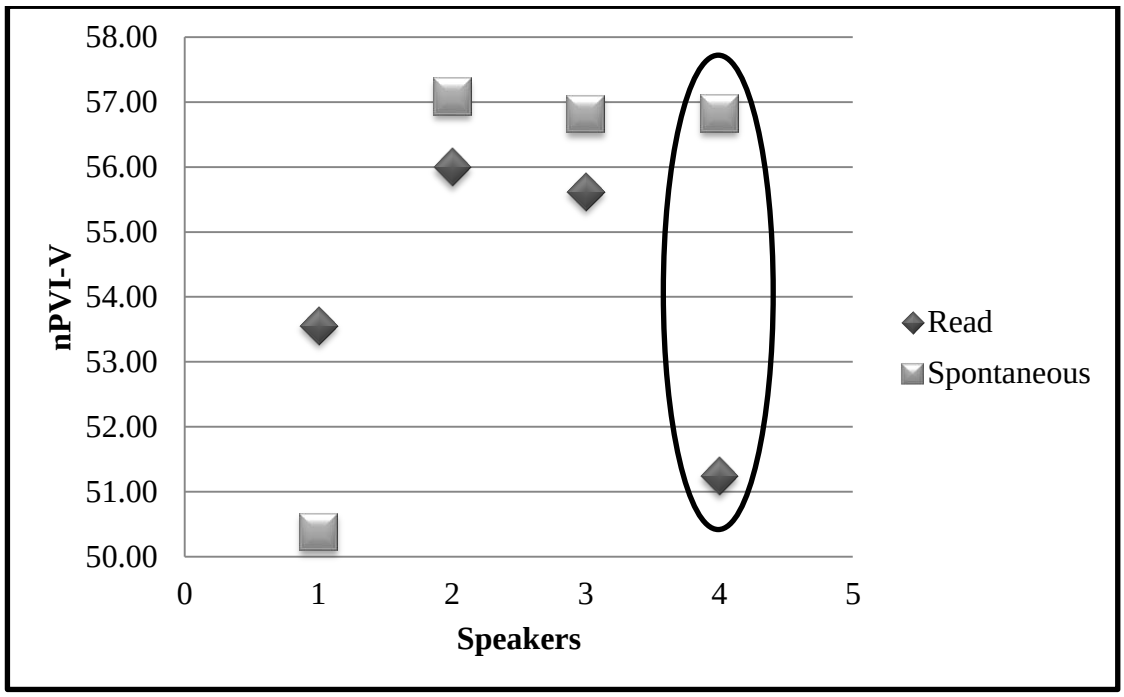

Figure 4.1.1: nPVI-V scores among Chinese speakers for read and spontaneous speech

4.1.2 nPVI-V Scores among Indian Speakers for Read and Spontaneous Speech

Table 4.1.2 below shows the results of nPVI-V scores among the four Indian speakers for read and spontaneous speech styles. The nPVI-V score for Speaker 1 to 4 are 57.68, 59.22, 60.46 and 61.30 respectively. Among the four speakers, the highest nPVI-V score is from Speaker 4 while the lowest nPVI-V score is from Speaker 1.

For the spontaneous speech style, the nPVI-V score for Speaker 1 to 4 are 43.88, 59.88, 54.40 and 58.03 respectively. Among the four speakers, the highest nPVI-V score is from Speaker 2 while the lowest nPVI-V score is from Speaker 1.

Table 4.1.2: nPVI-V scores among Indian speakers for read and spontaneous speech

Speakers	Read Speech (nPVI-V Score)	Spontaneous Speech (nPVI-V Score)
1	57.68	43.88
2	59.22	59.88
3	60.46	54.40
4	61.30	58.03
Average	59.67	54.04

The average nPVI-V score for both speech styles among Indian speakers does not show any vast difference as the average score differ by 5.63. However, there is a difference for Speaker 1 while comparing the nPVI-V scores for both contexts as the values differ by 13.80 (see Figure 4.1.2). An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among the Indian speakers for nPVI-V (t = 1.53, df = 3, p = 0.18).

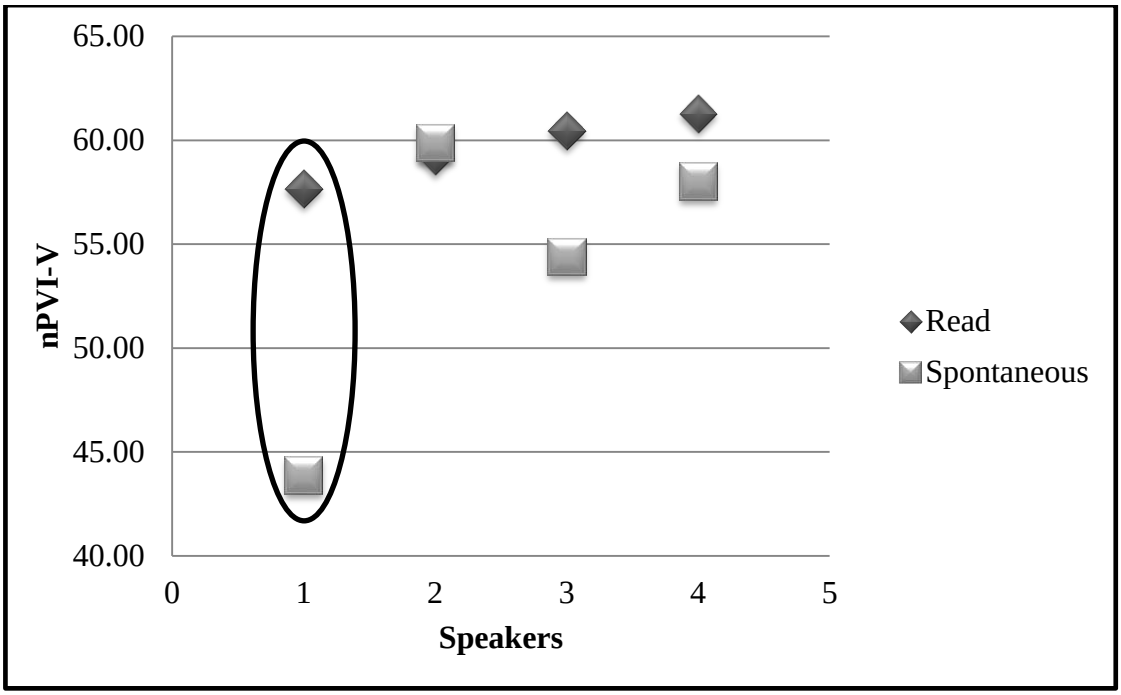

Figure 4.1.2: nPVI-V scores among Indian speakers for read and spontaneous speech

4.1.3 nPVI-V Scores among Malay Speakers for Read and Spontaneous Speech

Table 4.1.3 below shows the results of nPVI-V scores among the four Malay speakers for read and spontaneous speech styles. The nPVI-V for Speaker 1 to 4 is 56.38, 54.28, 53.84 and 57.92 respectively. Among the four speakers, the highest nPVI-V score is from Speaker 4 while the lowest nPVI-V score is from Speaker 2.

For the spontaneous speech style, the nPVI-V score for Speaker 1 to 4 is 50.87, 48.41, 52.59 and 64.61 respectively. Among the four speakers, the highest nPVI-V score is from Speaker 4 while the lowest score of nPVI-Vis from Speaker 2.

Table 4.1.3: nPVI-V scores among Malay speakers for read and spontaneous speech

Speakers	Read Speech (nPVI-V Score)	Spontaneous Speech (nPVI-V Score)
1	56.38	50.87
2	54.28	48.41
3	53.84	52.59
4	57.92	64.61
Average	55.61	54.12

The average nPVI-V score for both speech styles among Malay speakers does not show any difference as the average score differ by 1.49. Similarly, there is no vast difference found for each speaker while comparing the nPVI-V scores for both contexts (see Figure 4.1.3). An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among the Malay speakers for nPVI-V ($t = 4$, $df = 3$, $p = 0.70$).

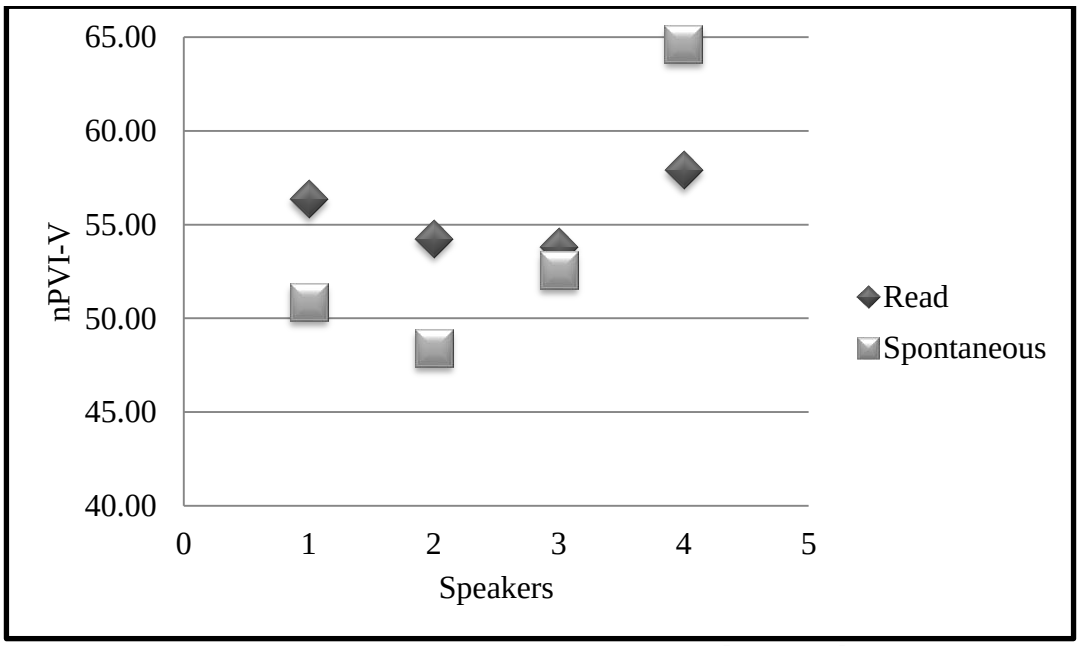

Figure 4.1.3: nPVI-V Scores among Malay Speakers for read and spontaneous speech

4.2 Overall Average rPVI-C and Standard Deviation Scores

As discussed in Chapter 2, the PVI is used to measure the differences in duration of successive intervals. The rPVI is the mean of the differences between successive intervals where rPVI-C is the raw Pairwise Variability Index for consonantal intervals.

