Speech prosody in the production of Setswana-English bilingual children aged 6-7 years.

BOIKANYEGO SEBINA

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Department of English Language and Applied Linguistics, University of Reading
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Abstract

The study investigates the acquisition of Setswana speech rhythm and the penultimate syllable vowel length by early sequential Setswana-English bilingual children aged 6-7 years old growing up in Botswana, a country with a diglossic setting, where English is the dominant high-status language in educational and public contexts. For this group of children, taught full-time in English from the age of three years, the second language (L2) becomes their dominant language through exposure to English-medium education. The speech rhythm and the penultimate syllable vowel length patterns of the Setswana-English bilingual children are compared with those of age-matched Setswana monolingual children educated in public schools for whom English is a learner language. The aim was to ascertain if the prosodic patterns of the bilingual children reflect those of monolingual children or if the high-status English has an effect on these prosodic features in comparison with monolingual children.

In view of the on-going debates over perceptions and production of speech prosody, it is valuable to consider monolingual and bilingual speech acquisition to determine the extent to which high exposure to L2 input contributes to foreign accent and divergent speech prosody in L1. Previous studies have reported inconsistent results regarding the rhythmic pattern of bilingual children of 5 years of age and older. While other studies demonstrated that this group of bilingual children keep the rhythmic pattern of their two languages separate (e.g., Bunta & Ingram, 2007) - i.e., they maintain first/second language-specific syllabic stress or prosody patterns during parallel or sequential acquisition of the two languages - others have shown an interaction of the two languages (Kehoe, 2002; Mok, 2011; Whitworth, 2002). The research presented in this thesis tests these claims.

The study primarily uses spontaneous speech from twenty participants based on the telling of the wordless picture story *Frog where are you?* (Mayer (1969). Praat (Boersma & Weenink, 2002) was used to generate waveforms and spectrograms where sound files were segmentally labelled into syllables and vowels. A Praat script was also used to extract the duration of the vowels. The nPVI-V and the Varco V rhythm metrics were utilised to examine the speech rhythm of the children. The results showed that the bilingual group's L1 prosodic pattern diverged from that of the non-bilingual group. The evidence in this population, of evident transfer effects from English bilingualism on L1 Setswana speech prosody, challenges the assumption that speech prosody is established early in life, especially when the language is a less marked, syllable-timed language like Setswana.

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Dedication

This work is dedicated to my husband Caesar and my children Gonewa, Isago, Kgosi and Aane. I love you very much!

Special dedication goes to my son Isago whose Setswana language development inspired this research!

Declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Candidate:

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1. INTRODUCTION

1.1 Overview

This study investigates prosodic features, specifically speech rhythm and penultimate syllable vowel lengthening (hereafter PSVL), in the Setswana speech of sequential Setswana-English bilingual children growing up in Botswana, a country with a diglossic setting (see section 1.3.8). Sequential bilinguals learn one language first and additional languages later (Montrul, 2002, 2004). They are contrasted with simultaneous bilinguals, who are exposed to more than one language from birth and so their two languages develop almost equally (Montrul, 2002, 2004).

The study aims at finding out if there are any effects of English, the language given high status in Botswana (Magogwe & Oliver, 2007; Mathangwane, 2008; Nyati-Ramahobo, 2004), on Setswana speech rhythm and PSVL. The study specifically looks at the speech of native Batswana (citizens) children (6-7 years old) who were exposed to English at an early age and attend private English medium schools compared with those of age-matched Setswana monolingual children educated in public schools for whom English is a learner language. Any changes to the timing of the syllable will result in changes to the rhythm pattern in the speech of these children. That being so, it is probable that it will also affect the PSVL of these bilingual children.

The study aims to ascertain if the prosodic patterns of this group of children mirror those of monolingual children educated in public schools for whom English is a learner language or if the high-status English (Nyati-Ramahobo, 2004) has an effect on the timing of the Setswana syllable in comparison with monolingual children. The theoretical implication is how far exposure has an effect on predicted separate phonological representation and phonetic prosodic production, or whether L2 sequential exposure reveals transfer back to L1, i.e., English-affected speech prosody, due to the change in language dominance, which could result in divergent prosody and foreign accent in Setswana, possibly causing unintelligibility in Setswana conversations. The study is of the view that, if speech prosody is disrupted, it could make the Setswana of the Setswana-English bilinguals difficult to comprehend in their own community and/or make them "stand out".

A secondary aim of the study is to interrogate theories of second language (L2) effect on first language (L1) and or bilingualism. It is hoped that this investigation will throw some light on to the role L2 plays in the development of prosodic patterns in L1, and may give us insights into issues of language acquisition such as incomplete acquisition in L1, acquisition delay in L1, and L1 attrition. These three issues are outlined below.

Any differences in the speech rhythm and PSVL of Setswana-English bilinguals compared to Setswana monolinguals could be a result of incomplete acquisition, or acquisition delay or language attrition. Incomplete acquisition can occur when sequential or simultaneous bilingual children are exposed to a high input of second language (L2) in early childhood before they have fully acquired the linguistics system of the first language (Montrul, 2002, 2004). Similarly, Putnam and Sánchez (2013) are of the view that incomplete acquisition occurs when

sequential bilinguals are not exposed to the best first language (L1) input during the age of prime linguistic development which, according to them, ranges from birth to 4 years of age. Batswana children who attend private English medium schools and have been exposed to high English language input at nursery schools from the age of 3 years or below fall under this category. Since the children in this study spend most of their daytime at school (0800-1700 hours), they are extensively exposed to English (L2) and L1 input is significantly reduced. Therefore, the acquisition of these children's L1 may be assumed to be interrupted, possibly leading to incomplete acquisition. Montrul (2006) argues that, once children start school in one language, they will not reach native speaker attainment in both languages with the minority language being the most affected. Montrul (2006) alludes to the concept of Critical Period Hypothesis, which states that there is a sensitive period for L1 acquisition, which occurs before puberty. The language situation in Botswana, where English is afforded a high and prestigious status at the expense of Setswana, may also result in incomplete acquisition in Setswana. This makes Botswana an ideal place to investigate L1 incomplete acquisition in the phonological system, particularly speech rhythm and PSVL, among children who are educated in a prestigious L2, where L1 is reduced from an early age.

Similarly, exposure to L2 in early childhood could lead to acquisition delay in the phonological system of the Setswana-English bilingual children, resulting in delayed native-like speech rhythm and PSVL in the speech of the bilinguals compared to monolinguals. The present study discusses the possibility of acquisition delay in the speech rhythm and PSVL of the Setswana-English bilinguals.

It is worth pointing out that age alone at which the child was exposed to L2 is not enough to determine if what has taken place is incomplete acquisition or acquisition delay. It is also necessary to take into consideration the age at which the linguistic element under investigation is fully acquired as what could have taken place is L1 attrition, defined as the disintegration of an L1 as a result of L2 domination (Kopke & Schmid, 2004). A number of studies have shown that phonological perception in areas such as speech rhythm and syllable vowel length of the L1 is acquired early in life (Dehaene-Lambertz & Houston, 1998; Nazzi, Bertoncini, & Mehler, 1998; Nazzi, Jusczyk, & Johnson, 2000). The present study aims at looking into to the possibility of L1 attrition in the speech of Setswana-English bilinguals through comparing the result of the present with previous studies on L1 attrition. This is because this group of children are dominant in L2 and so it is possible that their L1 could disintegrate. Furthermore, if phonological perception is acquired early in life, the bilingual children in the present study who were exposed to L2 at the age of 3 years had had sufficient time to acquire the prosodic features of Setswana such as speech rhythm and PSVL. Any differences in the speech rhythm and PSVL of the bilinguals compared to monolinguals could be due to L1 attrition.

It is worth noting that the aim of the present study can only draw tentative conclusions about the role of these three language theories (L1 incomplete acquisition, L1 acquisition delay and L1 attrition) in the data presented here. This is because the present study is not a longitudinal study and the study did not use younger monolingual control group.

The main methodology adopted by the study is a quantitative data collection strategy of inquiry referred to as quasi-experimental research design (Dörnyei, 2007). A quasi-experimental research design best suited the objectives of this study, which aims at determining the effects

of English language on the speech rhythm and penultimate syllable vowel length on the Setswana speech of Setswana-English bilingual children. While quantitative methodology is the main methodology employed in the study, qualitative data is also collected through the language background questionnaire that was completed by the parents.

1.2 A sociolinguistic profile of Botswana

Botswana, a landlocked country, locked between Angola, Zambia, Zimbabwe, South Africa, and Namibia, is situated in Southern Africa. In addition, to the countries that Botswana shares the border with, the Southern African region consists of Lesotho, Malawi, and Swaziland. Botswana is a former British protectorate, colonised by Britain from 1885 to 1965 (Adeyemi & Kalane, 2011). Botswana was formerly known as Bechuanaland Protectorate when it was under British rule and the citizens of Botswana were called Bechuana. After independence in 1966 the name was changed to Botswana, subsequently the citizens were referred to as Batswana.

Even though Botswana has a small population of around 2 million, based on the 2011 Botswana Population and Housing Census, it is a multi-ethnic, multicultural, and multilingual country. The 2 million covers people of different ethnic groups who speak different ethic languages. According to Batibo (2005) there are roughly 28 languages spoken in Botswana. These are divided into Bantu, Khoesan, and Indo-European depending on their linguistic characteristics (Smieja & Mathangwane, 2010). It is estimated that 80% of the population speaks Setswana which also serves as the national language (Bagwasi, 2003; Letsholo, 2009). For this reason, Setswana plays the role of an indigenous lingua franca in Botswana (Bagwasi, 2003). It is not surprising that the Setswana language is the most spoken language because the majority of the

population is the Tswana ethnic group which could be estimated at 80%; same percentage as the speakers of the language. The Tswana ethnic group comprises of the Batawana, Bangwato, Bakgatla, Batlokwa, Bakwena, Balete, Barolong and Bangwaketsi. While the different Tswana ethnic groups speak different dialects of Setswana, the dialects are mutually intelligible.

Around 15% of the population is made up of different minority Bantu ethnic groups who speak their mutually unintelligible languages as well as Setswana (Jason & Tsonope, 1991). These include the Bakalaka, Bayei, Bambukushu, Basarwa, Bakgalagadi and Babirwa. The 5% of the population comprises of the Indo-European family whose languages are Afrikaans and English (Letsholo, 2009). It is probable that the population figures might have changed since the publication of the referenced sources. Other languages spoken in Botswana include Silozi, Nambya, Zezuru, Isindebele, Otjiherero and Ciikuhane (Letsholo, 2009).

1.3 English in Botswana

1.3.1 Historical development

The English language has been a part of the languages spoken in Botswana for over a century. English was introduced by the missionaries and the colonial rule around the mid nineteenth century (Smieja & Mathangwane, 2010). In order for the people to read the bible which was written in English the missionary opened Christian schools where people were taught to speak, read and write English. Some of these schools which are still in existence in the present Botswana are Materspei College Senior Secondary School in Francistown, St Joseph's College Senior Secondary School in Kgale and so on which were opened by the Roman catholic church. Other than the Christian schools, people who worked for the colonial administration were

taught to speak, read, and write English (Smieja & Mathangwane, 2010). This was to ensure the smooth running of the everyday activities of the colonial administration as the colonials were English natives and thus English was the medium through which instructions were given (Smieja & Mathangwane, 2010). Most importantly English was the language of the administrative law (Jason & Tsonope, 1991; Smieja & Mathangwane, 2010; Tlou & Campbell, 1984). Therefore, it was necessary for the administrative staff to have some form of proficiency in the English language. It is evident that the opening of the Christian schools and the teaching of English to the administrative staff contributed immensely to the spread of the English language in Botswana at the time.

In the early twentieth century ward schools, which were not affiliated to any religion, were set up (Tlou & Campbell, 1984). English was one of the main subjects taught at these schools (Tlou & Campbell, 1984). Even thought there was an increase in the number of institutions where English was taught, according to Andersson and Janson (1997) quite a small number of Batswana were proficient in the English language. However, this did not deter the members of parliament and the government officials to declare the English language as an official language when Botswana attained independence in 1966 while Setswana became the national language.

1.3.2 English in the government domain

English is the language used in all government correspondence in Botswana. It is used in government administration and records, law and courts as well as in education (see section 1.3.3 on education in Botswana). It is the language, which is used in most official and formal transactions in the government sector, though at times alongside Setswana. Setswana is mostly reserved for informal encounters. English is the language used in the parliament, The House of Chiefs and during *kgotla* (ward) meetings (village meetings with government officials). At times, but not always, during kgotla meetings an interpreter would interpret the proceedings of the Kgotla meetings to Setswana. It is noteworthy that of recent Kgotla meetings are sometimes addressed in Setswana, though accompanied by code-switching between Setswana and English. The move to use more Setswana at Kgotla meetings was initiated by the current (2017) president of Botswana, Lieutenant Dr Sir Seretse Khama Ian Khama.

According to Smieja and Mathangwane (2010), parliamentary debates were conducted exclusively in English until in 1987, when a Presidential Directive permitted the use of Setswana. Even so, other parliament proceedings such as the President's State of the Nation Address, the Budget speech and so on were strictly in English (Smieja & Mathangwane, 2010). Allowing the parliament debates to be conducted in Setswana was such a positive move because most of the members of the parliament were not fluent in English. There is no qualification required for one to become a member of the parliament; the members of the parliament are elected by the people of the constituency they hope to represent. This means that some of the members of parliament only had primary school education level. Since the school was the main or only institution where one could learn the English language, these members of parliament's proficiency in English was limited and this made it difficult for them to take part in the debates, consequently, denying them the right to contribute to the

development of their constituency and the country at large. The use of English during parliament debates thus disempowered them.

The language situation with The House of Chiefs is a bit different, as the use of both English and Setswana was endorsed from independence in 1966. However, all the Setswana proceedings have to be translated into English (Smieja & Mathangwane, 2010). The members of The House of Chiefs are paramount chiefs from different ethnic groups; they inherited their position as chiefs. Therefore, there is no qualification required for one to become a chief. As such, their fluency in English varies from poor to fluent. For those who are not proficient in English it would be difficult to take part and even understand proceedings that are in English. The role of the chief is to relay government intentions regarding the country's policies, the developments of the country and so on to the villagers as well as inform the government officials such as the members of the parliament of the needs of the village especially those concerning the development of the village. For example, schools, tarred roads, water, electricity and so on.

The use of English in political proceedings such as political rallies has also slightly declined since independence, with politicians preferring Setswana to English. In the past, it was normal to find politicians addressing the audience in English without taking into consideration their limited knowledge of English. It is worth noting that, even though English is the official language, the majority of the population are not competent in English (Mathangwane, 2008). English is mostly used by a few elites and, at times, in code-switching between English and Setswana.

The preference to use English at political rallies by the politicians must have emanated from the wrong perception that one who speaks English well is intelligent, a perception that still holds to date. The politicians took advantage of this and used it as a political strategy. Through speaking English, the message they sent to their potential voters was that they (politicians) are intelligent. Therefore, the people would vote them with the belief that the person they have voted is intelligent and so would represent them well at parliament. The slight decline in the use of English in political rallies could be attributed to the fact that most of the parliamentarians or potential parliamentarians these days are young and most of them have a tertiary institution certificate which most of their followers are aware of, therefore, the politicians do not have to prove their intellect to their potential voters through speaking English. Someone of these potential parliamentarians are former university lecturers who hold a Master's degree or a PhD.