Table 4.2 below shows the overall average rPVI-C and standard deviation scores among Chinese, Indian and Malay speakers. The overall average rPVI-C for all speakers of MalE for read speech style is 66.12 and the standard deviation is 62.10. For spontaneous speech style, the overall average rPVI-C for all speakers is 64.38 and the standard deviation is 66.03. It can be seen that there are no differences among the speakers for both read and spontaneous speech as their rPVI-C values only differ around 1.74. An independent samples t-test showed that there was no significant difference shown between read and spontaneous speech for rPVI-C ($t = 0.46$, $df = 11$, $p = 0.65$).

Table 4.2: Overall average rPVI-C and standard deviation scores

		Read Speech		Spontaneous Speech	
Speakers	**Ethnicity**	**rPVI-C Score**	**Standard Deviation**	**rPVI-C Score**	**Standard Deviation**
1	Chinese	78.55	66.30	68.45	71.16
2	Chinese	60.91	56.94	50.58	48.94
3	Chinese	65.21	65.22	68.46	64.22
4	Chinese	67.30	65.71	72.63	86.06
5	Indian	70.55	59.70	58.16	61.66
6	Indian	71.19	64.32	76.52	75.40
7	Indian	70.94	65.56	74.15	73.45
8	Indian	58.63	53.08	55.82	56.01
9	Malay	60.06	58.99	48.76	46.22
10	Malay	54.40	56.13	49.09	51.77
11	Malay	67.05	64.28	71.31	79.41
12	Malay	68.67	68.94	78.60	78.10
	Average:	66.12	62.10	64.38	66.03

4.2.1 rPVI-C Scores among Chinese Speakers for Read and Spontaneous Speech

Table 4.2.1 below shows the results of rPVI-C scores among the four Chinese speakers for read and spontaneous speech styles. The rPVI-C scores for Speaker 1 to 4 are 78.55, 60.91, 65.21 and 67.30 respectively. Among the four speakers, the highest rPVI-C score is from Speaker 1 while the lowest rPVI-C score is from Speaker 2.

For the spontaneous speech, the rPVI-C scores for Speaker 1 to 4 are 68.45, 50.58, 68.46 and 72.63 respectively. Among the four speakers, the highest rPVI-C score is from Speaker 4 while the lowest rPVI-C score is from Speaker 2.

Table 4.2.1: rPVI-C scores among Chinese speakers for read and spontaneous speech

Speakers	Read Speech (rPVI-C Score)	Spontaneous Speech (rPVI-C Score)
1	78.55	68.45
2	60.91	50.58
3	65.21	68.46
4	67.30	72.63
Average	67.99	65.03

The average rPVI-C score for both speech styles among Chinese speakers does not show any vast difference as the average score differ by 2.96. However, there is a difference for Speaker 1 and 2 because rPVI-C score for read speech is relatively higher than spontaneous speech as their value differ by 10.10 and 10.33 respectively (see Figure 4.2.1). An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among the Chinese speakers for rPVI-C ($t = 0.48$, $df = 3$, $p = 0.65$).

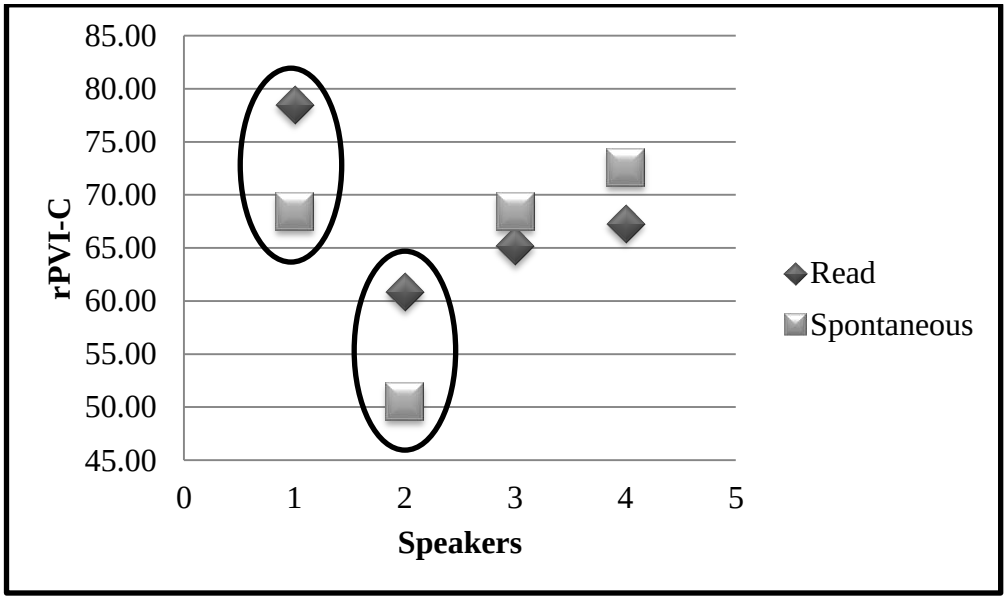

Figure 4.2.1: rPVI-C scores among Chinese speakers for read and spontaneous speech

4.2.2 rPVI-C Scores among Indian Speakers for Read and Spontaneous Speech

Table 4.2.2 below shows the results of rPVI-C scores among the four Indian speakers for read and spontaneous speech styles. The rPVI-C scores for Speaker 1 to 4 are 70.55, 71.19, 70.94 and 58.63 respectively. Among the four speakers, the highest rPVI-C score is from Speaker 2 while the lowest rPVI-C score is from Speaker 4.

For the spontaneous speech, the rPVI-C scores for Speaker 1 to 4 are 58.16, 76.52, 74.15 and 55.82 respectively. Among the four speakers, Speaker 2 has scored the highest the rPVI-C score while Speaker 3 has scored the least the rPVI-C score.

Table 4.2.2: rPVI-C scores among Indian speakers for read and spontaneous speech

Speakers	Read Speech (rPVI-C Score)	Spontaneous Speech (rPVI-C Score)
1	70.55	58.16
2	71.19	76.52
3	70.94	74.15
4	58.63	55.82
Average	67.83	66.16

The average rPVI-C score for both speech styles among Indian speakers does not show any difference as the average score differ by 1.67. However, there is a difference for Speaker 1 because the rPVI-C score for read speech is relatively higher than spontaneous speech as the value differs by 12.39. The score for Speaker 4 is the least compared to the other three speakers for both read and spontaneous speech (see Figure 4.2.2). An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among the Indian speakers for rPVI-C ($t = 0.27$, $df = 3$, $p = 0.80$).

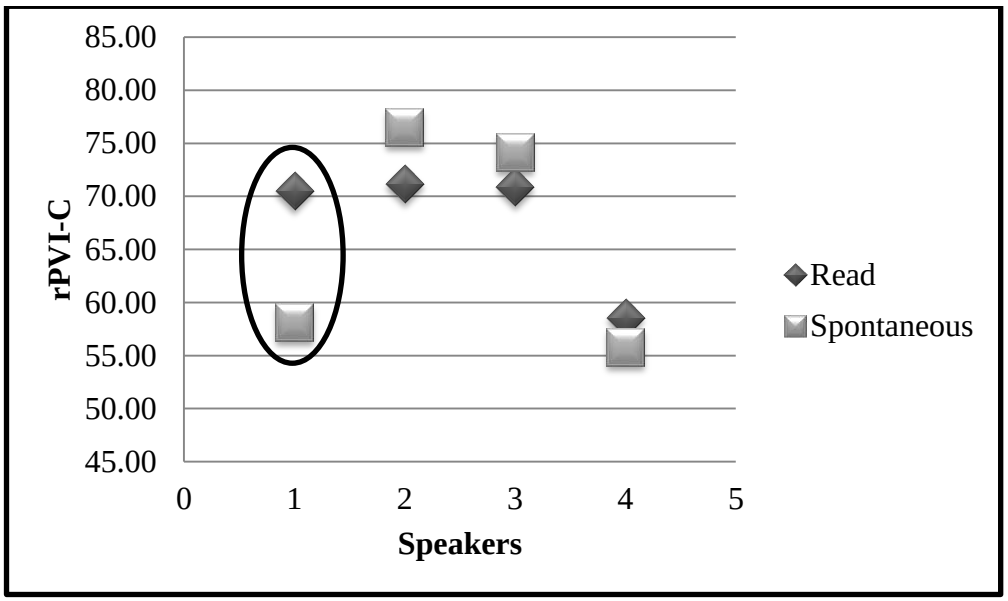

Figure 4.2.2: rPVI-C scores among Indian speakers for read and spontaneous speech

4.2.3 rPVI-C Scores among Malay Speakers for Read and Spontaneous Speech

Table 4.2.3 below shows the results of rPVI-C scores among the four Malay speakers for read and spontaneous speech styles. The rPVI-C scores for Speaker 1 to 4 are 60.06, 54.40, 67.05 and 68.67 respectively. Among the four speakers, the highest rPVI-C score is from Speaker 4 while the lowest rPVI-C score is from Speaker 2.

For the spontaneous speech, the rPVI-C scores for Speaker 1 to 4 are 48.76, 49.09, 71.31 and 78.60 respectively. Among the four speakers, the highest rPVI-C score is from Speaker 4 while the lowest rPVI-C score is from Speaker 1.

Table 4.2.3: rPVI-C scores among Malay speakers for read and spontaneous speech

Speakers	Read Speech (rPVI-C Score)	Spontaneous Speech (rPVI-C Score)
1	60.06	48.76
2	54.40	49.09
3	67.05	71.31
4	68.67	78.60
Average	62.55	61.94

The average rPVI-C score for both speech styles among Malay speakers does not show any difference as the average score differ by 0.61. However, there is a difference for Speaker 1 because the rPVI-C score for spontaneous speech is relatively higher than read speech as the value differs by 11.30. An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among the Malay speakers for rPVI-C ($t = 7$, $df = 3$, $p = 0.95$).

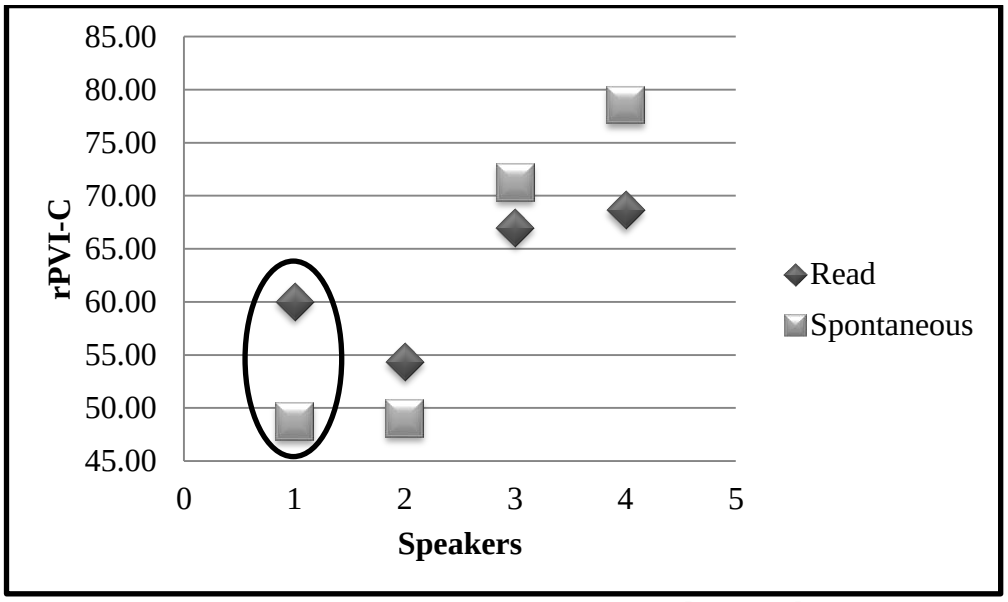

Figure 4.2.3: rPVI-C scores among Malay speakers for read and spontaneous speech

4.3 Overall Average Scores for VarcoV

As discussed in Chapter 2, the VarcoV is used to identify the variation in speech rate and for discriminating the influence of the rhythm of one's first language on the second language spoken (Grabe & Low, 2002). VarcoV is calculated as: standard deviation of vocalic interval duration divided by mean vocalic interval duration and then multiplied by 100.

Table 4.3 below shows the overall average VarcoV scores among Chinese, Indian and Malay speakers. The overall average VarcoV scores for all speakers of MalE for read speech style is 62.82. For spontaneous speech style, the overall average VarcoV for all speakers is 68.73. It can be seen that there are no differences among the speakers for both read and spontaneous speech as their VarcoV scores only differ around 5.91. An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among all speakers for VarcoV ($t = 1.76$, $df = 11$, $p = 0.092$).

Table 4.3: Overall average VarcoV scores

		Read Speech	Spontaneous Speech
Speakers	**Ethnic**	**VarcoV Scores**	
1	Chinese	77.70	71.80
2	Chinese	62.12	65.80
3	Chinese	59.22	67.05
4	Chinese	62.51	88.62
5	Indian	64.99	49.01
6	Indian	66.63	80.24
7	Indian	66.23	66.31
8	Indian	61.19	67.74
9	Malay	58.53	68.53
10	Malay	61.97	70.07
11	Malay	53.34	56.73
12	Malay	59.36	72.92
	Average:	62.82	68.73

4.3.1 VarcoV Scores among Chinese Speakers for Read and Spontaneous Speech

Table 4.3.1 below shows the results of VarcoV scores among the four Chinese speakers for read and spontaneous speech styles. The VarcoV scores for Speaker 1 to 4 are 77.70, 62.12, 59.22 and 62.51 respectively. Among the four speakers, the highest VarcoV score is from speaker one while the lowest VarcoV score is from speaker two.

For the spontaneous speech, the VarcoV scores for Speaker 1 to 4 are 71.80, 65.80, 67.05 and 88.62 respectively. Among the four speakers, the highest VarcoV score is from Speaker 4 while the lowest VarcoV score is from Speaker 1.

Table 4.3.1: VarcoV scores among Chinese speakers for read and spontaneous speech

Speakers	Read Speech (VarcoV Score)	Spontaneous Speech (VarcoV Score)
1	77.70	71.80
2	62.12	65.80
3	59.22	67.05
4	62.51	88.62
Average	65.39	73.32

The average of VarcoV score for both speech styles among Chinese speakers does not show vast difference as the average score differ by 7.93. However, there is a difference for Speaker 4 because VarcoV score for spontaneous speech is relatively higher than read speech as their values differ by 26.11 (see Figure 4.3.1). An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among the Chinese speakers for rPVI-C (t = 1.18, df = 3, p = 0.28).

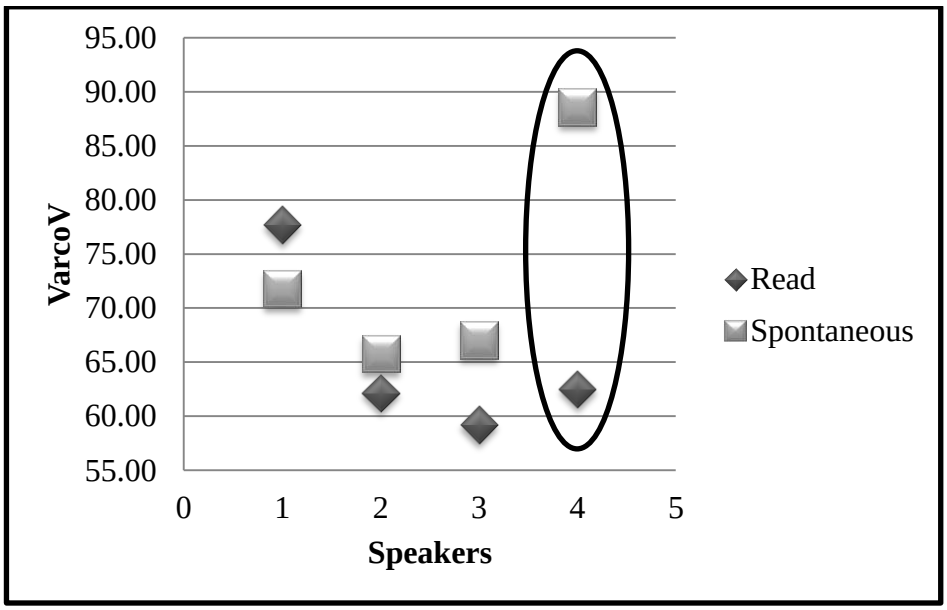

Figure 4.3.1: VarcoV scores among Chinese speakers for read and spontaneous speech

4.3.2 VarcoV Scores among Indian Speakers for Read and Spontaneous Speech

Table 4.3.2 below shows the results of VarcoV scores among the four Indian speakers for read and spontaneous speech styles. The VarcoV scores for Speaker 1 to 4 are 64.99, 66.63, 66.23 and 61.19 respectively. Among the four speakers, the highest VarcoV score is from Speaker 2 while the lowest VarcoV score is from Speaker 4.

For the spontaneous speech, the VarcoV scores for Speaker 1 to 4 are 49.01, 80.24, 66.31 and 67.74 respectively. Among the four speakers, the highest VarcoV score is from Speaker 2 while the lowest VarcoV score is from Speaker 1.

Table 4.3.2: VarcoV scores among Indian speakers for read and spontaneous speech

Speakers	Read Speech (VarcoV Score)	Spontaneous Speech (VarcoV Score)
1	64.99	49.01
2	66.63	80.24
3	66.23	66.31
4	61.19	67.74
Average	64.76	65.82

The average of VarcoV score for both speech styles among Indian speakers does not show vast difference as the average score differ by 1.06. However, there is a difference for speaker one and two in their respective VarcoV score. The score read speech is relatively higher compared to spontaneous speech for speaker one and the score for spontaneous speech is relatively higher compared to read speech for speaker two. The difference between score for both speech context for speaker one and two is 16.98 and 13.61 respectively (see Figure 4.3.2). An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among the Indian speakers for rPVI-C ($t = 0.16$, $df = 3$, $p = 0.88$).