1.3.3 English in education in Botswana

The declaration of English as an official language in Botswana meant that a good system of learning all aspects of English language must be in place so that the people could attain proficiency in English. The use of English as the medium of instruction in schools was formalised in 1977 as a recommendation of the first National Commission on Education (NCE 1 1977a). The NCE 1 recommended that Setswana be used as the medium of instruction in the first four years of primary school, that is, from Standard (hereafter STD) / Grade One to Four, while English was taught as a subject. English became the medium of instruction from Standard Five up to tertiary level (NCE 1 1977a). The Botswana education system comprises of seven years of primary education (STD One to STD Seven), three years of junior secondary school (Form One to Form Three) and two years of senior secondary school (Form Four to Form Five). The years spent at tertiary institution ranges from one year to five years depending on the programme and course one is pursuing. For example, most of the undergraduate degree

programmes are four years long except for the Law degree, which takes five years. The postgraduate certificate and undergraduate certificate programmes are one-year long. Master's and Doctor of Philosophy (PhD) are two years and four years long respectively.

The 1977 National Policy on Education was revised in 1994 after the second National Commission on Education in 1993 and it is the one that is currently in use. The 1993 National Commission on Education recommended that the use of English as a medium of instruction in primary schools must be reduced from STD Five to STD Two (NCE 1993). Accordingly, Setswana was endorsed as a medium of instruction only in STD One because it is thought to hamper the child's mastery of English, the main language needed for success in primary school and in further education, as well as in the world of work (NCE 1993). However, in public schools teachers find it impossible to put into practice the recommendations of the 1993 NCE as most of the children lack knowledge of the English language, especially at lower primary level (Kasule & Mapolelo, 2005). Therefore, they resort to teaching every subject in Setswana or code-switch between Setswana and English so that learning can take place for the benefit of these students (Kasule & Mapolelo, 2005).

Placing more emphasis on English was believed to allow students to experience and acquire the language of technology, social mobility, and globalisation consequently enabling Batswana to be competitive internationally. For example, due to their knowledge of English, Batswana students are afforded the opportunity to study anywhere in the world where English is the medium of instruction.

As a way of ensuring that competence in English is maintained, a pass in English became a prerequisite for admission to tertiary institutions (Magogwe & Oliver, 2007; Mathangwane, 2008). Students who fail English, even if they passed other subjects, do not get a tertiary admission. The effect of this is a large demand for private English medium schools where affluent parents pay money for their children to become fluent and proficient in English, the language of success and upper social class. The private English medium schools are reputable for producing good results and so they are preferred over the public schools, which often are referred to as Tswana medium schools.

At most of the private English medium schools, Setswana is introduced as a subject at senior primary, from STD Four (around the age of 9 years) and pupils are not allowed to communicate in Setswana except during Setswana lessons. In rare cases where Setswana is taught as a subject from STD One (around the age of 6 years), it is only allocated an hour slot a week in the school timetable. This limited time does not help in the learning of Setswana especially that the children are not fluent in Setswana having been exposed to high English (L2) input from the age of three years when they started private English medium nursery schools. Therefore, the teachers find themselves in a situation where they have to teach the Setswana subject to these English dominant pupils in English or having to code-switch between Setswana and English so that learning of Setswana could take place. The one-hour a week teaching of Setswana also does not allow the children to learn and practice Setswana because once they leave the Setswana lesson they go back to speaking English, the language they are comfortable in speaking. In addition, the schools' policy, which restricts the use of Setswana to Setswana lessons and discourages its use in their daily activities does not help in this regard. The Setswana teacher lamented that by the time they meet the pupils the following week, all that they had learnt the previous week had been forgotten; therefore, they had to re-teach the

content. This cyclical practice makes the teaching of Setswana at these schools a slow, drudge process.

1.3.4 English at home

The desire for the children to become fluent in English has resulted in an emerging trend where Setswana is the home language when children are young but, when they start school, parents prefer to communicate with their children mostly in English (Arua & Magocha, 2002; Mathangwane, 2008), though at times characterised by code-switching with Setswana. This makes English the dominant language in middle class and high-class households, as these are the ones who could afford taking their children to private English medium schools. Therefore, children grow up speaking English and neglect their native / ethnic languages. The dominant use of English at home is seen as a way of enhancing the learning of the language. English becomes the dominant language of these children, as it is the school and home language. The dominance in English could have an impact on the Setswana rhythm as well as the penultimate syllable vowel length. It is the objective of this present study to establish if this is the case.

1.3.5 English in the media

As an official language, English permeates the social, economic and cultural lives of Batswana (Nyati-Ramahobo, 2004). Even though both English and Setswana are used in the media, the use of English outweighs that of Setswana. All the newspapers are in English, except the government *Daily News,* which prints two versions of the newspaper, one in English and the other in Setswana (Sebina & Arua, 2012; Sebina & Arua, 2014). In addition, the private newspaper *Mmegi* has a small section in Setswana. Similarly, of all the five radio stations in the country, only one state owned radio station uses Setswana as its main medium of communication, however this is along English (Sebina & Arua, 2012; Sebina & Arua, 2014).

For example, the news is read in both Setswana and English, first in Setswana and then in English. Correspondingly, the state owned television station uses both English and Setswana.

1.3.6 English in the private sector

It being an official language, English is used in all formal transactions in businesses and the religious sector. Setswana is set aside for informal settings. Since most of the private businesses are owned by foreigners, English became a medium through which orders were transmitted. The dominant use of English is also seen in the bank sector and industries. English is also the language of religion. Botswana is a Christian state with the majority of the population following the Christianity religion. This is not surprising as Botswana is a former British colony where along with the British colonisers came the missionaries. Since the bible's original language is English the churches continued using the language but alongside Setswana. The bible has since been translated into Setswana. There are other religions such as Muslim and Hinduism practiced in Botswana which also use English together with Setswana and the language of their religion such as Arabic for Muslim. The use of English in the religious domain could also be that English is the common language that most members of the congregation would understand because of people from different nations as we live in a global village.

1.3.7 Status of English in Botswana

As a result of its official status and economic functions, English is afforded a high and prestigious status in Botswana. While both Setswana and English are used in Botswana, English has a higher profile than Setswana. Setswana is reserved for informal proceedings and is mostly used in conversations while English is used in formal set up and so it is mostly the written language. The official status and functions of English shows how much value is placed on English in Botswana. The speaking of English is a vehicle through which one's social, economic and educational status is conveyed. 'English is the language of upward social mobility, education and jobs' (Smieja & Mathangwane, 2010, p. 216). In Botswana, like many African countries, "English language is seen as a personal asset, as an instrument to promote one's personal career, as a stepping stone to getting a better job and as a social status marker" (Schmied, 1991, p. 170). One who speaks English well is regarded as intelligent and belonging to a high social class (Mathangwane, 2008). As such, people want to be seen speaking English even when they are not proficient in it. The high, prestigious status given to English has resulted in a negative attitude towards Setswana and other local languages, as people favour English over their native languages.

The status of English in Botswana provides an opportunity to investigate the effects of promoting English at the expense of Setswana. It is for this reason that the present study investigates the effects of English on the speech rhythm and PSVL on the speech of Setswana-English bilingual children who have been exposed to high English input from early childhood. The aim is to determine if the preference of English over Setswana where English becomes the dominant language has an implication on the PSVL and speech rhythm of Setswana-English bilingual children who are dominant English, thereby resulting in incomplete acquisition, delayed acquisition or L1 attrition.

1.3.7.1 Prestigious status of English in some former British colonies in Africa

The prestigious status of English is also prevalent in other African countries that are former British colonies, such as Ghana and Kenya, as English is an official language in both. English is the dominant language in the Ghanaian state as it is by far the most spoken and preferred language (Anyidoho & Dakubu, 2008). The powerful position that English occupies is inherent in the language education policy. In Ghana, English was the medium of instruction from year 4 of primary in public schools, but the 2002 language education policy recommended that it must be the only medium of instructions in all levels as this was the case in private schools (Anyidoho & Dakubu, 2008).

The policy makers argued that this will enable better performance in examination as well as prepare students for high school (Opoku-Amankwa & Brew-Hammond, 2011). Moreover they argued that fluency in English is important for one's social status (Opoku-Amankwa & Brew-Hammond, 2011). The status of English in Ghana has resulted in negative attitudes towards local languages (Anyidoho & Dakubu, 2008) . Similarly, the language education policy in Kenya state that English should be the medium of instruction from year one of primary in urban schools for the same reasons as those of Ghana and Botswana. Proficiency in English is synonymous with literacy and high socio-economic class. It is the most preferred languages in urban areas and it is prominent in media (Michieka, 2011). The prestigious position that English holds in Kenya has resulted in shunning of the local languages (Michieka, 2011).

1.3.8 Diglossia in Botswana

The Botswana language situation, with English as the language of power and prestige, clearly reflects diglossia. Fishman (1972, p. 92) defines diglossia as 'the functional distribution of more than one language to serve different communication tasks in a society'. It is without doubt that diglossia is a part and parcel of a multilingual society such as Botswana. Originally, diglossia referred to two varieties of the same language used in the society for different purposes (Romaine, 1995). The varieties were ranked according to high valued (H) and low valued (L) varieties (Romaine, 1995). The L is acquired at home and is reserved for informal domains, whereas the H is used in formal domains such as education, government, religious, law and courts, science and technology, trade and industry (Romaine, 1995). Romaine (1995) further states that the H is a prerequisite for entry at tertiary institutions in most cases. Even though English and Setswana are not the same language, the status of English as H in Botswana is a clear indication of diglossia. Romaine (1995) points out that the result of diglossia is that a once dominant language in society is replaced by another language and the use of the once dominant language declines. In addition, fluency in the other language increases as the younger generation prefers to speak it.

This is a clear picture of the language situation in Botswana where the younger generation, especially those who attend or have attended private English medium schools, prefer speaking English as they are proficient in it compared to Setswana and so are comfortable speaking it. This makes English their dominant language. It is worth noting that Setswana is still the dominant language for the majority of the population, because most people cannot afford to take their children to expensive private English medium schools. Therefore, Setswana is spoken by the majority of the population. Bagwasi (2003) is of the view that Botswana's diglossia situation could be referred to as "double overlapping diglossia" p. 214. because both

the English as an official language and Setswana as the national language are at times both used in official functions (see section 1.3.2 on English in the government domain) as well as both being used as the medium of instruction in schools (only in STD One) (see section 1.3.3 on English in education in Botswana).

The diglossic nature of Botswana is one motivation to investigate the implications of English as the H language. The present study aims at highlighting the socio-political factors (which are responsible for English being the H language) implications on the amount, timing and quality of input on the Setswana-English bilinguals Setswana prosodic development specifically speech rhythm and PSVL. This could result in incomplete acquisition or acquisition delay or L1 attrition in these two prosodic elements.

1.4 Rationale of the study

The central motive to carry out this research is because, quite often, studies on bilingual children's phonological acquisition focus on segmental aspects while supra-segmental ones, such as prosody, including speech rhythm and PSVL, are given less attention. Even though the prosodic features of speech rhythm and PSVL in early bilingualism are generally under-researched, there is evidence that African languages such as Setswana are the ones that are least investigated in the literature (Gibbon & Gut, 2001; Gut, Urua, Adouakou, & Gibbon, 2001). A lot of literature in this area is on Germanic and Romance languages (Bunta & Ingram, 2007; Grabe, Post, & Watson, 1999; Kehoe, C. Lleó, & M. Rakow, 2011; Lleó, Rakow, & Kehoe, 2007; Whitworth, 2002) and a few on Cantonese (Mok, 2011). It seems there is nothing on Setswana, the national language of Botswana. This matters theoretically and methodologically

because the study aims to highlight the effects if any of high L2 input on the development of L1 prosody on children who were exposed to high L2 input in early childhood.

Previous literature in the field has demonstrated the effects of high L2 input on the L1 of children who had left their country of origin and are residents in a foreign country, where the language spoken by the majority is a foreign language that they are forced to learn. This means that their exposure to L1 is drastically reduced at early childhood and this can result in incomplete acquisition or acquisition delay or L1 attrition. The contribution that the present study hopes to make to the field is that high L2 input at the expense of L1 input in early childhood has implications to the development of L1 which could potentially lead to incomplete acquisition in L1 or acquisition delay in L1 or L1 attrition even when the children still reside in their native country, where the native language is the language of the larger community, and have never lived outside their native country.

Secondly, with the increase in the number of children who grow up speaking English and neglect Setswana, it is necessary to highlight the implications of such practice to the development of prosody with the hope that language policy makers will amend the policy to allow Setswana to be on a par with English.

Thirdly, the present study seeks to provide a description of the Setswana speech rhythm and PSVL in the speech of Setswana monolingual and Setswana-English bilingual children because, to the best knowledge of the researcher, there is no study that has done so.

Fourth, speech rhythm and PSVL are important in parsing language in Setswana and any disruption to the expected patterns may cause problems in this respect.

Fifth, the study aims at establishing whether the speech rhythm and PSVL patterns in these group of children could shed light on the theories of incomplete acquisition, acquisition delay, and L1 attrition**.**

It is the aim of this study to fill the gap in the literature by investigating the nature of speech rhythm and PSVL in the production of Setswana-English bilingual children who are educated in prestigious private English medium schools. The objectives of the study is to establish if there are differences in the Setswana speech rhythm and Setswana PSVL pattern in the production of Setswana-English bilingual and Setswana monolingual children. Determining the speech rhythm of the participants involves measuring the length of the Setswana syllable in the speech of Setswana monolinguals and Setswana-English bilinguals then subjecting the measurements to speech rhythm metrics. The PSVL is determined by calculating the length of the penultimate syllable vowel of the bilingual and monolingual group. There after the rhythmic scores and the penultimate syllable vowel lengths of the two groups will be compared. In addition, the existing studies mentioned above have been carried out on young children who are 5 years and below. The present study will use older children from 6-7 years of age to determine if this group of bilingual children is able to keep the rhythm pattern of their two languages distinct - as it is alleged by Bunta and Ingram (2007) that, by the age of 3, the rhythm of the L1 is acquired (Mok, 2011) - whether the rhythm tends towards English rhythm (their dominant language), or whether they merge the rhythm of the two languages resulting in something intermediate between the two.

The investigation of speech rhythm and PSVL in the present study continues to provide insightful knowledge on bilingual acquisition of prosodic features thus broadens the scope of this under explored area. In addition, the research continues to provide knowledge on the effects of L2 learning on L1 as well as illustrate the consequences if any, of an increased L2 input and reduced L1 input in early childhood. In so doing, the study builds upon pioneering work of researchers such as Montrul (2006), who asserts that "timing, quality and amount of input play a significant role in maintaining language skills" (Montrul, 2006, p. 340). These are the key elements that the present study also aims to test. While Montrul's (2006) focus is on grammar, it is probable that these key elements could play a vital role in the acquisition of prosody.

1.5 Objectives of the study

The objectives of the study are:

1. To offer a description of the pattern of rhythm timing of Setswana in the speech of Setswana-English bilingual children aged 6-7 years in comparison with monolingual peers.
2. To give a description of the pattern of the penultimate vowel syllable length in Setswana multisyllabic words in the speech of Setswana-English bilingual children aged 6-7 years in comparison with monolingual peers.
3. To determine the extent to which in the bilingual Setswana-English population, the children in Standard 1, aged 6 years, have a different pattern of speech rhythm timing in Setswana in comparison with the children in Standard 2, aged 7 years, who will have had increased exposure to English.

4. To establish the extent to which, in the bilingual Setswana-English population, the children in Standard 1, aged 6 years, have a different pattern of penultimate syllable duration in Setswana in comparison with the children in Standard 2, aged 7 years, who will have had increased exposure to English.

1.6 The scope of the study

The study investigates the speech rhythm and PSVL in the speech of ten 6-7 years Setswana-English bilingual children and ten age matched Setswana monolingual children. Therefore, there are 20 participants in the study. The Setswana-English bilingual children attend private English medium schools where the medium of instruction is strictly English. For this reason, the bilingual children's dominant language is English having been exposed to high English input from early childhood at the age of 3 years when they started private English medium nursery schools. The Setswana monolingual children attend public schools (Tswana medium) where English is a learner language. The groups of children are Batswana natives, they resided in Botswana where the data was collected, and they had never lived outside the country at the time the data was collected.