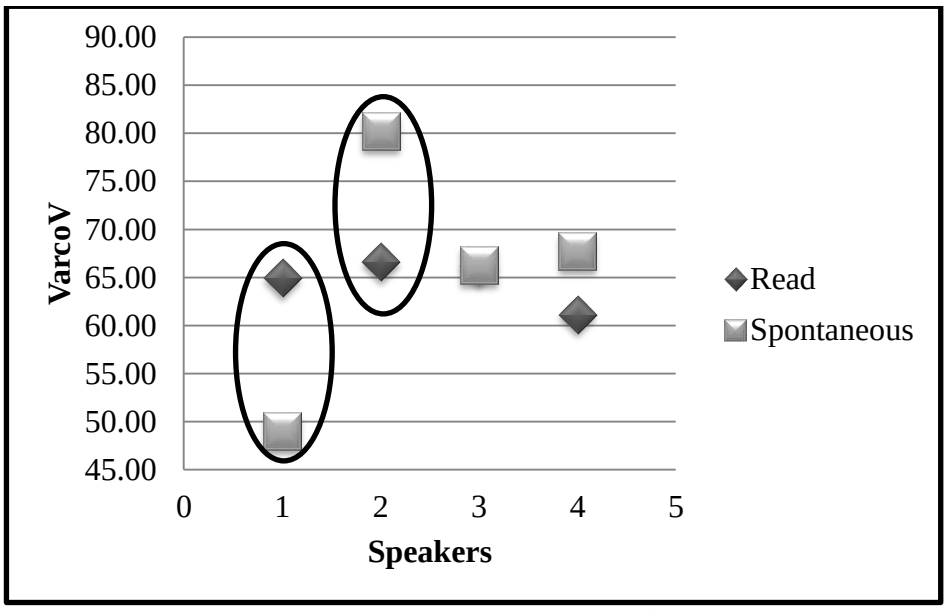

Figure 4.3.2: VarcoV Scores among Indian Speakers for read and spontaneous speech

4.3.3 VarcoV Scores among Malay Speakers for Read and Spontaneous Speech

Table 4.3.3 below shows the results of VarcoV scores among the four Malay speakers for read and spontaneous speech styles. The VarcoV scores for Speaker 1 to 4 are 58.53, 61.97, 53.34 and 59.36 respectively. Among the four speakers, the highest VarcoV score is from Speaker 4 while the lowest VarcoV score is from Speaker 1.

For the spontaneous speech, the VarcoV scores for Speaker 1 to 4 are 68.53, 70.07, 56.73 and 72.92 respectively. Among the four speakers, the highest VarcoV score is from Speaker 4 while the lowest VarcoV score is from Speaker 2.

Table 4.3.3: VarcoV scores among Malay speakers for read and spontaneous speech

Speakers	Read Speech (VarcoV Score)	Spontaneous Speech (VarcoV Score)
1	58.53	68.53
2	61.97	70.07
3	53.34	56.73
4	59.36	72.92
Average	58.30	67.06

The average of VarcoV score for both speech styles among Malay speakers does show vast difference as the average score differ by 8.76. However, there is a difference for speaker four because VarcoV score for spontaneous speech is relatively higher than read speech as their value differ by 13.56 (see Figure 4.3.3). An independent samples t-test showed that there was no significant relationship shown between read and spontaneous speech among the Malay speakers for rPVI-C ($t = 2.19$, $df = 3$, $p = 0.071$).

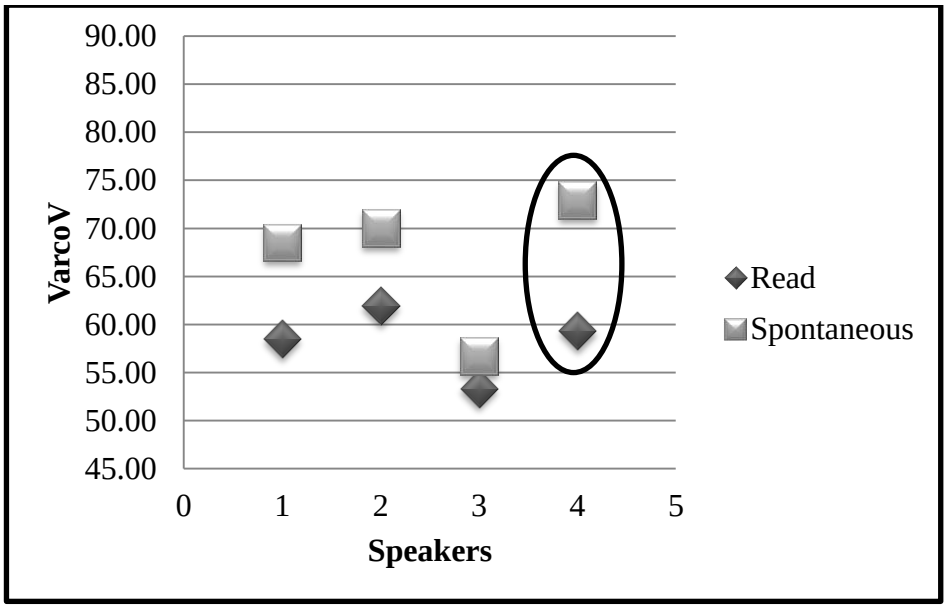

Figure 4.3.3: VarcoV scores among Malay speakers for read and spontaneous speech

4.4 Discussion

4.4.1 Factors Affecting the Rhythmic Properties in Different Speech Styles

The results of this study were analysed following Grabe and Low (2002). Classification of rhythmic pattern of a language were carried out based on the scores produced by each metrics where languages that fall below 50 will be classified as syllable-timed language whereas languages that fall above 50 will be classified as stress-timed language (see Section 2.3.2).

As discussed in Chapter 2, Grabe and Low (2002: 6) noted in their study that "stress-timed languages would exhibit high vocalic nPVI and high intervocalic rPVI values". Hence, based on the overall results obtained for read and spontaneous speech, the Chinese, Indian and Malay speakers can be categorized as being more stress-timed speakers of MalE for both speech styles as they exhibited high vocalic nPVI-V and high intervocalic rPVI-C scores. Besides, they also exhibited high vocalic VarcoV. When the results were compared between read and spontaneous speech, all speakers were more stress-timed in read speech compared to spontaneous speech as they exhibited high vocalic nPVI-V scores and intervocalic rPVI-C scores compared to spontaneous speech (see Figure 4.4.1 (a - b)).

These results obtained contradict several studies conducted on MalE rhythm by Tan and Low (2014) and Wan Aslynn (2012). MalE was more syllable-timed for read speech in Wan Aslynn (2012). Besides, Tan and Low's (2014) study also showed that MalE was more syllable-timed for spontaneous speech. This may be due to the speakers of the current study who were categorized as fluent speakers and may have been more careful and paying attention to the written words when pronouncing the syllables and words. Despite having different L1 including English, these speakers did not transfer their L1 rhythm onto their L2.

Both speech styles differ in scores as read speech has higher PVI scores than spontaneous speech; however, both speech styles still fall under the category of stress-timed as an independent samples t-test showed that there were no significant difference found between read and spontaneous for nPVI-V (t=1.08, df=11, p=0.29) and rPVI-C (t=0.46, df=11, p=0.65).

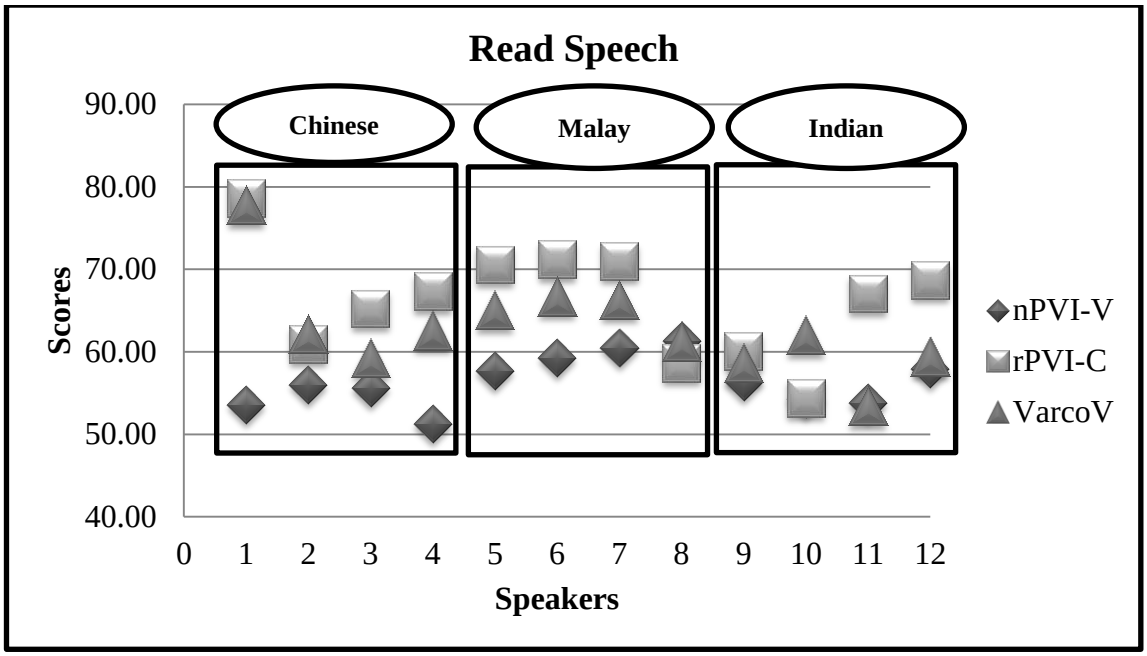

Figure 4.4.1(a): Summary of nPVI-V, rPVI-C and VarcoV scores among all speakers for read speech