The primary methodology of data collection was storytelling and a language background questionnaire, which was completed by the parents. The children told the story from a wordless picture book *Frog, Where Are You?* (Hereafter referred to as *Frog Story*) (Mayer, 1969) in Setswana while the researcher recorded them. The bilingual children also told the story in English. The recorded data was analysed using Praat (Boersma & Weenink, 2007) to extract the vowel durations, which were used to calculate the speech rhythm and PSVL of the children.

The statistical analysis was performed through the Statistical Package for the Social Science (SPSS).

1.7 The outline of the thesis

Chapter one (this chapter) serves as the introduction of the thesis. The chapter discusses the overview of the study, the sociolinguistics of Botswana, English in Botswana, the rationale of the study, the objectives of the study, the scope of the study as well as the thesis outline. The aim of this chapter (chapter one) is to put the study into perspective.

Chapter two gives a comprehensive review of the main literature relevant to the study, for example on speech rhythm and PSVL. There is also discussion of incomplete acquisition, acquisition delay, and L1 attrition, as this study may throw light on these issues. The chapter begins by discussing the theoretical concepts that the study contributes towards such as cross-linguistic influence and language contact. Once this has been done the chapter delves into an in depth review of the literature. The research questions and the hypothesis are then drawn based on the reviewed literature.

Chapter three outlines the methodology the study employed. This involves the research design, setting and participants, ethical consideration, data collection, recording environment, recording instrument, selection of participants, coding of data, data analysis, pilot study, and statistical analysis. These steps are taken to ensure valid, reliable, and quality research.

Chapter four discusses the findings of the study. The findings address the research questions and hypothesis of the study. In so doing the finding chapter puts into perspective the speech rhythm and PSVL patterns of Setswana-English bilinguals and Setswana monolinguals. This is achieved through supporting the data with statistical measurements.

Chapter five provides an interpretation and an intensive discussion of the findings presented in chapter four in order to answer the research questions of the study. The findings of the study are discussed and compared to current literature on speech rhythm and PSVL. There is also a discussion of how the findings might help us better understand incomplete acquisition, acquisition delay, and L1 attrition.

Chapter six is the conclusion of the thesis. It summarises the main findings of the study, outlines the limitations of the study, and provides recommendations for future research on the field.

2. LITERATURE REVIEW

2.1 Overview

In order to explain the theoretical and empirical design for this thesis, focusing on young monolingual and bilingual speakers' speech rhythm and the penultimate syllable vowel length (PSVL) in Botswana, relevant literature is now discussed, covering first the theoretical concepts of cross linguistic influence and language contact. This followed by a consideration of how these issues apply to Setswana phonetics/phonology, focusing on the Setswana syllable as the key linguistic phenomenon to inform the research questions and research design of the study. The review then moves into accounts of acquisition of speech rhythm in monolingual and bilingual children. The chapter finishes with a review of issues of the age factor, covering such concepts as incomplete acquisition, acquisition delay, and L1 attrition.

2.2 Theoretical concepts

2.2.1 Cross-linguistic influence

The present study contributes towards existing literature on the theoretical concept of cross-linguistic influence. Much of the research on bilingual language acquisition has demonstrated that bilingual children are able to treat the languages they speak as separate and independent systems from early on (Bosch & Sebastián-Gallés, 2001; De Houwer, 1990; Genesee, Nicoladis, & Paradis, 1995; Hulk, 1997; Meisel, 1989). This gave rise to the Autonomous Development Hypothesis, which rests on the premise that a) bilingual children separate their two languages from early in development; b) bilinguals' language develops in the same way

as in monolinguals; c) the bilinguals' acquired grammar in each of their two languages is not different from the monolinguals. Even though the languages of a bilingual are largely autonomous, that is they develop separately, their language system differs from that of monolinguals. This should be expected, as there are two languages, consequently a broader variety of grammar to choose from during the bilingual's language development. Therefore, it is probable that the languages can influence each other. Grosjean (2001) argues that these languages are constantly in competition, even in the monolingual mode, resulting in the production of non-target language. Language mode, is defined as "the state of activation of the bilingual's languages and language processing mechanisms at a given point in time" (Grosjean, 2001, p. 3). Grosjean (2001) further argues that a bilingual's language mode exists on a continuum. The bilingual assumes a monolingual language mode if the interaction is with monolinguals and so one language is deactivated; however, if he or she interacts with bilinguals who speak both of his or her languages both languages are activated (Grosjean, 2001). It should be noted that, most of the time; bilinguals are at the intermediary points of the continuum. This depends on 'interlocutor, situation, content of discourse and function of the interaction' (Grosjean, 2001, p. 5).

Research has shown that the co-existence of two languages in the bilingual environment results in influence of one language on the other (Döpke, 1998; Fabiano & Goldstein, 2005; Hulk & Müller, 2000; Kehoe, Lleó & Rakow, 2004; Lleó, 2002; Paradis & Navarro, 2003; Serratrice, 2007; Yip & Matthews, 2000, 2007;). Cross-linguistic influence (hereafter CLI), sometimes used synonymously with cross-linguistic transfer, is a concept used to describe this aspect of bilingual language processing. The discussion of CLI in this section mainly focuses on the following studies: CLI is defined as the "linguistic influence of one of a bilingual's languages while processing the other" (Nicoladis & Gavriala, 2014, p.903). Though the definitions of CLI

suggest that there is an effect of one language on the other, with the influence from either language, especially with sequential bilinguals (see section 1.1 above) a lot of studies have focused on transfer effects of L1 on L2. It was thought on the one hand that L1 was stable enough to stand the effects of L2; on the other hand it was seen as detrimental to L2 acquisition (Cook, 2003). This led to the development of the contrastive analysis hypothesis (CAH) (Lado, 1957) which held that errors in L2 are a result of transfer from L1 (Lightbown, Spada, Ranta, & Rand, 2006). However, L1 attrition studies such as (Kopke & Schmid, 2004) (see section 1.1 above) demonstrated that L2 can also have an effect on L1 (De Leeuw, Mennen, & Scobbie, 2012; Major, 1992).

Major (1992) demonstrated L1 attrition on Voice Onset Time (VOT) of the voiceless stops /p t k/ in the speech of late consecutive bilingual migrants in Brazil who were native speakers of American English. The study established a shorter VOT of the phonemes in the speech of these speakers due to the influence of Portuguese, which has a shorter VOT compared to English. This was more noticeable in the proficient speakers of Portuguese (L2). Major (1992) concluded that there is a correlation between proficiency of L2 and L1 attrition. The reason put forth is that, as one gets more proficient in the L2, it interferes with the production of L1. It is perhaps for this reason that the term 'cross-linguistic influence' was adopted to account for the fact that the influence can be bi-directional (Lightbown et al., 2006). Speech rhythm in bilingualism research (Bunta & Ingram, 2007; Grabe et al., 1999; Kehoe et al., 2011; M. Kehoe, C. Lleó, & M. Rakow, 2011; Lleó et al., 2007; Whitworth, 2002), discussed in details in section 2.3 below also demonstrated that the influence is not only from L1 to L2, but also from L2 to L1. Speech rhythm (discussed in depth in section 2.3) works on the premise that languages can be classified into distinct rhythmic classes such as stress-, syllable- and mora timing

(Abercrombie, 1965, 1967; Pike, 1945). Bunta and Ingram (2007) investigated the development of rhythm in bilingual children from the ages of 3; 9 - 5; 2 years who were acquiring different rhythmic languages, Spanish and English where Spanish is considered syllable-timed and English stress-timed. They found a significant difference between the rPVI-C and nPVI-V (rhythmic indices, see section 2.3) of the bilingual languages compared to monolinguals. As such, CLI is a theory of language learning that is relevant for speech rhythm in bilingualism. The present study aims at demonstrating this effect and thereby continue to provide insightful knowledge on cross-linguistic influence in bilingual language development.

CLI is noticed when a bilingual's production and or comprehension of a language differs from that of a monolingual due to a bilingual's knowledge of another language (Serratrice, 2013). Serratrice (2013) further stated that the differences could be quantitative or qualitative; whereas in quantitative differences the bilingual's speech is different from the monolingual's speech, in qualitative differences both the monolingual and, more often, bilingual children exhibit tendencies that are not evident in adult speech. An example of a quantitative difference is demonstrated by Nicoladis and Gavrila (2014), they reported that Welsh-English bilinguals produced more reversals in their English adjectival construction compared to English monolinguals due to the influence of Welsh, whose adjectives appear post-nominally. Serratrice (2007) also found that, even though both monolingual Italian and English-Italian bilingual children who accepted an overt third person pronoun as co-referential subject antecedent, the bilinguals did so more often than the monolingual children because of the existence of English in their environment. Döpke (1998) shows qualitative CLI in the development of verb placement in the German of three German-English bilinguals, which is not indicated in the German monolinguals. While verb phrases are head-final in German, the

German-English bilinguals placed them initially in their German, a word order peculiar to English.

While the above examples are morpho-syntactic, their discussion in the present study which focuses on phonology is for the purpose of illustration as it seems Gut (2010) is the only phonological study on the subject. Another instance of qualitative CLI is reported by Gut (2010) in the phonological processes of vowel reduction and speech rhythm of German-English and English-German bilinguals. The bilinguals showed distinct differences in the measurement of vowel reduction and speech rhythm compared to the monolinguals of these languages.

It should be noted that CLI is not the joining of two languages the bilingual speaks; rather, it should be taken as the transfer of strategies for acquiring one language to another (Genesee & Paradis, 1997). The debate is whether CLI is due to language processing, overlap/ambiguity of language structure or language dominance. While other possibilities such as idiosyncratic input (Paradis & Navarro, 2003) have been shown to account for some cases of CLI, language dominance, overlap/ambiguity of language structure and language processing are the aspects most discussed in the literature. The discussion of these aspects in the present study will focus on studies by Argyri & Sorace (2007), Nicoladis (2002, 2006, 2010, 2012), and Yip and Matthews (2000). An example of idiosyncratic input is demonstrated by Paradis and Navarro (2003), who reported that a Spanish-English bilingual child as well as the parents produced more overt subjects in Spanish compared to monolingual Spanish and their parents.

Language dominance is closely related to the degree of language input the child receives; an increased input in one of the languages the child speaks and a reduced input in the other results in dominance in the language that receives more input (Döpke, 1998). Equally, Grosjean (1982) is of the view that a bilingual child's dominance in one language is largely due to ample contact with the language that is essential in the day-to-day communication with the immediate community. It is important to point out that the child's dominant language is not necessarily the dominant language of the community. For example, the children in the present study are dominant in their L2 (English) in the L1 environment where L1 (Setswana) is the dominant language of the larger community. The amount of input the child receives in a language and its active use is closely related to proficiency and in turn dominance in that particular language. The Setswana-English bilingual children in the present study are exposed to high L2 input at school as well as at home (see section 1.3.3 and 1.3.4). The dominant language is thus one that the child knows best and is used as the main language in the bilingual's life. The children in the present study go to private English medium schools where English is the medium of instruction as well as the home language as such it is arguable that English is the language they are proficient and dominant in because it is the one that they receive the most exposure to (see section 1.1 and 1.4).

Language dominance is often determined by computing Mean Length of Utterance (MLU) for each language the bilingual speaks (Yip & Matthews, 2000). MLU is the number of morphemes or words in a child's intelligible spontaneous utterance (Rice, Redmond, & Hoffman, 2006; Rice et al., 2010). A morpheme is the smallest linguist element that carries meaning in speech (….) (Rice et al., 2006; Rice et al., 2010) For example the following are morphemes:

a. *boy*,

b. *is,*

c. *–ed* (*the past-tense)*

The MLU score is obtained by dividing the number of morphemes by the number of utterances, ideally a sample size of 100 utterances (Rice et al., 2006; Rice et al., 2010). For example: the child made the following utterances:

a. *The boy walked to school*. Six morphemes – *the, boy, walk, -ed, to, school*.

b. *He was late.* Three morphemes - *he, was, late.*

MLU score: 6+3 morphemes = 9 morphemes divided by 2 utterances = **4.5.**

It is worth noting that even though the success of MLU in determining the language ability of a child has been established, Rice et al (2006) argue that it should be correlated with other language measure such as Developmental Sentence Scoring (DSS) and Index of Productive Syntax (IPSyn).

The language with a high MLU score is the dominant one and, therefore, the one the bilingual is most proficient in. It is therefore plausible that the dominant language will influence the less dominant. This hypothesis is supported by a number of researchers who demonstrated CLI in the direction of a dominant language to a weaker one (Argyri & Sorace, 2007; Bernardini & Schlyter, 2004; Döpke, 1998; Nicoladis, Song, & Marentette, 2012). Yip and Matthews (2000) reported influence from Cantonese to English in the null objects, *wh-in-situ* interrogatives, and prenominal relatives by a Cantonese-English bilingual child at a period when Cantonese was dominant. Similarly, Argyri and Sorace (2007) reported CLI from English to Greek in the

eight-year-old English-Greek bilinguals who are dominant in English as they found that English influenced their use of null pronominal subjects, post-verbal subjects in wide-focus context and post-verbal subjects in what-embedded interrogatives. Nicoladis et al. (2012) is yet another study that established that dominance plays a role in the directionality of CLI; there was a higher rate of English vocabulary in the French constructions of English-French bilinguals dominant in English in her study. Like other studies, Timothy (2009) investigated the development of speech rhythm in a Cantonese-English balanced bilingual who acquired both of the languages simultaneously over a period of one year. The results of the study indicated that language dominance has an effect on the bilinguals' speech rhythm development. Timothy (2009)'s study is relevant to the present study because the present study investigates speech rhythm patterns of the Setswana-English bilingual children who are dominant in their L2 (English).

Nevertheless, other studies do not support dominance as a predictor of CLI, arguing that CLI is due to language-internal features such as linguistic structure and not external ones like dominance (Argyri & Sorace, 2007; Müller, 1998; Müller & Hulk, 2001; Nicoladis, 2002, 2006). Dominance in these studies could not account for the directionality of CLI found in the bilingual speech. While Argyri and Sorace (2007) found that dominance predicted the directionality of CLI from English to Greek in English dominant bilinguals, the reverse was not the case, as dominance did not account for CLI in the English of Greek dominant bilinguals. In the same vein, Nicoladis (2002) demonstrated that three- and four-year-old French-English bilinguals' dominance in French did not correspond to the amount of reversed novel noun-noun compounds in either language. Since dominance could not account for all instances of CLI, researchers turned to linguistic structure (overlap/ambiguity) for answers.

According to the linguistic structure hypothesis, CLI ensues when there is an overlap or ambiguity in the languages spoken by a bilingual child (Argyri & Sorace, 2007; Nicoladis, 2012). The overlap is due to the complimentiser domain (hereafter C-domain), which has been found to be problematic in language development and is responsible for the syntax-discourse pragmatics interface as well as sentence type (Argyri & Sorace, 2007; Hulk & Muller, 2000). "Overlap refers to the existence of the same underlying structure in both of a bilingual's languages while ambiguity refers to the existence of more than one linguistic structure with roughly the same meaning" (Nicoladis, 2012, p.321). Therefore, CLI occurs when the bilingual's languages have similar syntactic construction and one of the languages allows for more than one construction. The ambiguous language is said to influence the grammatical analysis of the other language (Argyri & Sorace, 2007; Nicoladis & Gavrila, 2014). Dopke (1998) argued that CLI takes place when the bilingual child encounters ambiguous signals from their two languages. While Dopke (1998) and Argyri and Sorace (2007) are of the view that overlap/ambiguity occurs at the surface level, Hulk and Muller (2000) argued that it occurs at the deep level of structure of a language.

The process of overlap/ambiguity is clearly illustrated in the construction of the possessive in English and Spanish. While both English and Spanish construct the possessive periphrastically as in *the bone of a dog*, English has an additional option of the morpheme -'s as in *the dog's bone*; therefore Spanish-English bilinguals will show more periphrastic constructions in their English possessives as it is the one common in both languages thereby illustrating CLI (Nicoladis & Gavriala, 2014). In support of the hypothesis, Muller and Hulk (2001) compared the rate of object omission by German-French, Dutch-French, and German-Italian with

monolingual children of these languages. The results indicated that, compared to monolinguals, bilingual children's rate of object omission was higher in Italian and French. These results are attributed to the structures of the languages involved; Dutch and German allow object omission in clause-initial position when the object has a discourse referent (Muller & Hulk, 2001). Therefore pragmatics plays an important role in determining the syntactic choice. For example:

a. Q: ga je mee naar de Titanic? /Kommst Du mit zur Titanic?

   ``Will you come along to the Titanic?"

   Ans: 0 heb ik al gezien / 0 hab

   have I already seen

   ich schon gesehen

``I've already seen it."

(Muller & Hulk, 2001, p.3)

The object *it* has been omitted in the answer.

Similar findings of overlap are reported by Nicoladis (2006) who investigated the possibility of CLI in adjective-noun strings by pre-school bilingual children. English allows only adjective-noun order while French allows both adjective-noun and noun-adjective order. The participants were asked to name pictures by using an adjective-noun string. The bilinguals were found to produce significantly more noun-adjective strings in English than monolinguals, especially with those adjectives, which appear post-nominally in French such as the adjective *green*. For example; *book green* instead of the correct English order *green book.* In addition the bilingual children produced more reversals with pre-nominal French adjective due to the influence of English. For example; *"une personne grand"* - *"a person big".* The study therefore established a unidirectional influence.

Structural overlap/ambiguity (linguistic structure) can explain many documented instances of CLI, but it has shown to be inadequate in explaining all cases of CLI found in bilingual children because CLI can occur in the absence of structural overlap and ambiguity within the bilingual's languages (Nicoladis, 2002, 2012; Yip & Matthews, 2000). The Cantonese-English bilingual child in Yip and Matthews (2000) produced reversal in both Cantonese and English relative clauses even though they are solely pre-nominal and post-nominal in Cantonese and English respectively. In addition, other studies have reported the absence of CLI when there is overlap and ambiguity. Nicoladis, Rose, and Foursha-Stevenson (2010) reported little evidence of CLI in naming moving objects by French-English bilinguals even though overlapping exist in these two languages. As a result, researchers turned to language processing to account for CLI in bilingual children.

According to the speech production model, the first stage in relaying a message is conceptual; the speaker first selects the concept related to the message. Thereafter, the lemma (grammatical, morphological and lexical) level is activated and finally the phonology of the words (Ferreira & Dell, 2000; Levelt, Roelofs, & Meyer, 1999). Nicoladis (2006, 2012) argued that overlap in the two languages of a bilingual results in competition between these languages at the lemma level and phonological level leading to CLI. For example, the French-English bilinguals who want to relay a message about a green book would activate both the French syntactic form of noun-adjective and English form of adjective-noun. The syntactic form of the target language will be highly activated and so would be more likely to be spoken (Nicoladis, 2010, 2014). This then raises the question: if the target language is the one that is eventually produced, how does CLI occur? Argyri and Sorace (2007) reported CLI due to language

processing in eight-year-old English-Greek bilinguals. The study investigated CLI in the syntax-pragmatic interface and narrow syntax with the aim of establishing whether the distribution of null/overt subject pronouns, preverbal/postverbal subjects (syntax-pragmatics interface) were more prone to CLI from English to Greek than *what* interrogatives with subject/object pronouns in the declarative (narrow syntax). Argyri and Sorace (2007) argued that the established CLI in the direction of English dominant bilinguals in both structures, though selectively, is due to language processing. One of the reasons for this conclusion could be that overt subject pronouns were not susceptible to CLI even though there is overlap of null/overt subjects between Greek and English (Argyri & Sorace, 2007). Also, in support of language processing in explaining CLI are Nicoladis and Gavrial (2014) who investigated CLI in Welsh-English bilinguals' production of adjectival constructions. The adjectival constructions are exclusively post-nominal in Welsh and exclusively pre-nominal in English therefore, there is no structural overlap. Nevertheless, compared to monolinguals, the bilingual children produced more reversals in both languages. Nicoladis and Gavrial (2014) concluded that CLI is due to competition between the bilinguals' two languages during processing and so a kind of speech error.

Nicoladis (2010) is of the view that language processing is able to explain CLI in children in both the presence and absence of structural overlap/ambiguity. However, it is worth noting that these investigations were carried out in the domain of syntax; in fact, the morpho-syntax domain has been widely investigated with regards to CLI, leaving other linguistic elements under-explored. It is probable that language processing will be unable to explain CLI in other linguistic elements such as phonology. In addition, even though Nicoladis and Gavrial (2014) concluded that language processing was responsible for CLI, they also reported that language

dominance plays a role in the direction of CLI. This is because as a group Welsh dominant bilingual children showed higher percentage of reversals in English but this was not the case with individual participants. Therefore, adding to the existing debate that individual language dominance alone does not indicate the direction of CLI. In light of this, the present study aims to further explore the language dominance hypothesis in the domain of phonology with particular focus in speech rhythm and PSVL. Some researchers argued that CLI in some features of phonology could be attributed to the amount of language usage and input the child receives; a high input or usage in one language will result in CLI in the less dominant language (Hulk & Müller, 2000; Lleó, 2002; Nicoladis, 2012). In investigating phonology, the present study contributes to this under-researched area of CLI.

Kehoe, Lleó, and Rakow (2004) who investigated voice onset time (VOT) in bilingual German–Spanish children reported transfer of this voicing feature from one language to the other. One of the participants, whose input in German was increased and input in Spanish reduced, produced many of his Spanish voiceless stop with high VOT, which Kehoe et al (2004) attributed to the influence of German, which has high VOT compared to Spanish. This finding echoed that of Johnson and Wilson (2002), who also found CLI in the speech of Japanese-English bilingual children living in Canada. The dominant English resulted in the production of long lag VOT in Japanese voiceless stops, in which the lag is generally shorter. Another study, which reflects CLI in phonology, is Gut (2010), who investigated the direction of CLI on vowel reduction and speech rhythm by four trilingual speakers with different L1s (Polish, Russian and Hungarian), two with L2 German and L3 English, the other two with L2 English and L3 German. The study reports inconclusive results for L1 influence on vowel reduction and speech rhythm in the speaker's L2 and L3. Gut's (2010) study is highly relevant to my study, because my study aims at investigating the influence of L2 in the speech rhythm

of L1. In particular, the present study aims at establishing if the dominant use of English by 6-7 years old Setswana-English bilinguals who are educated in private English medium schools and for whom English is dominant predicts the direction of CLI.

2.2.2 Language contact

The concept of cross-linguistic influence is a result of language contact (Sankoff, 2002). Language contact is the use of more than one language in the same place at the same time (Thomason & Kaufman, 2001). This is illustrated in bilingualism and bilingual countries such as Botswana, where English and Setswana are the two recognised languages in the country. Thomason and Kaufman (2001) go on to state that the result of language contact is change in the language, with one language having an influence on the other. The influence is mostly noticed through borrowing, defined as "the incorporation of foreign elements into the speakers' native language" (Thomason & Kaufman, 1988, p. 21). The telling signs of borrowing are language mixing and code switching. Though the common linguistic outcome of contact is lexical borrowing, Thomason and Kaufman (2001) argue that, in addition, there are also phonological modifications in the recipient language; however, they do not give examples. The present study aims to investigate this phonological interference/transfer in the prosodic features of speech rhythm and penultimate vowel syllable length in the speech of Setswana-English bilingual children.

The following section of the thesis gives an in-depth discussion of speech rhythm, what it is, speech rhythm metrics, and acquisition of speech rhythm by children.

2.3 Speech rhythm

This section gives a comprehensive discussion of speech rhythm in order to achieve the objective of the study of determining the speech rhythm patterns in the Setswana speech of Setswana-English bilinguals in comparison with their aged matched Setswana monolinguals. The in depth discussion of speech rhythm in this section will also enable the achievement of the objective of the study on the effect of increased level of English on the Setswana speech rhythm pattern of the Setswana-English bilingual children compared with their monolingual peers.

2.3.1 Definition of the key terms relating to speech rhythm

The review of the literature has necessitated some discussion of key terminology in the present study, particularly with reference to the term rhythm, prosody, syllable, suprasegmental, and stress. It is necessary to discuss the definitions of these terms before exploring what speech rhythm is. It is believed that doing so will set the stage for the discussion on speech rhythm.

Rhythm is a fundamental part of life. The Oxford dictionary defines rhythm as "a strong regular pattern of movement or sound" (Dictionary, 2002, p. 1500). Likewise, the Cambridge dictionary defines it as "a strong pattern of sound or movement manifested in words, poetry, music and dance" (p.679). Rhythm is "the recurrence of a perceivable temporal patterning of strongly marked (focal) values and weakly marked (non-focal) values of some parameter as constituents of a tendentially constant temporal domain (environment)" Gibbon and Gut (2001, p. 1). They further state that the temporary patterns are manifested in poetry and music, and refer to the rhythmic environment of syllable and foot as rhythmic units. Thus, in linguistics,

rhythm is manifested in prosody. According to Nooteboom (1997), prosody is properties of speech that cannot result from segmental sequence of phonemes underlying human utterances such as voice pitch and syllable duration. Other key terms, which collocate with rhythm and prosody are syllable, stress and suprasegmentally.

An attempt to define the syllable has been one elusive task for phonologists. According to Roach (2010, p.67) "a syllable is described as consisting of a centre which has little or no obstruction to airflow and which sounds comparatively louder; before and after this centre there will be greater obstruction to airflow and/or less loud sound". In their attempt to describe a syllable, Ladefoged and Johnson (2010, p. 248) are of the view that there are two theories that try to define the syllable. One theory defines the syllable "in terms of properties of sound such as sonority (acoustic energy) or prominence (some combination of sonority, length, stress and pitch)." Other theories define "the syllable based on the notion that a syllable is a unit in the organisation and planning of the sounds of an utterance (Ladefoged & Johnson, 2010, p.248). In sum, Ladefoged and Johnson (2010, p.248) are of the view that "a syllable is the smallest unit of speech." They argue that a syllable is intrinsic in every utterance (Ladefoged & Johnson 2010).

Stress is another phonological feature that features prominently in speech rhythm literature. It is usually defined in terms of prominence. Ladefoged and Johnson (2010) state that "a stressed syllable is pronounced with a great amount of energy than an unstressed syllable and it is more prominent in the flow of speech" (Ladefoged & Johnson, 2010, p.249). Likewise, Roach (2010) is also of the view that stressed syllables are more prominent than the unstressed syllables. However, unlike Ladefoged and Johnson (2010), Roach (2010) goes further to state that what

makes the stressed syllable prominent than the unstressed syllables is that the stressed syllables are louder, longer, are produced with some pitch and they have a vowel. Therefore, prominence is determined by loudness, length, pitch, and quality (Roach 2010).

Suprasegmental features sometimes referred to as prosodic features are overlaid on the syllable (Ladefoged & Johnson, 2010). It is perhaps for this reason that some phonologists (Wells, 2006) do not distinguish between suprasegmental and prosody and so use them interchangeably. Suprasegmental features go beyond the segments (vowels and consonants) and they include rhythm, stress, intonation, tone, and pitch (Wells, 2006). It could be seen from the definitions of these key terms that these phonological concepts are related.

2.3.2 What is speech rhythm?

Speech rhythm is the "alternation of timing and the perceived regularity of prominent units in speech" (Bunta & Ingram, 2007, p. 999). Gut (2012) defines speech rhythm as the "temporal organisation of languages" (p.83). In their attempt to define rhythm in speech, Turk and Shattuck-Hufnagel (2013) question whether it "includes some aspect of periodicity in timing, refers to abstract structuring of time […] and or refers to systematic surface timing patterns determined by grouping and prominence structure […]" (p. 95). Speech rhythm works on the premise that languages can be classified into distinct rhythmic classes such as stress-, syllable- and mora timed (Abercrombie, 1965, 1967; Pike, 1945). Rhythm in speech relies on the notion of isochronous recurrence of some units in speech timing; that is, rhythm regulates the duration of certain units in speech: the syllable in syllable-timed languages; the foot in stress-timed languages; and the mora in mora-timed languages (Arvaniti, 2012; Grabe & Low, 2002). The existence of different types of isochronous intervals in spoken speech is explicitly supported

by Abercrombie (1967), who writes: “As far as is known, every language in the world is spoken with one kind of rhythm or with the other” (p. 97). The concept of isochrony sparked a lot of debates in the literature.

The present study examines speech rhythm in the speech of 6-7 years old Setswana-English bilinguals and Setswana monolinguals to test the claim that languages can be classified according to rhythm classes. The present study hypothesises that due to the dominant use of English by the Setswana-English bilinguals their Setswana speech rhythm will be different to that of monolinguals. In so doing the study will contribute towards this under researched area in bilingual children L2 acquisition of prosodic features especially in African languages. The speech rhythm patterns of the children could shed light on the theories of incomplete acquisition, acquisition delay, and L1 attrition.

2.3.3 Isochrony debates

Isochrony has stirred a lot of debates in the literature with some scholars in support of isochrony while others are against it. The following sections give a detailed comprehensive discussion of these debates.

2.3.3.1 Against Isochrony

The isochrony hypothesis sparked debates among scholars; as such they set out to test its reliability. Extensive instrumental research that had been carried out failed to provide acoustic evidence for isochrony of the rhythmic units of feet in stress-timed languages and syllable duration in syllable-timed languages. The results of the research, which focused on the duration of inter-stress intervals in a variety of languages, indicated that, in stressed-timed languages, inter-stress intervals are not equal and that foot duration is proportional to the number of

syllables they contain (Bolinger, 1965; O'Connor, 1965). Bolinger (1965) further states that the location of the interval within an utterance influences the duration of inter-stress intervals. Similarly, there is no evidence that the interval/duration of syllables or moras in syllable- and mora-timed languages respectively are approximately equal (Dauer, 1983; Pointon, 1980; Roach, 1982; Wenk & Wioland, 1982). Pointon (1980) demonstrated that, in Spanish, considered syllable-timed, syllable duration is not constant; it varies depending on factors such as syllable structure, stress and segmental content. Equally Wenk and Wioland (1982) rejected the notion of isochrony of syllables in French; instead, they suggested that the larger rhythmic units of the size roughly corresponding to the phonological phrase in prosodic phonology, which are characterized by final lengthening, would be responsible for rhythm in French. In the same way, durational studies of Japanese found no evidence of mora isochrony (Beckman, 1982; Han, 1994; Warner & Arai, 2000).

Roach (1982) also tested the variation in syllable length between stress-timed (Arabic, English & Russian) and syllable-timed (French, Telegu & Yoruba) languages listed by Abercrombie (1967). Spontaneous speech recordings were analysed. The results falsified the dichotomy between stress and syllable timed languages. Roach (1982) found that inter-stress intervals are not more equal in stress- than in syllable-timed languages. Roach (1982) further established similarities in syllable duration variances in all the tested languages. Based on the findings, Roach (1982) argued that it is impossible to assign languages to these categories based on measurement of time intervals on speech. His conclusion alleged that all languages display syllable-timed and stress-timed characteristics; no language is distinctively syllable-timed or stress-timed. Roach (1982) further suggested that the difference between rhythm classes in languages is due to the distinction in their syllable structures; languages considered syllable-timed have simple syllable structure and stressed-timed ones display vowel reduction in

unstressed syllables. He concluded that no language is explicitly stress-timed or syllable-timed; both types of timing are inherent in all languages, what varies is the degree of timing a language exhibit, some are stressed-timed dominant while others are syllable-timed.