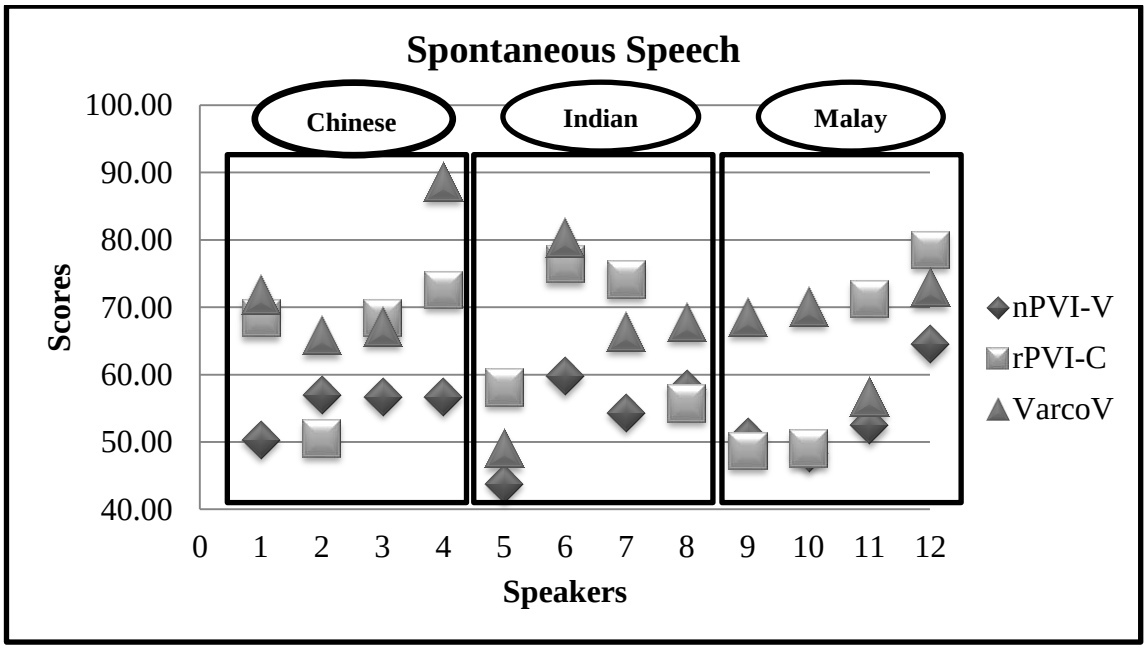

Figure 4.4.1(b): Summary of nPVI-V, rPVI-C and VarcoV scores among all speakers for spontaneous speech

4.4.2 Factors Affecting the Rhythmic Properties among Different Ethnic Groups

Based on the results obtained among different ethnic groups (Chinese, Malay and Indian), the results shows that all three ethnic group speakers are stress-timed for both speech styles as there are no statistical differences found for both speech styles among the three ethnic groups.

The results obtained for Chinese speakers contradict the study conducted by Deterding (2001) where the Chinese (Mandarin) speakers were categorized as syllable-timed speakers of English. As for the Indian (Tamil) speakers, the results obtained also contradict the study conducted by Oration (2009) and Keane (2006) where the Indian speakers (Tamil) were categorized as mora-timed and mix-timed speakers respectively. Besides, the Malay speakers in Tan and Low (2014) and Wan Aslynn (2012) were categorized as syllable-timed speakers as well which also contradicts the results of the current study (see Figure 4.4.2 (c-h)).

The difference between the current study and other studies on MalE are the age group of the speakers, educational backgrounds, dominant home language and also professions which may be the factors affecting both speech styles. For example, firstly, the speakers of Tan and Low (2014) and Wan Aslynn (2012) were students with an average of 21.1 and 28 respectively whereas the speakers of the current study are English lecturers with an average age of 43. Secondly, the dominant home language for each speaker is different as some use English as their home dominant language (see Section 3.2 of the current study). Thirdly, they are from different educational and professional backgrounds, and have different levels of fluency in English (see Tan & Low (2014); Wan Aslynn, 2012). Perhaps, the results of these fluent speakers suggest that despite different declared L1s, including English, these fluent speakers exhibit similar rhythmic patterns. Besides, they appear to be more stress-timed in spontaneous speech which contradicts the findings from previous studies. Their use of a less stress-

timed rhythmic pattern in read speech could have been an effect of being more careful and paying attention to the written words when pronouncing the syllables and words.

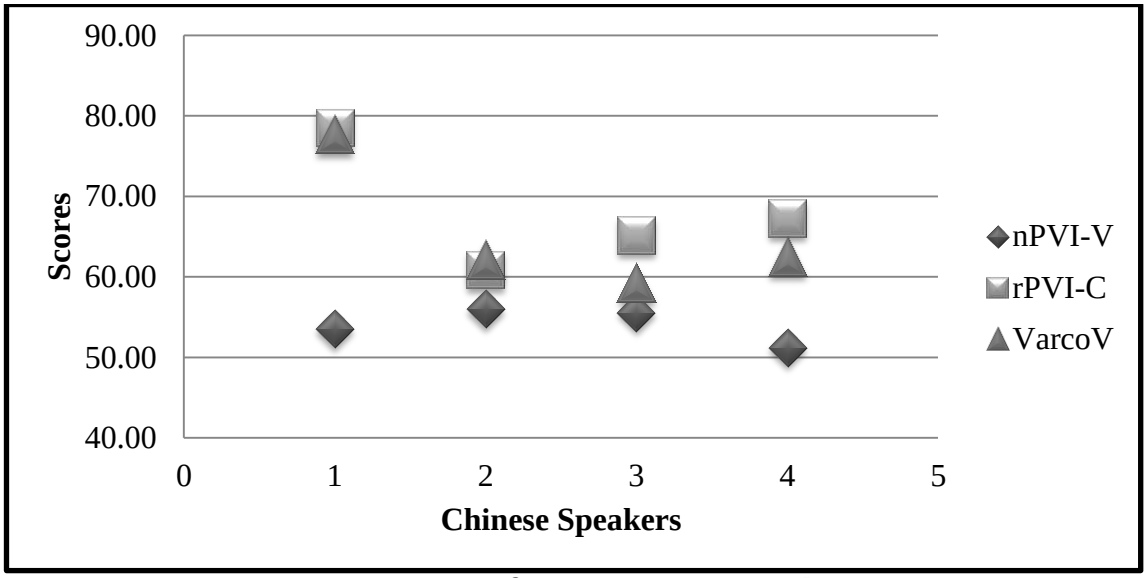

Figure 4.4.2(a): Summary of nPVI-V, rPVI-C and VarcoV scores among Chinese speakers for read speech

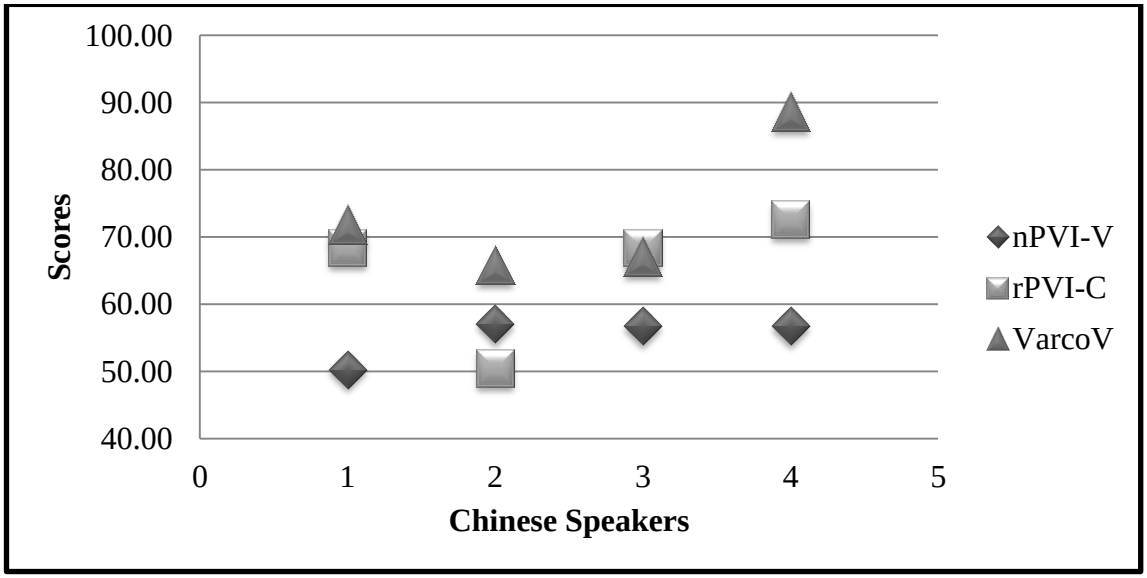

Figure 4.4.2(b): Summary of nPVI-V, rPVI-C and VarcoV scores among Chinese speakers for spontaneous speech

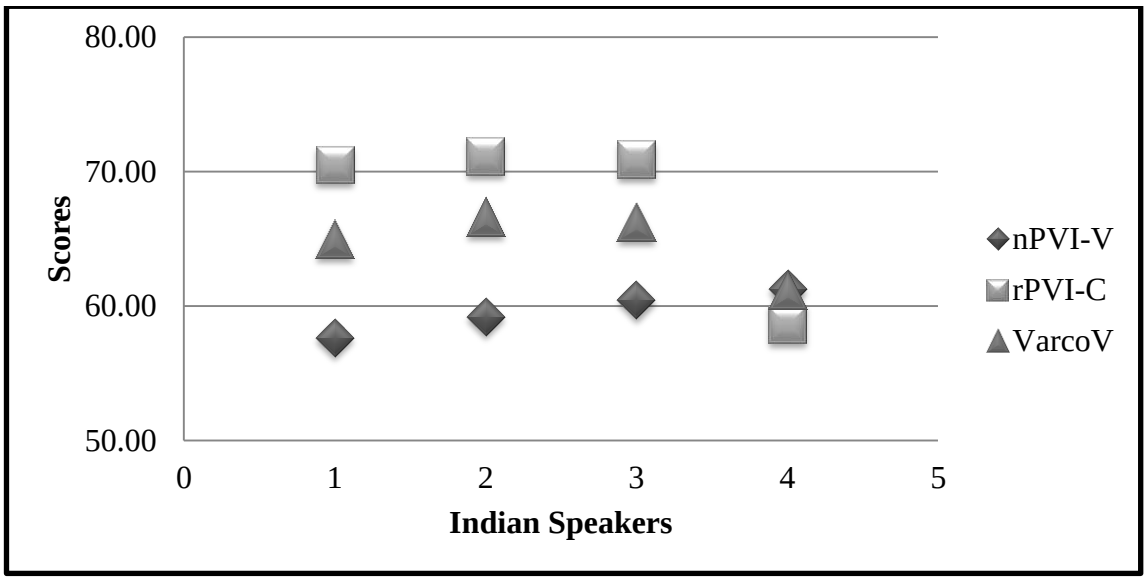

Figure 4.4.2(c): Summary of nPVI-V, rPVI-C and VarcoV scores among Indian speakers for read speech

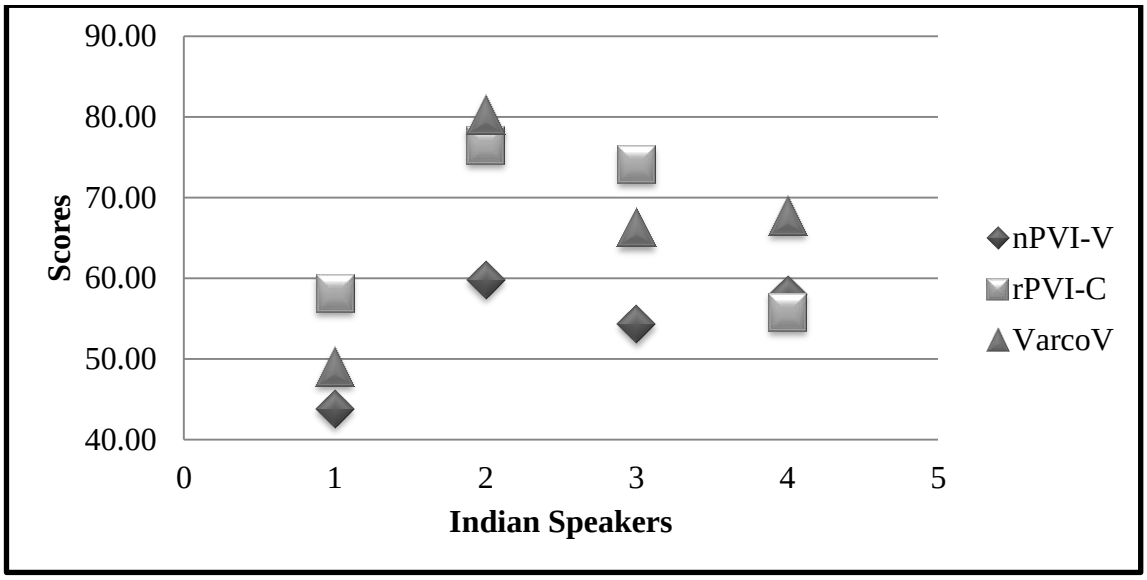

Figure 4.4.2(d): Summary of nPVI-V, rPVI-C and VarcoV scores among Indian speakers for spontaneous speech

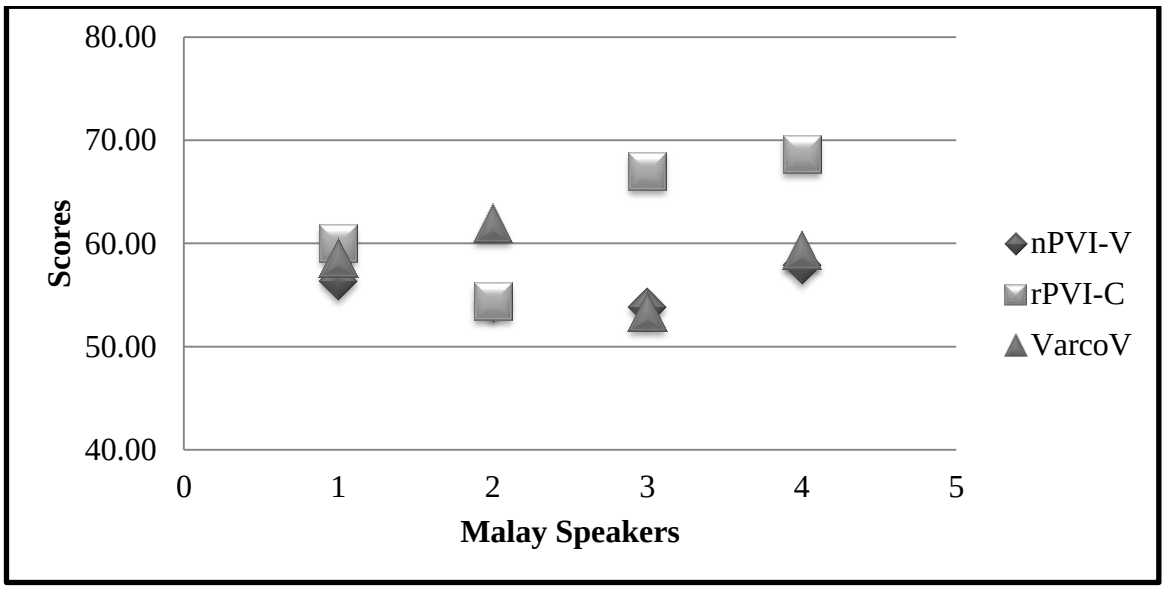

Figure 4.4.2(e): Summary of nPVI-V, rPVI-C and VarcoV scores among Malay speakers for read speech

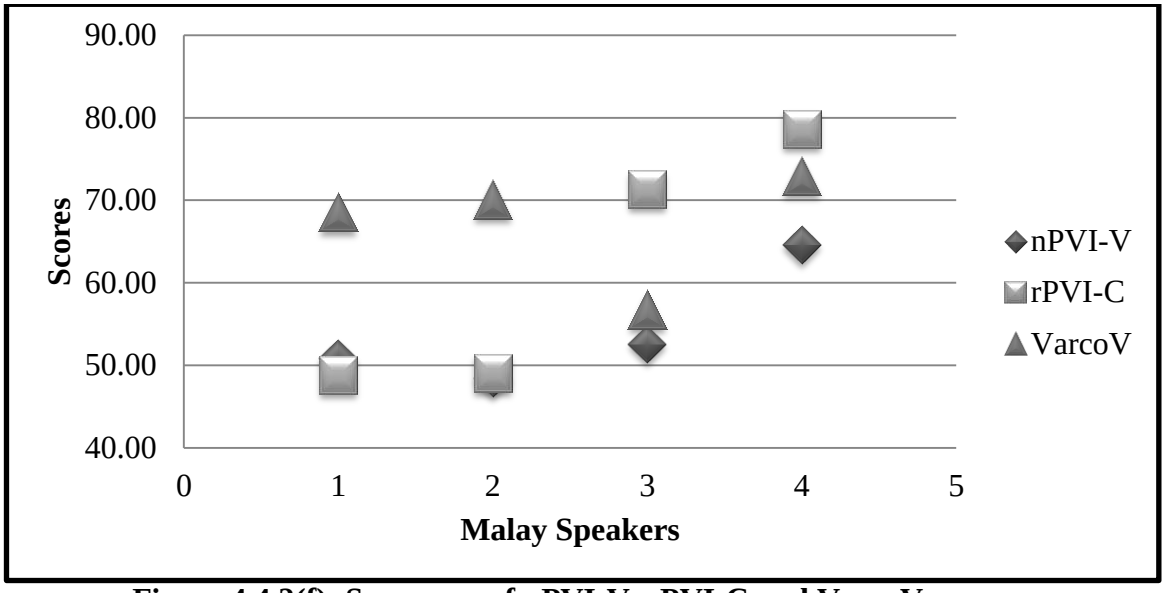

Figure 4.4.2(f): Summary of nPVI-V, rPVI-C and VarcoV scores among Malay speakers for spontaneous speech

As discussed in Chapter 3, the twelve speakers in this study have different L1s (see section 3.2). This factor may have influenced the results obtained in the current study. Speaker 1 from the Chinese, Indian and Malay ethnic groups will be taken as examples because the results obtained for these three speakers in comparison with the three metrics were a little unique.

(a) Chinese Speaker 1

For Chinese Speaker 1, the nPVI-V, rPVI-C and VarcoV score for read speech was higher compared to spontaneous speech (see Figure 4.4.2a). Although the score for read speech was higher compared to spontaneous speech for nPVI-V, the differences between both scores were very small. Besides, the score for rPVI-C and VarcoV is higher for both read and spontaneous speech compared to nPVI-V. It thus appears that Chinese Speaker 1 is more of stress-timed speaker of English. This could be attributed to the speaker's home dominant dialect, Cantonese, which is described as being stress-timed (Mok & Dellwo, 2008).