The lack of physical isochrony obliged researchers such as Dasher and Bolinger (1982) and Dauer (1983, 1987) to turn to a phonological account to explain why a given language may sound more stress-timed than another. The phonological account emphasizes that ‘‘the perceived rhythmic differences found across languages are the result of language-specific phonological properties, which are each reflected in durational variation in the speech stream and combine into different rhythmic patterns with different percepts,” (Li & Post, 2014, p.226). Dauer (1983) comparison of inter-stress intervals in English, Thai, Spanish, Italian, and Greek did not indicate differences. She observed that the inter-stress interval in these languages is proportional to the number of syllables in an interval and that stress recurrence were no more constant in languages considered stress-timed than syllable-timed ones. Based on these results, Dauer (1983, 1987) concluded that languages exist on a rhythmic continuum from least stress-timed to most stress-timed languages; i.e., like Roach (1982), she concluded they are not uniquely stress-timed or syllable-timed and so proposed that it is more accurate to use the terms stress-based and syllable-based languages instead of stress-timed and syllable-timed. The same view is shared by Nespor (1990), who asserted that languages such as Polish and Catalan, which could not be classified as either stress-timed or syllable-timed, fall somewhere within the scale, hence demonstrating that languages exist on a rhythmic continuum. Even though Polish and Catalan exhibit most characteristics of stress-timed and syllable-timed languages respectively, Polish does not have vowel reduction - a feature of stressed-timed languages - while Catalan allows vowel reduction and, as a result, deviates from syllable-timed languages which do not exhibit vowel reduction (Nespor, 1990). It is noteworthy that Ramus, Dupoux,

and Mehler (2003) grouped Catalan with syllable-timed languages while polish did not group with either stress-timed nor syllable-timed languages.

Dauer (1983, 1987) further alleged that the contrast between stress-timed and syllable-timed languages is due to distinctive phonetic and phonological properties, which are syllable structure, vowel reduction, phonetic realisation of stress, and its influence on the linguistic system. In Dauer's (1983) words "rhythmic differences […] across languages […] are more a result of phonological, phonetic, lexical and syntactic facts about the language than any attempt on the part of the speaker to equalize inter-stress or inter-syllable intervals" (p.55). The so-called stress-timed languages have a diversity of syllable structure and complex consonant clusters; in addition, unstressed vowels undergo shortening and at times are absent in languages considered stress-timed. By contrast, languages considered syllable-timed have an open syllable structure and no vowel reduction (with the exception of Catalan). Dauer (1983) notion reflected that of Dasher and Bolinger (1982), who asserted that the features of the phonological structure of a language, such as syllable structure, vowel reduction and vowel length distinctions, are responsible for its rhythmic type.

Though the phonological account seemed plausible, some researchers questioned it as it could not account for the perceptual evidence of speech rhythm demonstrated by infants (Dehaene-Lambertz & Houston, 1998; Mehler, Dupoux, Nazzi, & Dehaene-Lambertz, 1996; Nazzi et al., 1998) and adults (Cutler, Mehler, Norris, & Segui, 1986, 1992). This led some researchers to question the reliability of a phonological account in explaining the rhythmic differences in languages. Ramus, Nespor, and Mehler (1999) pointed out that the phonological account does not give details of how the perceptual system extracts rhythm from the speech signal. They further argued that the phonological factor is unable to account for the languages such as Polish

and Catalan because it does not state how phonological features interrelate with each other and how much each contributes to rhythm perception. As such, the phonological account fails to explicitly state where these languages fall within the rhythmic scale: whether towards stress-timed or towards syllable-timed.

2.3.3.2 In support of Isochrony

Despite lack of empirical evidence in support of speech rhythm as a platform for distinguishing languages, language acquisition research, particularly Mehler et al. (1996) established a dichotomy between languages based on rhythmic classes. Mehler et al. (1996) asserted that it is due to the dichotomy between stress and syllable timing in languages that infants are able to acquire the phonology of their L1. This finding led Mehler et al. (1996) to hypothesize that infants rely on rhythm to distinguish between two languages that have different rhythmic pattern. The hypothesis is supported by Ramus, Nespor, and Mehler (1999) who argued that it is due to speech rhythm that bilingual children are able to acquire languages belonging to different rhythmic class, as it allows them to discriminate between their L1 and a language with a different rhythm, otherwise there will be confusion since they receive opposing rhythm from their L1. Therefore, speech rhythm provides valuable insights into how bilingual children acquire their languages.

Mehler et al. (1996) hypothesis is also supported by Christophe and Morton (1998), Dehaene-Lambertz and Houston (1998) and Nazzi et al. (1998), who demonstrated that new-borns were able to distinguish between utterances in their own L1 and utterances belonging to a different rhythmic class. Nazzi et al. (1998) study is perhaps the most convincing for the dichotomy of languages in terms of rhythmic class. In this study, French new-borns were presented with a

set of sentences from the foreign languages English and Japanese, considered stress- and mora-timed respectively. Since the focus of the study was on rhythm (prosody) the recordings were filtered at 400 Hz; according to Nazzi and Ramus (2003), this frequency eliminates most lexical information while maintaining prosodic cues. The rationale was to demonstrate that if infants' discrimination depended on recognition of their L1 in its totality, then they would be unsuccessful in discriminating foreign languages; if the recognition relies on rhythmic types, however, they would succeed. The French new-born babies were able to differentiate between English and Japanese, foreign languages with different rhythmic classes, from their L1 French, considered syllable-timed. However, they failed to discriminate between English and Dutch, which are both considered stress-timed. Nazzi et al. (1998) concluded that language discrimination depended on rhythm and rhythmic classes, and that the stress/syllable timing is inherent in human perceptual system.

The results of Nazzi et al. (1998) echoed those of Cutler et al. (1986) and Cutler et al. (1992), which showed that adult monolingual French speakers and French-English bilinguals dominant in French, listening to French words, used the syllable to segment words in speech processing (syllabification strategy). For the bilinguals, the strategy extended to English (stress-timed) word segmentation due to the dominant French. Contrary to this, English listeners, listening to English, French or nonsense words did not replicate these results. Cutler (1986; 1992) concluded that the difference in the results between the French and the English listeners was due to the rhythmic differences of these languages. French is considered syllable-timed; for this reason, the listeners used syllabification strategy to segment words in speech processing while English is considered stress-timed, hence, the English listeners could not use syllabification strategy. Therefore, the results indicated that adults' speech processing depends on the rhythmic type of their native language. Equally, Ramus et al. (2003) demonstrated that

adults are able to discriminate between languages belonging to different rhythm classes. The participants, who were French native speakers, were presented with sentences from English, Dutch, Spanish, Catalan and Polish. They listened to two sentences of the same language and then they listened to a third sentence of either the same or different language. The participants had to decide if the third sentence was the same or different from the two, they had listened to. English (stress-timed) and Spanish (syllable-timed) were easily separated by listeners, providing further justification of the different rhythmic classes of these two languages. Contrary to this, English and Dutch sentences were not easily differentiated as they belong to the same rhythm class (stress-timed).

It is worth noting that some studies on perceptual isochrony have yielded inconclusive results. In his attempt to establish the perceptual basis of stress-timing and syllable-timing, Miller (1984)'s English and French phonetician and non-phonetician participants listened to read and conversational speech in Arabic, Finnish, Indonesian, Japanese, polish, Spanish and Yoruba and were asked to rhythmically classify them. The listeners uniformly classified the stress-timed Arabic; however, there were some inconsistencies with the classification of other languages. The phoneticians were more inclined to classifying languages into rhythmic classes compared to non-phoneticians, something (Miller (1984)) attributed to their training. On the contrary, both French listeners classified Spanish (syllable-timed) as stress-timed while English non-phoneticians listeners did not. Since Spanish and French are considered syllable-timed, the expectation is that it would be easily classified as such by French listeners. The results indicated that listeners are not prejudiced by the rhythm of their native language in classifying languages. Equally, Scott, Isard, and de Boysson-Bardies (1985) study where English and French participants were asked to tap initial consonants in both English and French speech did not support perceptual isochrony. While the English listeners were expected to be

more isochronous in their tapping to both languages, this was not the case; the result indicated that the French were more isochronous in both languages. The results suggest that listeners are not necessary influenced by the rhythm of their L1 in responding to a stimulus. Arvaniti and Ross (2012) also reported unsupportive results of perceptual isochrony. The participants listened to modified speech of English, German, Greek, Italian, Korean and Spanish and were asked to match them to a sequence of non-speech trochees (a foot consisting of one stressed syllable and one unstressed syllable). Modified Stimulus resulted in varied responses; low pass filtered utterances resulted in the rating of all languages, as more similar to trochees than English, while flat *sasasa* (replacement of consonantal interval by [s] and vocalic intervals by [a]) showed German, English and Spanish rated as similar to trochees than Greek, Italian and Korean (Arvaniti & Ross, 2012). The conclusion drawn was that the classification of language into rhythm classes could not rely on listeners' perception.

The percept of a rhythmic distinction between languages in terms of stress- and syllable-timing is empirically supported by Ramus et al. (1999), Low, Grabe and Nolan (2000), Deterding (2001), and Grabe and Low (2002). Ramus et al. (1999), compared measurements of eight languages (English, Dutch, Polish, French, Spanish, Italian, Catalan and Japanese); the findings supported the notion of rhythm classes because traditionally stress-timed classified languages like English and Dutch, and syllable-timed languages such as Spanish and French were found to belong to these rhythmic classes. Low et al. (2000) were also able to distinguish between Singapore English (SE) (described as syllable-timed) and British English (BE) (described as stress-timed). The researchers investigated the differences in the acoustic nature of the two varieties of English by calculating the variability index of vowel duration. This has become known as the "Pairwise Variability Index" or PVI (see section 2.3.2 below). The results

indicated that SE displayed less variability between successive syllables thereby showing an almost equal duration of successive vowels compared to BE, which exhibited a high variance. Similarly, Deterding (2001), who used a Variability Index (VI) metric, was able to distinguish between syllable-timed and stress-timed languages through measuring rhythmic properties of syllable-timed Singapore English and stress-timed British English. The duration of consecutive syllables in recordings of spontaneous speech of the English varieties were compared; the result indicated that there was a greater variability in the measurement of syllable-to-syllable duration of British English indicating that Singapore English is syllable-timed.

Grabe and Low (2002) is another study which was able to establish a dichotomy between stress-timed and syllable-timed languages by comparing the durational variability of different languages classified as stress-, syllable- and mora-timed with unclassified languages such as Greek, Malay, Mandarin, Welsh and so on. The findings indicated that, compared to syllable-timed languages, stress-timed languages show greater durational variability of consonantal intervals and vocalic intervals due to complex consonant clusters and vowel reduction respectively, while Japanese was grouped with syllable-timed languages, and unclassified languages did not match any of the rhythmic classes. The finding adds to the novel focus of this study, because this proposed dichotomy in relation to the duration of the syllable-time Setswana and stressed-timed English was examined. Other studies which were able to distinguish between languages on the bases of rhythmic classes are Dellwo (2006), White and Mattys (2007a) and Arvaniti (2012). Even though these studies report contradictory results regarding classification of some languages, the success in establishing the dichotomy between stress- and syllable-timed languages is attributed to the rhythm metrics used.

2.3.4 Rhythm metrics

Rhythm metrics are formulae used to classify languages into rhythm classes: stress-, syllable- and mora-timed (Arvaniti, 2012). They involve measuring the duration of the syllable and/or vowels of different languages then comparing them to establish a systematic rhythmic pattern of these languages. Therefore, rhythm metrics present quantitative rhythmic differences across languages. Ramus et al. (1999) could be said to be the pioneers of rhythm metrics as they were the first to devise measures that could quantify languages into rhythm classes. Ramus et al. (1999) and others after them (Arvaniti, 2012; Dellwo, 2006; Grabe & Low, 2002; Ling, Grabe, & Nolan, 2000; White & Mattys, 2007a) were largely influenced by language acquisition research, in particular, the finding that new-borns were able to discriminate between perceived rhythmic classes. Ramus et al. (1999) were convinced that language acquisition is to some extent depended on speech rhythm; therefore, they set out to study linguistic rhythm correlates that can be found in the phonotactics of languages. Phonotactics is the "sequential arrangement of phonetic segments in morphemes, syllables and words" (Vitevitch & Luce, 1999, p. 374). Ramus et al. (1999) exploited Dauer's (1983, 1987) phonetic and phonological quantification of languages into vowel reduction and syllable structure, as they believed that these features have an effect on the vocalic and consonantal interval duration.

Ramus et al.'s (1999) approach moved away from isochrony as a pedestal for the distinction of languages into rhythm classes; instead, they concentrated on the acoustic phonetic element of rhythm. Their rhythm metric, referred to as interval measures (IM), required segmentation of an utterance into successive vocalic and consonantal intervals, and measurement involved the duration of each of these intervals. The measurements were then subjected to further calculations, as follows (Ramus et al., 1999):

- The proportion of vocalic intervals in the sentence, or %V.
- The standard deviation of vocalic intervals within the sentence, or ΔV.
- The standard deviation of consonantal intervals within the sentence, or ΔC. (p. 7)

The rhythm metric was applied to eight languages, which were considered stress-, syllable- and mora-timed. The results indicated that the so-called stressed-timed languages (English, Polish and Dutch) exhibited a low %V and a high ΔC, whereas languages considered syllable-timed (Spanish, Italian, Catalan and French) displayed a high %V and a low ΔC. Japanese, a 'mora-timed' language, did not cluster with either stress- or syllable-timed languages as it showed exceptionally high %V or extremely low ΔC. Even though Japanese did not cluster with either stress- or syllable-timed, the findings demonstrated that languages do indeed fall into different rhythm classes, contrary to the findings of Roach (1982) and Dauer (1983). Ramus et al. (1999) concluded that the measurements, which successfully distinguish languages into rhythm classes, are %V and ΔC. They further argued that these metrics accounted for the discrimination of languages by infants who do not possess knowledge of language's phonological concepts of stress and syllabification.

Similar to Ramus et al.'s (1999) metric, is Low et al.'s (2000) metric that was later expanded in Grabe and Low (2002). Like Ramus et al. (1999), Low, and colleagues measured the acoustic phonetic component of rhythm by dividing utterances into vocalic and consonantal intervals. Different from Ramus et al. (1999), they developed a Pairwise Variability Index (PVI), which reflected the level of variability in consecutive vocalic and consonantal intervals. The PVI works on the premise that stress-timed languages exhibit vowel interval difference in stressed and unstressed syllables while syllable-timed languages display the opposite, as they do not have vowel reduction (Low et al. 2000). The metric quantifies languages with the aim of

placing them on the stress-syllable timing continuum scale. In so doing, Low et al. (2000) and Grabe and Low (2002) agree with Dauer (1983) and Roach (1982), who are of the view that languages exist on a rhythmic continuum. Low and colleagues were of the view that their metric was better at classifying languages into rhythm classes than Ramus et al's. (1999) rhythm metric. They argued that the PVI would not show spurious variability caused by speaker rate variation within and across sentences, as Ramus et al.'s (1999) metric would, in a less tightly controlled data set; Ramus et al.'s (1999) data collection method was tightly controlled: five sentences, four speakers, eight languages.

The PVI is divided into raw PVI (rPVI), which is normalised to (nPVI). This is represented by the equations below: Grabe and Low (2002, p.3)

"1. (rPVI) equation.

$$PVI = \left[\sum_{k=1}^{m-1} |d_k - d_{k+1}| / (m-1)\right]$$

where *m* is number of intervals, vocalic or intervocalic, in the text and *d* is the duration of the *k*th interval. Notice that rPVI is not normalised for speech rate.

2. (nPVI) equation

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

where *m* is number of items in an utterance and *d* is the duration of the *k*th item."

The rPVI is normalised to nPVI by dividing each absolute difference between successive intervals by their mean to control for speech rate variation. The total is multiplied by 100 to yield values comparable to rPVI. Grabe and Low (2002) asserted that languages that are considered stress- and syllable-timed contrasted in the durational variability of vowels and thus stressed-timed languages would have a greater durational variability between successive vowels in a sentence while syllable-time languages will have less. Grabe and Low (2002) proposed that nPVI should be reserved for vowels and rPVI for consonants. It is worth noting that the rPVI is also represented as rPVI-C and nPVI as nPVI-V.

Grabe and Low (2002) subjected the languages used in Ramus et al. (1999) to PVI. They also included other languages that were not tested by Ramus et al. (1999) such as Thai, Tamil, Singapore English and unclassified languages Estonian, Greek, Luxembourg, Malay, Mandarin, Rumanian, and Welsh. The purpose of unclassified languages was to determine if they would cluster with stress-timed, syllable-timed or be intermediate. Their classification of English, Spanish, and French agreed with Ramus et al. (1999). However, whereas Ramus et al. (1999) did not group Japanese with either 'stress-timed' or 'syllable-timed' languages, Grabe and Low (2002) grouped it with languages thought to be syllable-timed.

The above finding is very significant to my study because the nPVI can be used to measure rhythm in the speech of Batswana children who speak Setswana, a language considered to be syllable-timed (Coetzee & Wissing, 2007) but also sometimes referred to as mora-time (Botswana, 2001). In addition, choosing nPVI is also influenced by the fact that it is widely used as it has shown to be successful in measuring speech rhythm in bilingual child studies (Bunta & Ingram, 2007; Kehoe et al., 2011; Mok, 2011). Furthermore, Arvaniti (2012) and

Bunta and Ingram (2007) established that nPVI is more successful in distinguishing the speech rhythm of monolingual speakers than the rPVI. Hence, this measure will be adopted for this study, which aims at establishing the differences in bilingual compared to monolingual Setswana children.

Despite the success of the PVI, a battery of rhythm metrics have since been developed to capture the rhythmic differences across languages; however, Arvaniti (2012) argues that these are often normalised variants of Ramus et al. (1999) and Grabe and Low (2002) metrics. The proliferation of rhythmic metrics could largely be attributed to the fact that Ramus et al. (1999) and Grabe and Low (2002) metrics classified the same languages differently. It is perhaps for this discrepancy that linguists set out to devise rhythm metrics that could give a uniform classification of languages.

Frota and Vigário (2001) introduced Δ%C and Δ%V, a normalised variant of Ramus et al. (1999) metrics, because they were of the view that the results presented in Ramus et al. (1999) were inversely related to speech rate. Frota and Vigário (2001) metrics measured the standard deviations of normalised percentages for consonantal and vocalic intervals so, they claimed that their metrics were successful in dealing with languages which could not be classified, as well as those considered to have a mixed rhythm, such as Catalan and Polish. Another criticism of Ramus et al. (1999) metrics is that while a combination of ΔV with either %V or ΔC grouped languages of similar rhythmic pattern, a combination of ΔV and ΔC was insensitive to sequential interval differences (Low et al., 2000). Alternatively, Dellwo (2006) proposed a rate normalised standard deviation of consonants (ΔC) through the division of consonantal interval duration by divided by the mean measures of consonantal (Varco C) interval. Likewise White and Matty (2007a) advised the normalisation of ΔV vocalic interval duration (Varco V).

Deterding (2001) Variability Index (VI) metric, which is similar to the PVI, is another one of the additional metrics developed. The metric, which successfully distinguished between the stressed-timed British English and syllable-timed Singapore English, calculates the mean durational differences between successive syllables.

Another approach to measuring speech rhythm, similar to the PVIs, is Wagner and Dellwo (2004) Yet Another Rhythm Determination (YARD) metric. Unlike the PVIs, which calculate vocalic and consonantal intervals separately, YARD calculates the z-transformed syllable duration (normalised syllable duration). In so doing, it captures the successive disproportions characteristic of stress and syllable timed languages because it accounts for inter speakers' variability by offering steady rhythmic patterns as well as moderate changes of speech rate (Wagner & Dellwo, 2004). By the same token, Wagner and Dellwo (2004) argue that YARD is better than Ramus et al. (1999) %V and ΔC metrics, which focus on syllable complexity instead of sequential nature of rhythm. Gibbon and Gut (2001) also proposed the Rhythm Ratio (RR), which calculates the average ratio of all adjacent syllable or vowel pairs as a percentage.

Though similar to the PVI, other metrics calculated the duration of prosodic units such as syllables and foot rather than that of segments. Barry, Andreeva, Russo, Dimitrova, and Kostadinova (2003) presented the PVI measure for syllables, while Nolan and Asu (2009) proposed the nSPVI and nFPVI which look at syllable and feet respectively. Nolan and Asu (2009) argued that the PVI's focus on just the duration of vowels and consonants inadequately discriminated between languages such as English and Estonian; they demonstrated that the

nSPVI and nFPVI, which measured the duration of phonological syllable and phonological feet, were better at discriminating such languages. The PVI depicted Estonian as mixed rhythm while the nFPVI demonstrated that the two languages have same foot timing but the nSPVI distinguished them. Even though Nolan and Asu (2009) metrics seemed credible, Tan and Low (2014) pointed out that the segmentation of syllable and foot is unique to a language, thus would make it difficult to compare languages.

2.3.4.1 Reliability of speech rhythm metrics

Despite the development of other metrics in an attempt to curb the discrepancies in Ramus et al. (1999) and Grabe and Low (2002) metrics, the problem of not yielding similar results across different studies persisted and have been noted by researchers such as (Arvaniti, 2009; Barry et al., 2003; Gut, 2012; White & Mattys, 2007a, 2007b). While Japanese did not group with either syllable-timed or stress-timed languages with Ramus et al. (1999) metrics, Grabe and Low (2002) grouped it with syllable-time languages. Moreover, PVI classified Thai and Tamil as stress-timed but %V and ΔC grouped it with syllable-timed languages. Furthermore, while PVI placed the unclassified languages Catalan, Greek, and Welsh intermediate between stressed- and syllable-timed on the continuum scale, %V and ΔC placed them within the stressed-timed end of the scale (Arvaniti, 2012).

Another criticism labelled against Grabe and Low (2002) metric is that it is only successful in classifying prototypical languages, such as the stressed-timed English, Dutch and German and syllable-timed Spanish and French; however, it failed to classify non-prototypical languages as only four (stressed-timed Thai and syllable-timed Mandarin, Japanese, Luxembourgish) out of the 13 non-prototypical languages were successfully classified (Arvaniti, 2009). Nolan and Asu

(2009) metrics also displayed some inconsistencies; while nFPVI showed that English and Estonian have similar foot timing, nSPVI did not differentiate them. Even though Dellwo (2006) VarcoC produced much clearer discrimination than ΔC in classifying stress-timed English and German and syllable-timed French, this was not systematic across languages because it seemed to eliminate all disparities between languages without significant variances in score (White & Mattys, 2007a). For example Varco C did not distinguish between the scores of English, German, Italian, and Korean (Arvaniti, 2012).

The unreliability of rhythmic metrics could largely be attributed to material selection, speaking style and segmentation techniques of the acoustic signal employed by different studies (Gut, 2012). While syllabic consonants were counted as vowels in Thomas and Carter (2006), other studies, such a Gut (2012), did not include them. Similarly, Ramus et al. (1999) counted post-vocalic glides as part of vowels, while Arvaniti (2012) included them with consonants. In the same way Arvaniti (2012) argues that the unreliability is due to inter-speaker variation, elicitation and the syllable composition of the material. However, she points out that the limited nature of the studies undertaken in terms of speech material used, participants and language makes it impossible to ascertain this, as some have used one speaker per language while others have relied on either elicited or spontaneous speech.

In order to address these issues, Arvaniti (2012) tested six languages (English, German, Greek, Italian, Korean and Spanish) and eight speakers for each language were used. Isolated sentence reading, story reading, and spontaneous speech methods of data collection were employed. Furthermore, the syllable composition of the sentences was manipulated to determine the metrics' sensitivity to intra-language and inter-language. The data was subjected to different

popular rhythm metrics of Delta C, %V, PVI, VarcoV, and VarcoC to determine if they will yield similar results. The findings indicated that different rhythmic metrics produce different scores when participants read sentences opposed to reading a story. These findings echo those of Thomas and Carter (2006), who established that spontaneous speech and reading of a passage produced different PVI scores. Equally, Mok and Lee (2008) reported different scores for the same Korean speakers reading of a story and semi-spontaneous retelling of the same story. Barry and Russo (2003) reported different rhythmic scores for read German and spontaneous German and Italian. While the PVI-C and ΔC were able to discriminate between the two languages in spontaneous speech the PVI-V was insensitive to the differences shown by ΔC.

On the contrary Knight's (2011) results were in support of rhythm metrics. Knight (2011) took a slightly different approach in testing the claim that rhythm metrics are valid and reliable in distinguishing languages and varieties. She investigated the stability of the rhythm metrics in producing consistent results for the same individual, on an indistinguishable material, doing the same task, on consecutive days. The analysis was based on the recordings of four Southern British English adults reading of The North Wind and the Sun. Although Knight (2011) did not find any statistically significant difference over time on any of the metrics, she established that vowel-based metrics such as the nPVI-V, Varco V, and %V were more stable, indicating that these are the ones that should be considered valid and reliable, particularly %V.

Different rhythm metrics also showed inconsistency in sentence types. For example, while nPVI-V did not indicate any differences between German stress-timed and syllable-timed sentences, the %V and Varco C of German stressed-timed sentences was lower than that of

syllable-timed sentences when one would expect it to be higher. Accordingly, Barry and Russo (2003) reported different rhythmic scores for read German and spontaneous German and Italian. While the PVI-C and ΔC were able to discriminate between the two languages in spontaneous speech, the PVI-V did not reflect the differences shown by ΔC. Likewise, Wiget et al. (2010) reported different %V, Varco C and nPVI-V values for randomly-sampled British English sentences, thereby demonstrating that the choice of sentences have an impact on the rhythm score by different metrics.

Arvaniti (2012) further established that syllable complexity of the material affected the value of rhythmic classification of the languages. Similarly, different metrics yielded inconsistent results regarding inter-speaker variability. Barry, Andreeva, and Koreman (2009) noted different rhythmic measures for fast and slow German speech with the fast German speech going towards syllabled-timed Spanish. Correspondingly, Deterding (2001) noted that Singapore English speakers and British English speakers exhibited different measures for fast and slow speech with the slow speech showing more durational variances between nearby syllables. Inversely, nPVI-V was insensitive to speech rate for African American English and American English (Thomas & Carter, 2006).

It is perhaps for these discrepancies that some researchers have questioned whether metrics actually succeed in measuring speech rhythm. Mori, Hori, and Erickson (2014) argue that the rhythm metrics studies focus on durational measure of segments (vowel and consonants), syllables and foot, disregarding phonetic constituents such as fundamental frequency (F_0), vowel quality and intensity, which significantly contribute to prominence and recurring patterns, and so the omission adds to the rhythm metrics' unreliability. English lexical stress is

not solely realised by duration but it also depends on pitch, intensity, and vowel quality (Mori et al., 2014). The findings of Moon and Lindblom (1994), which investigated the effects of duration, speech material and speaker variability on the formant patterns of English stressed front vowels, indicated changes in both the vowel duration and formant patterns. Correspondingly Barry et al. (2009)'s study, in which they measured the perceived rhythm of Bulgarian, English and German verse with regular poetic metrics, reflected that "the perceived strength of rhythmicity in a line of verse is […] also determined by F_0 changes within the metrical foot" (p.1). Equally, Cummins (2002) is of the view that rhythmic metrics cannot successfully capture rhythm in speech due to the linguistic units variation across languages, with English focus is on stress and feet while Spanish is on syllables and Japanese on mora. Consequently, he argues that these phonological elements (stress, syllable and mora) contribute to the rhythmic nature of a language, thus speech rhythm is intrinsic in phonology rather than phonetics.

Subsequently, this casts doubts on the rhythm metrics ability to measure L2 speech rhythm. Gut (2012) questioned the validity of rhythm metrics in discriminating between native and non-native speech as well as measuring L2 speech rhythm. Nonetheless, other studies (Bunta & Ingram, 2007; Kehoe et al., 2011; Lleó et al., 2007; Mok, 2011; White & Mattys, 2007a; Whitworth, 2002), demonstrated the ability of rhythm metrics in distinguishing between native and non-native speech. Whitworth (2002) and White and Mattys (2007a) showed that when L1 and L2 belong to the same rhythm classes the rhythm metrics do not separate them. Whitworth (2002) could not establish any significant difference between the rPVI-C and nPVI-V of German-English bilingual children's speech and that of monolinguals of these languages as the two languages are considered stressed-timed. Correspondingly, White and Mattys (2007a)

subjected the speeches of English-Dutch and Dutch-English bilinguals to Delta V, Delta C, %V, Varco V, Varco C, rPVI-C and nPVI-V metrics. They too did not find significant differences in the rhythmic scores and concluded that this was because the two languages are said to be stress-timed. Conversely, studies on the acquisition of rhythmically different languages (Bunta & Ingram, 2007; Kehoe et al., 2011; Lleó et al., 2007; Mok, 2011) - see section 2.3.5 - established a significant difference. By the same token, White and Mattys (2007a) reported a lower Varco-V score for bilingual Spanish-English and Korean-English compared to monolingual English. Equally, Singapore speakers of English displayed a different metric values from British speakers of English (Deterding, 2001). Likewise Fuchs (2016) established that Indian English had a lower nPVI-V and Varco V scores compared to British English.

Even though the metrics have successfully demonstrated the ability to discriminate between the monolingual and bilingual speech, Gut (2012) highlights inconsistences in studies such as White and Mattys (2007a), Stockmal, Markus, and Bond (2005), Grenon and White (2008) and Thomas and Carter (2006), as these were unable to discriminate between native and non-native speech. White and Mattys (2007a) noted that while Delta V was able to discriminate between Spanish speech by monolingual Spanish and English-Spanish bilinguals, it was insensitive to English spoken by English monolinguals and that spoken by Spanish-English bilinguals. Likewise, (White & Mattys, 2007a, 2007b) found that, while Varco V distinguished the influence of L1 rhythm on L2, Varco C did not. Similarly, the PVI could not differentiate between L1 and L2 English as well as L1 and L2 Spanish; yet, the same metrics showed significant differences between Korean-English bilingual speech and that of monolinguals. Gut (2012) hypothesizes that the discrepancies are due to the proficiency level of the L2 learner. Sarmah, Gogoi, and Wiltshire (2009) and White and Mattys (2007a), rejected this hypothesis.

Different metrics used by White and Mattys (2007a) did not establish any significant results in the speech rhythm of beginners, intermediate and advanced learners of Korean learners of English. Contrary, Stockmal et al. (2005) use of delta C and PVI-C reported a significant difference between beginners and advanced learners of Latvian. However, this could be due to the use of delta C and PVI-C metrics, as these have been shown to correlate with speech rate; therefore, they succeeded in measuring the learners' rate of articulation (Gut, 2012; Tan & Low, 2014). Nonetheless, Ordin and Polyanskaya (2015) use of the PVI and Varco to compare vocalic variability in L2 English proficiency level spoken by German and French adult learners showed that for both groups of learners, as their proficiency increased, the vocalic variability also increased (Ordin & Polyanskaya, 2015).