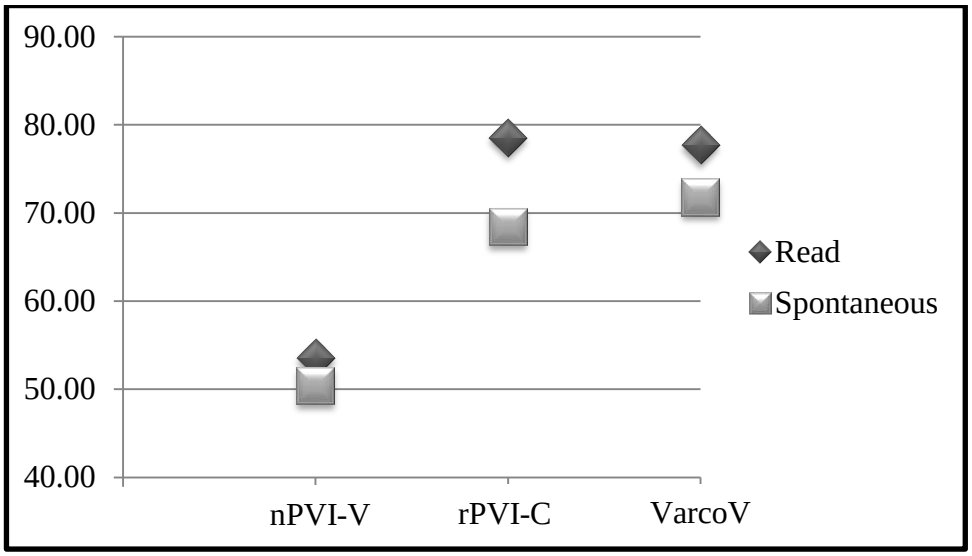

Figure 4.4.2(g): nPVI-V, rPVI-C and VarcoV Scores for Chinese Speaker 1 in Read and Spontaneous Speech

(b) Indian Speaker 1

For Indian Speaker 1, the overall scores for read speech are relatively higher compared to spontaneous speech. However, the nPVI-V and VarcoV scores are relatively lower for read and spontaneous speech respectively compared the rPVI-C score (see Figure 4.4.1b). It appears that Indian Speaker 1 can neither be classified as stress-timed or syllable-timed speaker. This result may be also an effect of home dominant language of the speaker which is Tamil because Grabe and Low (2002) and

Keane (2006) concluded in their studies that Tamil language is more of a mixed-timed language.

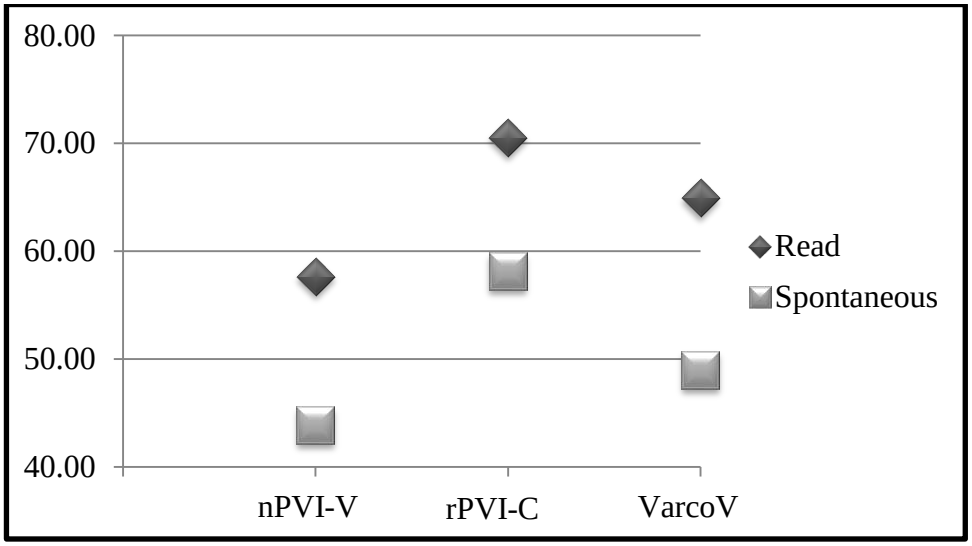

Figure 4.4.2(h): nPVI-V, rPVI-C and VarcoV Scores for Indian Speaker 1 in Read and Spontaneous Speech

(c) Malay Speaker 1

For the Malay Speaker 1, the nPVI-V and rPVI-C scores for spontaneous speech are lower compared to read speech. However, it is totally opposite for the VarcoV scores where the scores are relatively higher for spontaneous speech compared to read speech. A higher VarcoV compared to nPVI-V shows an overall difference in vocalic intervals and a less variability in neighbouring vowels. This suggests that Malay Speaker 1 may have a mixed-timed rhythm. However, this finding has to be treated with caution as it was only found in one speaker.

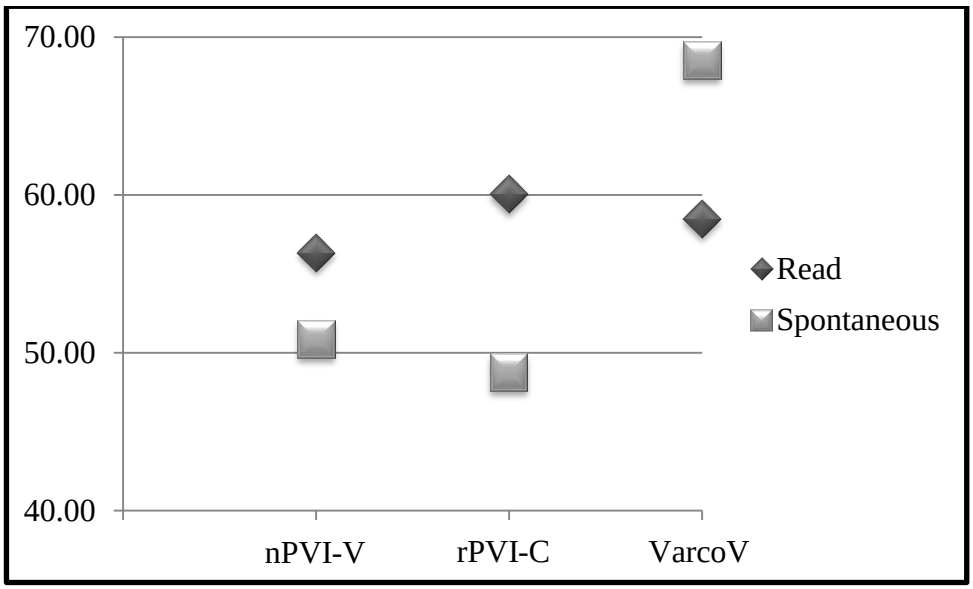

Figure 4.4.2(i): nPVI-V, rPVI-C and VarcoV Scores for Malay Speaker 1 in Read and Spontaneous Speech

Based on the description given above on the three speakers for the three different metrics, it is worth noting that the dominant home language for all three speakers (Chinese, Indian and Malay) is not English but their L1s, Cantonese, Tamil and Malay respectively (see Table 3.2). Therefore, by viewing the overall results of the study, the scores obtained for the three speakers tend to be slightly different compared to the other speakers. As discussed above, the factor influencing the results could be their dominant home language. This is confirmed by Morais (2000) where languages that can influence MalE are Malay, Chinese dialects like Mandarin, Hokkien, Cantonese and Hakka, and Indian languages such as Tamil, Malayalam and Telugu. However, the small number of speakers in this study does not allow such generalisations to be made. No statistical test was carried out due to there being only three speakers.

4.4.3 Differences in Rhythm of MalE Based on Different Metrics

Figure 4.4.3 below shows the comparison between the average score for all three metrics used in read and spontaneous speech style. The score for nPVI-V and rPVI-C were higher in read speech compared to spontaneous speech. As discussed in Chapter 2, Grabe and Low (2002) noted in their study that "stress-timed languages would exhibit high vocalic nPVI and high intervocalic rPVI values". This suggests that all speakers were more stress-timed in read speech compared to spontaneous speech in the current study. However, it cannot be concluded in such manner as the statistical test showed that there were no significant differences between both speech styles (see Table 4.4.3(a)).

Table 4.4.3(a): Results of statistical test for nPVI-V and rPVI-C

Metrics	***t***	***df***	***p***
nPVI-V	1.08	11	0.29
rPVI-C	0.46	11	0.65

As for VarcoV, there was a difference in the results obtained where the scores for spontaneous speech were higher than read speech. As discussed in Chapter 2, VarcoV is good in discriminating the influence of the rhythm of one's first language on the second language spoken. Hence, the results for the current study have shown that the speakers were more stress-timed in spontaneous speech compared to read speech for VarcoV. This may be due to the different L1 of the speakers which may have influenced the scores for VarcoV in spontaneous speech. This has again also confirmed the study by Morais (2000) (see section 4.4.2). However, it cannot be concluded in such manner as there were no significant differences found between both speech styles for VarcoV (see Table 4.4.3(b)).