As much as the discrepancies in the use of rhythm metrics can be attributed to inter-speaker variability, speaking style and choice of material or elicitation method (Arvaniti, 2012; Gut, 2012), Gut (2012) further contends that rhythm metrics do not measure L2 speech rhythm; instead, they measure phonetic by-products/phonological processes of vowel reduction and consonant cluster. Thus, she proposes that other approaches should be employed in the measurement of L2 speech rhythm. Nevertheless, rhythm metrics, especially vowel-based metrics such as the nPVI-V, Varco V and %V remain the most popular means of classifying languages into rhythm classes. It is for this reason that the present study which examines the speech rhythm of 6-7 years old Setswana-English bilingual children and Setswana monolingual children has adopted the nPVI-V and Varco V metrics to test the assumption that rhythm metrics are valid and reliable in discriminating languages and varieties as well as quantifying speech rhythm. These two metrics have been chosen on the bases that they have been successful in distinguishing the languages of monolinguals and bilinguals (Bunta & Ingram, 2007; Kehoe et al., 2011; Mok, 2011; Payne et al., 2011; White & Mattys, 2007). The present study

hypothesise that the nPVI-V and Varco V metrics will be able to differentiate between the Setswana spoken by Setswana-English bilinguals who are dominant in English and the Setswana spoken by monolingual children. The findings of the present study will continue to provide value information regarding the validity and reliability of rhythm metrics or lack of in discriminating the languages of the monolingual and bilingual children.

2.3.5 Acquisition of speech rhythm

The original investigation of the acquisition of speech rhythm by children can be credited to the pioneering works of Allen and Hawkins (1980) who established that the speech rhythm that is acquired first by children is more syllable-timed regardless of the rhythm of their target language. Allen and Hawkins (1980) asserted that vowel reduction and consonantal clusters, which are the main components of stress-timed languages, are difficult for children to acquire. This hypothesis was tested by Grabe et al. (1999), who compared the nPVI-V scores of four years old monolingual English, (considered stressed-timed) and French (considered syllable-timed) children to that of their mothers. The results supported Allen and Hawkins' (1980) hypothesis, as the rhythmic patterns of French children were similar to their mothers', while that of English differed from that of their mothers, tending towards syllable timing, thereby illustrating that stress-timing is more difficult for young children to acquire than syllable-timing.

Likewise, Ordin and Polyanskaya (2014) investigated the development of speech rhythm in L1 and L2 by children and adults. A comparison of rhythmic patterns at a range of ages in L1 acquisition and at diverse proficiency levels in L2 showed that speech rhythm begins from syllable timing to stress timing in both groups (Ordin & Polyanskaya, 2014). Further support

for the conclusion that speech rhythm develops from a low vocalic variability is provided by Ordin and Polyanskaya (2015) who examined the development of speech rhythm in L2 acquisition. Ordin and Polyanskaya (2015) compared vocalic variability in the German and French adult learners' proficiency in English. The results of both groups of learners showed that as their proficiency increased, the vocalic variability also increased (Ordin & Polyanskaya, 2015). Ordin and Polyanskaya (2015) concluded that acquisition of English speech rhythm by bilinguals develops from syllable timing to stress timing regardless of whether the language being acquired has similar rhythm timing with the native language of the learners. English and German are both considered stress-timed while French is considered syllable-timed.

Having established the rhythmic patterns of monolingual children acquiring stress-timed and syllable-timed languages, scholars set out to find out the rhythmic development of bilingual children acquiring languages that are both considered stress-timed, or both syllable-timed, or where one language is stress-timed and the other syllable-timed. Whitworth (2002) investigated speech rhythm patterns of six German-English bilingual children from the ages of 5-13 years using rPVI-C and nPVI-V. Since German and English are both considered stressed-timed it is unsurprising that she did not find significant differences between the patterns in the children's two languages. Bunta and Ingram (2007) took a slightly different approach by investigating the development of rhythm in bilingual children from the ages of 3;9 - 5;2 years who were acquiring different rhythmic languages, Spanish and English, where Spanish is considered syllable-timed and English stress-timed. Contrary to Whitworth (2002), they found a significant difference between the rPVI-C and nPVI-V of the bilingual languages. The results also indicated significant results in the nPVI-Vs of bilingual languages compared to monolinguals. The nPVI-V of bilingual English children indicated a lower variability compared to that of monolingual English children, whereas that of the bilingual and

monolingual Spanish children did not show lower variability. The findings are in support of Allen and Hawkins (1980) and Grabe et al. (1999), that young children's rhythm acquisition tends towards syllable-timing. The implication of Bunta and Ingram (2007) is that bilingual children as young as 4 years of age are able to keep the rhythmic classes of their two languages separate. However, it is also arguable that the Spanish bilingual and monolingual children were similar because syllable timing is easy to acquire, and so the debate continued on rhythmic development of bilingual children acquiring languages with different rhythm.

A similar study to Bunta and Ingram (2007) is by Lleó, et al. (2007) who compared the rPVI-C and nPVI-V of three-year-old German-Spanish bilingual children to that of the same number and age of monolingual child speaker of these languages. The findings indicated that while the German monolinguals' rhythmic patterns were different from that of the Spanish monolinguals, indicating that the two languages belong to different rhythm classes, the bilingual children displayed similar patterns in both of the languages. Contrary to Bunta and Ingram (2007), the results of the bilingual group in Lleó et al. (2007) showed that bilingual children merge the rhythm patterns of their languages, i.e., they do not keep them separate, as was the case with Bunta and Ingram (2007).

The contradictory results might be due to the ages of the participants. Studies have shown that rhythm is acquired quite early in childhood (Dehaene-Lambertz & Houston, 1998; Nazzi et al., 1998; Nazzi et al., 2000); therefore it is not surprising that children in Bunta and Ingram's study, who were older than those in Lleó et al. (2007), were able to keep the rhythm classes of the two languages separate, as they had been exposed to the two languages for a longer time. Interestingly, a study by Kehoe and Lleó (2005), who used similar participants as in Lleó et al.

(2007), showed that the rhythm scores of German monolinguals and German-Spanish bilinguals did not differ, but that of Spanish monolingual and German-Spanish bilingual children differed, with the bilingual patterns tending to the stressed-timed German. Kehoe et al. (2011) argued that, other than the fact that a small number of participants were used (5 participants), the fact that the bilingual group were brought up in Germany and thus received more input in German might have contributed to their rhythm tending towards stressed-timed German. The other reason for the bias towards German rhythm could be that German is their L1 and, most probably, their dominant language.

Faced with these contradictory results, Kehoe et al. (2011) repeated Kehoe and Lleó's (2005) study, the difference being a larger sample group (three in each group) and with the German-Spanish growing up in Germany, and Spanish-German in Spain. The participants were three years old. The aim was to establish if the difference in the results was due to the language environment and amount of language input the children were receiving or the constellation of the languages. The results echoed that of Lleó et al. (2007), indicating a significant difference in the rhythmic indices of monolingual German and Spanish children. This indicates that children are able to produce the rhythm patterns of their target language at an early age (Kehoe, et al. 2007). The results also showed that the bilingual children displayed similar rhythmic patterns in both languages indicating a bi-directional influence from both languages. Mok (2011) also established similar results with three-year-old simultaneous Cantonese-English bilinguals.

The discussed studies on the rhythmic patterning of bilinguals give reason to investigate the rhythm pattern of older participants (6-7 years old) growing up in a diglossic environment,

whose L1 is considered syllable-timed and whose L2 (English), which becomes dominant, is stress-timed. It will be valuable to our understanding of the processes involved to find out if the children keep their two languages separate, as in Bantu and Ingram's (2007) study, merge the two languages, as in Kehoe et al. (2011) and Mok (2011), or if the rhythm pattern tends towards the language environment, as in Kehoe and Lleó (2005). Based on the discussed, the present study aims at finding out if private English medium educated Batswana children (6-7 years old); who acquired Setswana (considered syllable-timed – see Section 2.4) as an L1, and then English as L2, where English became the dominant language, keep the rhythm pattern of their two languages distinct, merge them or whether the rhythmic pattern tends towards English stress-timed rhythm, their dominant language or towards syllable-timed (which is acquired first by children regardless of the speech rhythm of the L1) Setswana, their L1 and language environment.

2.4 The penultimate syllable vowel lengthening

This section gives an all-inclusive discussion of the penultimate syllable vowel lengthening in order to achieve the objective of the study of determining the PSVL patterns in the Setswana speech of Setswana-English bilinguals in comparison with their aged matched Setswana monolinguals. The detailed discussion of the PSVL in this section will also enable the achievement of the objective of the study on the effect of increased level of English on the Setswana PSVL pattern of the Setswana-English bilingual children compared with their monolingual peers.

Given previous studies' findings of phonetic cross-linguistic influence, this study focuses on a phonetic element, the syllable (see section 2.3.1 on the definition of the syllable) that is relevant to the present study research areas of speech rhythm and PSVL. The rationale for discussing the syllable is to put into perspective the discussion of the penultimate syllable vowel length. As well as to provide a full context for the syllabic focus of the research design, current assumptions of the syllable structure are explained.

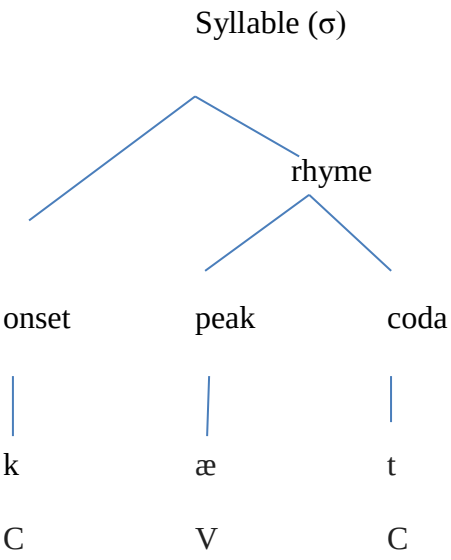
A syllable comprises of a peak/nucleus which has little or no airflow obstruction and is the place in the syllable where sonority is greatest (Roach, 2010). It is the core or central part of the syllable (Katamba, 1989; Roach, 2010). The peak/nucleus may be a vowel sound such as (ɪ, e, æ, ʌ, ɒ ,ʊ, iː, ɜː, ɑː, ɔː, uː) in RP English or (ɪ, i , ɛ, a, ɔ, ʊ, u) in Setswana. A sonorous consonant like nasal sounds (n, m, ŋ) and liquid sounds (l, r) (Roach, 2010) can also be the peak/nucleus. Sonorous sounds are evaluated as such in terms of their loudness (Roach, 2010). Vowels have the greatest sonority with plosive consonants having the least (Katamba, 1989). It is for this reason that vowels are often the peak/nucleus of the syllable. Since nasal and liquid sounds are close to the vowel in the sonority hierarchy, they can take the position of a vowel and become the peak/nucleus of the syllable in the absence of a vowel. Consonants that have the ability of becoming the peak/nucleus of the syllable are referred to as syllabic consonants (Roach, 2010). There are syllabic consonants such as (n, m, ŋ, l, r) in both English and Setswana.

In addition to the peak/nucleus, it is possible to have one or more consonants at the start and end of the syllable; these constitute the onset and the coda, or margin (Katamba, 1989; Roach, 2010). The onset precedes the peak/nucleus and the coda follows the peak/nucleus (Katamba, 1989; Roach, 2010). The onset and coda are optional, unlike the peak/nucleus which is

obligatory. The peak/nucleus and the coda together are often analysed as constituting the rhyme/rime (Katamba, 1989; Roach, 2010). The following English word illustrates this.

1)

Cat /kæt/



C-consonant V- vowel

Setswana, like most Bantu languages, has an open CV-CV syllable structure (Botswana, 2001). An open syllable structure ends in a vowel. The Setswana syllable can also take the following structures in which we are considering the underlined elements (all the Setswana and Swahili data illustrations were adapted from Botswana (2001)).

2) CV: go rata (to love) V: o a rata (you/he/she loves) C: sentle (well/ nicely).

The word *sentle* (well/nicely) is made up of three syllables *se-n-tle* /sentle/. The second syllable consists of the sonorous syllabic consonant /n/.

It is worth noting that most Setswana syllables are a single mora except in the penultimate position where stress tends to lengthen them to two moras/morae (Botswana, 2001). A mora is a unit of length associated with syllabic quantity (Botswana, 2001). Similarly, (Odden, 2005, p. 325) defines mora as 'a unit of prosodic weight related to length: a long vowel has two moras and a short vowel has one' (p. 325). To give an example using Setswana, short vowels are (ɪ, i, ɛ, a, ɔ, ʊ, u) and so have one mora. Examples of long vowels with two moras are (ɪɪ, ii, ɛɛ, aa, ɔɔ, ʊʊ, uu). A syllable with two moras is considered to be bimoraic (Botswana, 2001). In light of this, it is argued that a mora is a unit of timing (Cohn, 2003); i.e., the length of time it takes to pronounce a syllable is dependent on the number of moras it contains. Grabe and Low (2002) state that a mora is a sub-unit of a syllable, which is (that is the syllable) made up of a short vowel and any preceding onset consonants.

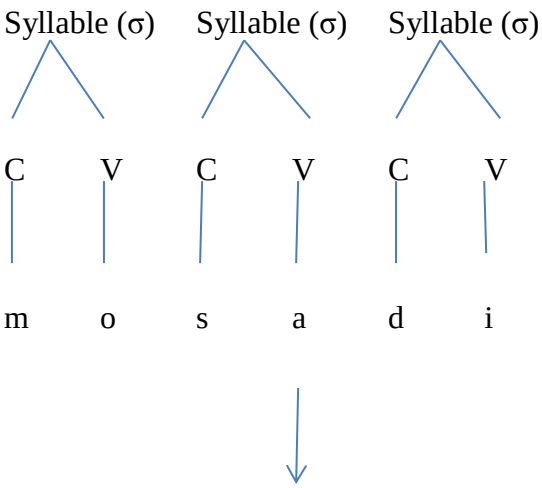
In phonemic transcription of Setswana, the addition of a mora is represented by doubling the vowel of the penultimate syllable, as in the above example of long vowels with two moras, or by using the syllabic length diacritic mark [ː] (Botswana, 2001). Examples of this are given below.

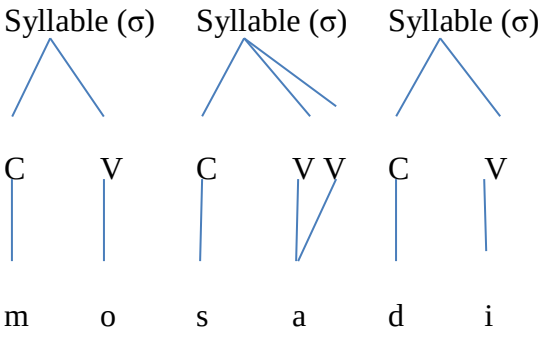
The following example illustrates the penultimate syllable lengthening (Botswana, 2001).

3) /musali/ [mʊ̀sá:dì] (mosadi) woman

The acute accent (ˊ) on the vowel indicates high (H) tone; grave accent (ˋ) a low (L) tone; (see section 2.4.1 and 2.5 for further description).

4)





The lower part of the diagram shows the addition of a mora required to lengthen the penultimate syllable. For this reason the vowel of the penultimate syllable is doubled, indicated by two V's (V V) meaning two of the same vowel. The same applies to syllabic consonants in the event that they take up the position of a vowel where there is no vowel.

Although the discussion above has centred on the mora, it is important to note that – even though there does not seem to be any empirical evidence to support the position – Setswana is considered syllable-timed (Coetzee & Wissing, 2007), not mora-timed. Coetzee and Wissing (2007) do not elaborate on why it is not considered mora-timed, but the reason could be that

the moras are not isochronous units due to post-nasal devoicing (see Hyman, (2001) on post-nasal devoicing in Setswana; these theoretical considerations lie beyond the scope of this study). Vance (1997) argues that, if moras are not isochronous units due to devoicing, the language cannot be considered mora-timed. The other reason pointing to Setswana being described as syllable-timed rather than mora-timed is that most Bantu languages are considered syllable-timed (Cole, 1955; Gut, et al., 2001). In addition, the syllable timing of Setswana could be attributed to its open syllable structure, lack of vowel reduction, and no lexical stress. Stress or accent in Setswana is mostly manifested in the lengthening of the penultimate syllable vowel (Hyman, 2009). Since Setswana is a tone language where syllabic pitch is used to distinguish between the meanings of words at both lexical and grammatical level (Batibo & Mae, 1999), the accent is realised through variations in pitch contour. This differs from stress-timed languages where lexical stress is realised through loudness, pitch, length, and vowel quality. This thesis therefore takes the theoretical view that Setswana is syllable-timed and not mora-timed.