Table 4.4.3(b): Results of statistical test for Varco V

Metric	***t***	***df***	***p***
VarcoV	1.76	11	0.09

An Anova statistical test was carried out and the results are tabled as below:

Table 4.4.3(c): Results of Anova statistical test for nPVI-V, rPVI-C and Varco V in read and spontaneous speech

Metrics	Read Speech	Spontaneous Speech
nPVI-V	F (2, 9) = 9.13, p = 0.0068	F (2, 9) = 0.05, p = 0.95
rPVI-C	F (2, 9) = 0.84, p = 0.46	F (2, 9) = 0.13, p = 0.88
VarcoV	F (2, 9) = 2.08, p = 0.18	F (2, 9) = 0.59, p = 0.57

The Anova statistical results shows there is no significant difference found for in both read and spontaneous speech for all three metrics except for the nPVI-V in read speech. The results for nPVI-V in read speech showed significant results. Based on the post hoc comparisons using the Tukey HSD test, it indicated that the mean score of the nPVI-V for Chinese speakers (M= 54.1, SD=2.19) was significantly different than Indian speakers (M= 59.67, SD=1.58). Besides, the mean score of the nPVI-V for Indian speakers was also significantly different than the Malay speakers (M= 55.61, SD=1.90). However, there were no significant differences found between the mean score of the nPVI-V for Chinese speakers and Malay speakers.

Hence, it can be concluded that the speakers were more stress-timed in read speech compared to spontaneous speech for nPVI-V. However, the small number of speakers in this study does not allow such generalisations to be made and the results have to be treated with caution.

4.5 Summary

In this chapter, all results obtained for three different types of metrics (nPVI-V, rPVI-C and VarcoV) have been tabulated based on different ethnic groups (Chinese, Indian and Malay) for read speech and spontaneous speech styles. Overall, it can be concluded that all three ethnic group speakers have exhibited similar rhythm (stress-timed) for both speech styles using the three metrics suggesting the possibility of a rhythmic pattern that cuts across ethnic groups for fluent speakers.

CHAPTER 5

CONCLUSION

This chapter provides a summary of the findings of this study in relation to the research questions. The implications and limitations of the study are also presented as recommendations for future research in this area.

5.1 Summary

This study was carried to provide a better understanding of the rhythmic pattern of MalE which has traditionally been categorized as a syllable-timed language. The approaches taken by Grabe and Low (2002) and Dellwo (2006) to capture the rhythmic properties of a language by using PVIs and VarcoV metrics were applied in this study. The objectives of this study was to investigate the properties of rhythm in the acrolectal form of MalE in both reading and spontaneous speech styles and among three different ethnic groups (Malay, Chinese and Indian) in Malaysia The summary of findings for each of the three research questions is presented in the following sub-sections.

5.1.1 Research Question 1: To what extent do different speaking styles (read and spontaneous speech styles) affect the rhythmic properties found in MalE?

Classification of rhythmic pattern of MalE was carried out following Grabe and Low (2002) (see section 2.3.2 & 4.4.1). The findings (see sections 4.1, 4.2 and 4.3) suggest that there is no significant difference between read and spontaneous speech, with both being stress-timed based on their nPVI-V, rPVI-C and also VarcoV (see Figure 4.4.1 (a - b)). The results contradict several studies on MalE (Tan & Low, 2014; Wan Aslynn, 2012). Wan Aslynn's (2012) study showed that MalE to be more syllable-

timed in read speech and Tan and Low's (2014) study also showed that MalE to be more syllable-timed for read speech and spontaneous speech (Tan & Low, 2014). Perhaps, the speakers of this study tend to be more careful while pronouncing every syllables and words for the read speech. Despite having different L1 including English, these speakers did not transfer their L1 rhythm onto their L2. Also, as discussed in Chapter 3, these respondents were fluent speakers of MalE.

Both speech styles differ in scores as read speech has higher PVI scores than spontaneous speech. However, as mentioned in Chapter 4, both speech styles are still categorized as stress-timed language due to the statistical results that show there were no significant difference found between both speech styles for nPVI-V and rPVI-C (see section 4.4.1).

5.1.2 Research Question 2: To what extent are there differences in the rhythmic properties among three ethnic groups (Malay, Chinese and Indian) in Malaysia?

The results were similar for all three groups for read and spontaneous speech despite the participants having different L1s including English as there were no significant differences found. Perhaps, this is because although each speaker has different L1s, their dominant home language is English. Moreover, these respondents are fluent speakers of MalE where all of them are English Language lecturers with educational backgrounds in English language teaching and or linguistics (see section 3.2). The results obtained are different from previous studies (Tan & Low (2014); Wan Aslynn, 2012) due to several factors which may have influenced the rhythmic properties of MalE.

As discussed in Chapter 4, the age groups of the participants in the current study and previous studies on MalE are different; the speakers of Tan and Low (2014) and Wan Aslynn (2012) were respondents with an average of 21.1 and 28 respectively while

the speakers of the current study are respondents with an average age of 43. Secondly, the dominant home language may be a factor that may have influenced the results of the current study. For example, the home dominant language for each speaker is different in this study as some even use English (see Section 3.2). However, for Tan and Low (2014) and Wan Aslynn (2012), both their respondents' L1 is the standard variety of Malay. Thirdly, the respondents of the current study and previous study of MalE (Tan & Low (2014); Wan Aslynn, 2012) are from different educational and professional backgrounds, and have different levels of fluency in English. The respondents of the current study are fluent speakers of English language and are also English language lecturers. However, the speakers of Tan and Low (2014) and Wan Aslynn (2012) were university students with different levels of fluency in English language.

5.1.3 Research Question 3: To what extent are there differences in the rhythm of Malaysian English based on different matrices (nPVI-V, rPVI-C and VarcoV)?

Firstly, the scores for nPVI-V and rPVI-C were high in both read speech compared to spontaneous speech. As discussed in Chapter 2, the higher the vocalic nPVI and intervocalic rPVI scores, the more stress-timed is the rhythm of a language. Thus, it can be concluded that all speakers appeared to be more stress-timed in both read speech and spontaneous speech based on the scores obtained.

Secondly, the scores for VarcoV were also high for read and spontaneous speech. This suggests that the speakers were also stress-timed in read and spontaneous speech. As discussed in Chapter 2, VarcoV is good in discriminating the influence of the rhythm of one's first language on the second language spoken. This shows that the current results of VarcoV may have been influenced by the L1s of the speakers. However, such generalization cannot be made as the statistical results showed that there were no significant differences between both speech styles for VarcoV. Therefore, it can

be concluded that all three metrics revealed almost similar results in measuring both speech styles which indicates that overall the rhythm exhibited by the group of fluent English speakers in this study can be deemed to be stress-timed for both read speech and spontaneous speech.

5.2 Implication from Current Study

Based on the current study, acrolectal MalE can be categorized as having a stress-timed pattern which actually contradicts the previous studies conducted on MalE. As discussed in Chapter 4, perhaps this is due to the use acrolectal speakers in this study as they are fluent speakers of English. Besides, metrics such as nPVI-V and rPVI-C used in this study suggests that MalE is stress-timed in read speech and spontaneous speech. For VarcoV, MalE was more stress-timed in spontaneous speech than read speech as the scores were higher in spontaneous speech compared to read speech. As discussed in Section 4.4.3 and 5.1.3, perhaps this is due to the influence of speakers' L1. Nevertheless, statistically there were no significant differences found across both speech styles for VarcoV.

Thus, this suggests that a language cannot be categorized solely based on the use of different metrics as different metrics yield different results and there is no suitable or definite metrics that can be used to determine the rhythm of a language. Perhaps, factors such as age group, fluency in a language and L1 and/or home dominant language also play a role in deciding the pattern of rhythm of a language.

5.3 Limitation of the Study

5.3.1 Respondents

As discussed in section 1.1, the sub varieties of MalE can be seen to be on a continuum ranging from acrolectal to basilectal varieties. However, only the acrolectal speakers were used to conduct this study. The number of respondents used in this study was also small (12 speakers- 4 Malay, 4 Chinese and 4 Indians) and did not encompass other ethnic groups. They were all of the same age group and educational and professional background. The latter criteria were used to ensure that only fluent speakers were used in this study.

5.3.2 Metrics

In this study, only two metrics (PVI and VarcoV) were used to analyse and compare the data of this study as these two metrics were commonly used in most of the previous rhythmic pattern studies (e.g. Cumming (2011); Grabe & Low (2002); Nokes & Hay (2012); Szakay (2006); Tan & Low (2013). Other metrics such as VI and %V were not used in this study.

5.3.3 Reliability of Study

In this study, the measurements of the data were carried out only by the author and a second round of measurement was not done by any other individual to improve the reliability of data.

5.4 Recommendation for Further Research

Future studies on rhythm in Malaysian English should include a bigger and more diverse sample. For example, the sample should look at whether there are differences between fluent speakers and English language learners or speakers for whom English is not dominantly used English as this study suggests that there may be differences in rhythmic patterns between the two groups. The influence of speakers who speak different L1s should also be investigated. The use of different speaking styles and context and rhythmic patterns should also be looked into as this is a relatively understudied area. Comparisons with more metrics like the VI and %V can be carried out to establish if these metrics yield different results. Lastly, the results obtained should be subjected to auditory judgements by trained phoneticians in future study as this will increase the reliability of findings and conclusions.

5.5 Concluding Comments

In conclusion, an acoustic analysis has been carried out in order to investigate the rhythmic properties of MalE among acrolectal speakers in read and spontaneous speech for three different ethnic groups (Chinese, Indian and Malay) based on three sets of metrics (nPVI-V, rPVI-C and Varco-V). The results showed that the rhythm of MalE is of stress-timed pattern which contradicts the results shown in previous studies where MalE was said to be of syllable-timed language. Therefore, it can be said that similar metrics used may not always yield similar results at all times as factors such as fluency in a language, age groups, L1 and/or home dominant language may affect the rhythmic properties of a speech style.

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