2.4.1 The penultimate syllable vowel lengthening in Bantu languages

The penultimate syllable vowel lengthening (PSVL) is prevalent in Bantu languages such as Setswana. Bantu languages are spoken in most areas in Africa, stretching from the west, east and southern part of the continent, including countries such as Cameroon (e.g., the Bankon language) in the west, Tanzania (Swahili) in the east, Botswana (Setswana) in the south, to name a few. Penultimate syllable prominence in Bantu languages, often referred to as accent or stress, is mostly manifested in the lengthening of the penultimate syllable vowel (Hyman, 2009). However, the concept of penultimate syllable vowel lengthening (hereafter PSVL), an important prosodic feature in Bantu languages, does not feature predominantly in phonological literature. An in-depth investigation of this prosodic element is thus necessary.

Different accounts agree that, even though PSVL is widespread in Bantu languages, it differs from one language to another based on the utterance and the role it plays in discourse (Hyman, 2009). Hyman (2009) further argues that PSVL has a tonal effect in most of the Bantu languages. The implication of this is a correlation between PSVL and tone (see section 2.5 on tone). In support, Hyman (1978, p.14) states '…many Bantu languages have an H and L tone with a superimposed penultimate accent. This accent may cause vowel lengthening … or it may affect the penultimate syllable.' This is not surprising as most Bantu languages, especially Southern ones, are tone languages, i.e., those that use syllabic pitch to distinguish between the meanings of words at both lexical and grammatical level (Batibo & Mae, 1999). This is illustrated by the examples below from Setswana, the main language spoken in Botswana. The acute accent (´) on the vowels indicates high (H) tone, the unmarked ones are the L tones (see section 2.5 for an in depth discussion of tone in Setswana).

1. **Lexical level**
   a. *Kae* /káı/ 'where'
   b. *Kae* /kaí/ 'how many'
2. **Grammatical level**
   a. *O bua Setswana* /ó́búasetswána/ 'He/she speaks Setswana'
      o-he/she, bua-speaks, Setswana-setswana
   b. *O bua Setswana* /ʊbúasetswána/ 'You speak Setswana'
      o-you, bua-speaks, Setswana-setswana

The word *kae* in example (1) is disyllabic, while the sentence *o bua Setswana* in example (2) is made up of six syllables. Syllabic pitch is used to distinguish between the meaning of words in examples 1 and 2. In example (1a), the high tone is drawn to the penult vowel whereas in

(1b) it is attracted to the final vowel to distinguish between the meanings of these words. Similarly, the pronoun *'o'* which is the focal point in distinguishing the meaning of the sentences, has different levels of pitch with 'o' in 2a receiving the H tone while in 2b is L tone. Since the H tone is drawn to the final vowel in 1b, this could therefore mean that the final vowel is the lengthened one instead of the penultimate vowel. It is arguable that to distinguish between some lexical and grammatical homographs, it is necessary to shift the H to the final vowel. This is because to distinguish between the meanings of words the H tone cannot be attracted to the same vowel in both instances. Nonetheless, the attraction of the H tone to the penultimate vowel, as seen in examples 1a and 2a above, is a common feature in most Bantu languages.

One aspect of tone that plays a significant role in the PSVL is the tone height, namely high (H) and low (L) tone (Botswana, 2001). Most Bantu languages' tonal systems make a distinction between H and L tone only, making them two-level tone languages (Zerbian, 2006, 2010) as illustrated in (1) and (2) above. Even so, phonologically, H tones are the ones believed to dominate because they are involved in tone spread, shift, and deletion; the L tones are assumed to be present by virtue of the H tones (Yip, 2002). It is perhaps for this reason that they are often left unmarked as in the examples 1 and 2 above.

Hyman (2009) distinguishes three different manifestations of PSVL in Bantu languages based on the domain, namely, utterance penultimate, phrase penultimate, and pre-pausal moraic penultimate lengthening. Pre-pausal moraic PSVL occurs on utterances, which appear before a pause; it depends on the utterance type (Hyman, 2009). Pre-pausal moraic PL is predominant in Shekgalagadi, a language spoken in Botswana (Hyman & Monaka, 2008). In Shekgalagadi,

penultimate vowel length is realised in citation forms and declarative indicatives when they precede a pause, but the same does not apply to yes-no answer questions, WH questions, imperatives, vocatives, exclamatives and hortatives (Hyman & Monaka, 2008). It is therefore imperative that the PSVL is realised on the correct forms as failure to do so might result in the wrong interpretation of the utterance which may result in a misunderstanding or even unintelligibility. The examples below taken from Hyman and Monaka (2008) illustrate pre-pausal moraic PSVL in Shekgalagadi. The diacritic mark [:] indicates lengthening while circumflex accent (^) indicates HL falling tone. It is worth pointing out that sometimes the vowel of the penultimate syllable is doubled to indicate length (see section 2.4). When the vowel is doubled it is referred to as an addition of a mora, for example, ri-naâ rɪ.

Forms with penultimate vowel length:

a. Citation form: ri-nâ:rɪ ‘buffalos’
b. Declarative: a-bal-a ri-nâ: rɪ ‘he is counting buffalos’

a-he, bal- counting, a-is ri-nâ: rɪ-buffalos

This example shows that, as with other Bantu languages, the penult vowel length has an effect on the tone. In this instance, the penultimate vowel changes from an H tone to HL falling tone followed by an L tone.

Forms without penultimate vowel length:

c. Yes-no answer questions

ri-nárɪ ‘buffalos?’

a-bal-a ri-nárɪ ‘is he counting buffalos?’

d. WH questions

ri-nárí zhé ↓ríhı ‘which buffalos?’

ri-nárí-buffalos, ↓ríhı- which?

e. Imperatives

bal-á ↓rí-nárı ‘count the buffalos!’

(For further examples see Hyman & Monaka, 2008).

Based on the description of PSVL in Shekgalagadi, it is probable that medial position words do not carry penultimate vowel length.

Phrase penultimate is another PSVL domain that Hyman (2009) distinguishes; the PSVL occurs only in phonological words which occur in phrase final position; the penult vowel of words in phrase medial position are subjected to prosodic vowel reduction and so there is no penult vowel lengthening (Downing, 2006; Hyman, 2009). This is different from PSVL in Setswana where the penult vowel length is maintained in sentence medial position though at a lesser degree (Cole, 1955). Phrase penultimate length is prevalent in Chichewa, a tone language spoken in Malawi; phonological phrasing is responsible for all PSVL (Downing, 2013). As with other Bantu languages, the H tone is attracted to the vowel in the penultimate syllable.

The example below illustrates this in Chichewa; the phonological phrases are in parentheses.

f. (Mwaána) (a-na-pézá galú kú-dáambo) (Kanerva, 1990, p.103)

child find dog at swamp.

‘The child found the dog at the swamp’

As shown in (f) above, *mwaána* is a phonological phrase made up of one word, making it the final word in the phrase. The penult vowel of *mwaána* is lengthened by the addition of a mora and it is also where the H tone is drawn. The addition of a mora is indicated by doubling the vowel /a/. In the phonological phrase that follows, *a-na-pézá galú kú-dáambo,* phrase initial and medial position words, vowels in penultimate syllables are not lengthened and the final vowels maintain the H tone, it is not retracted to the penultimate vowel. The verb 'pézá' is an exception as the H tone is realized on both the penult and final vowel. According to Downing (2013), in Chichewa, when a verb is in phrase medial position, the H tone doubles to be realized on the penult and final vowels. This seems to be peculiar to Chichewa only as this is not a feature of Chitumbuka, a language spoken in Malawi, which like Chichewa uses phrase penultimate. Since *dáambo* is the final word in this phonological phrase it goes through the phonological processes of PL and the H tone is attracted to it. It is interesting that while in *mwaána* the H tone is attracted to the added mora, in *dáambo* it is attracted to the initial vowel. The presence of clustered consonants *mb* could be the cause of this variation. While it would be interesting to explore the phonological processes responsible for this variation, it is beyond the scope of this study.

Hyman (2009) gives examples from Shona, a language spoken in Zimbabwe, a country in the Southern part of Africa, as another language that manipulates phrase penultimate syllables. In Shona, the penultimate vowel of the final word in a multi phonological word utterance is lengthened (Fortune, 1980). For example:

g. úya kú nó, mwaána 'come here, child!',

The penultimate vowel of the final word *mwaána* carries a marker of penultimate length.

Fortune's (1980) description of penultimate length in Shona presupposes that penultimate length is not realised in words spoken in isolation. Arguably, a word spoken in isolation is the final word in an utterance and thus is followed by a pause; therefore, it is bound to have penultimate vowel length relatively longer than the other vowels in that word.

Utterance penultimate is another PSVL domain in Bantu languages. The utterance penultimate is determined by the position of a word in an utterance. Hyman (2009) quotes Doke (1967) to illustrate an instance of utterance penultimate:

> "Normally in Sotho each isolated word and the final word in each sentence has stress on the penultimate syllable accompanied by length. The length of the vowels of the penultimate syllables is appreciably shortened when words are not final in the sentence." (Doke, 1967, p.125).

However, the quote seems to explain vowel length in sentence final and non-final penultimate syllables. Setswana could be said to fall under this type of PSVL.

The variations in the penultimate syllable vowel length in Bantu languages necessitate the investigation of this prosodic element in Setswana.

2.4.2 Penultimate syllable vowel lengthening in Setswana

According to Cole (1955), in Setswana, the full length of the penultimate syllable is achieved when the word is pronounced in isolation or when the word is in sentence final position; when the word is in non-sentence final position it still maintains the length and stress, but the penultimate lengthening is not as prominent as at sentence final position. The example below illustrates PL in Setswana:

(Botswana, 2001).

a. /musali/ [mòsá:dì] (mosadi) woman

This phonetic symbol (:) indicates length.

Botswana (2001) states that PL in Setswana is achieved by the addition of a mora.

b. /musali/ [mòsá:dì] mo-saa-di (mosadi) woman

Similarly, Kalanga, a dialect spoken in Botswana, requires the addition of a mora to lengthen the penultimate syllable vowel.

c. /ku-túm-á/ → ku-tuum-a [kùtû:má] to send.
Ku-to, tuma-send.
(Hyman & Mathangwane, 1998, p.199).

The addition of a mora has a tonal effect as it changes the penult syllable vowel to HL falling tone tailed by H, because the insertion of a mora requires an L tone (Hyman, 2009). While the addition of a mora to lengthen the penult syllable vowel has tonal effects in Setswana, the HL tone change does not seem to be the case, as shown in (a). Though this goes to show the varied

ways of PSVL in Bantu languages, it raises some questions because in most Bantu languages, the insertion of a mora for penult vowel lengthening causes the HL falling tone changes followed by an H tone especially when words are spoken in isolation. For instance, in Chitumbuka, a language spoken in Malawi, every isolated spoken word experiences penult vowel lengthening with a falling tone (Downing, 2006).

Contrary to Cole's (1955) view on PSVL in Setswana, Zerbian (2017) states that the Setswana ideophones exhibit an absence of penultimate syllable lengthening; rather they prolong lengthening of final sounds. Dingemanse (2012, p. 65) defines ideophones as 'marked words that depict sensory imagery'. Therefore, ideophones are words thought to be onomatopoetic, but in Setswana and other Bantu languages there is more to them than the sound associated with what the word describes (Cole, 1955; Zerbian, 2017). 'Ideophones are descriptive of sound, colour, smell, manner, appearance, state action or intensity whereas onomatopoeia are descriptive of sound only' (Cole, 1955, p. 370). Cole (1955) further states that ideophones are just a small number and are not regularly used in Setswana. Zerbian (2017) gives the following example to illustrate; *Go nó go dídímetse gó ríle tú.- it was dead quiet.* Based on the definition of an ideophone, the ideophone in the sentence is *tú.* Presuming that the underlined are the lengthened ones it is not surprising that these are lengthened as these are monosyllabic words and so the only vowel in a word will be lengthened. It is not clear why the first syllable vowel of *dídímetse* has attracted lengthening compared to other syllables in the word. What should be lengthened based on her argument should be the final syllable vowel since the example sentence is meant to illustrate lengthening of the final syllable vowel in ideophones.

Zerbian (2017) further states that the penultimate syllable is lengthened in pause list and imperative sentences. Even though Zerbian (2017) does not directly state it, the conclusion drawn from this is that the penultimate syllables of words, which are not in pause list, or non-imperative sentences are not lengthened.

These divergences give more reason to investigate PSVL in Setswana.

It is important to note that the penultimate syllable length rule discourages monosyllabic words such as: **n, e, bo,** or **lo** (Botswana, 2001). They must be attached to **<u>na,</u>** known as a stabiliser, to form a word that can be translated to English. Doing so makes them disyllabic (Cole, 1955) such as:

1) a. *nna* (I)

   b. *lona* (them).

However, this account fails to explain the existence of monosyllabic words such as:

2) a. *Ja* /ʤa/ (eat)

   b. *fa* /fa/ (here)

It could be argued that the use of the word ‘discourages’ acknowledges the existence of monosyllabic words. Nonetheless, an elaborate discussion of their presence in a language where disyllabic (or more) words are central to the phonology is essential.

Even though penultimate syllable vowel lengthening plays a prominent feature in the phonology of Setswana, unlike other Bantu languages such as Swahili, it does not indicate a

distinction in the lexical meaning of words. The following examples taken from (Botswana, 2001) illustrates this:

1. Swahili

A.

i. [wake] ‘wives’

ii. [wa:ke] ‘his/her’

B.

i. [zao] ‘crop’

ii. [za:o] ‘theirs’

2. Setswana

A.

i. [mosadi] ‘woman’

ii. [mosa:di] ‘woman’

B.

i. [rekisa] ‘sell’

ii. [reki:sa] ‘sell’

The present study looks at the speech of 6-7 years old primary school bilingual children exposed to high L2 input and those exposed to minimal L2 input, to ascertain their PSVL pattern. Studies such as Montrul (2006) have shown that an increase in the L2 input where L1 input is significantly reduced results in charges to L1. One of the aims of this study is, therefore, to see whether the L2, which does not have penultimate syllable vowel lengthening as a

phonological pattern, has had an effect on the L1 of children in either group, as this may affect their intelligibility in Setswana.

2.4.3 The importance of the penultimate syllable vowel lengthening in Setswana

Since there is no difference in the meaning of words with lengthened or without lengthened penultimate syllable vowel, it is debatable that a change to the penultimate syllable vowel length is unlikely to result in unintelligibility on one hand. On the other hand, misplacement of the syllable length could result in changes to the tone necessary in discriminating between meanings of words (since it has an effect on the tone as discussed in section 2.4.1 and section 2.5). Any changes to the tone could result in a situation where homographs such as in

Kae /kái/ 'where' and *Kae* /kaí/ 'how many', which are pronounced in the same way, and so the meanings of these words will not be distinguishable. This could lead to unintelligibility.

In addition, misplacement of the syllable length could give rise to issues with lexical retrieval, as it is a predictable element of the Setswana word. This shows that PSVL is important in parsing language in Setswana and any disruption to the expected patterns may cause problems in this respect. This argument is based on the finding that like other Bantu languages, stress in Setswana is manifested in the lengthening of the penultimate vowel (Hyman, 2009). Word stress is an integral part of the phonological system of a language. Transferring of lexical stress from the penultimate syllable vowel to other vowels may affect the vowel quality and so there is a possibility that word recognition would be affected. This assumption is supported by Culter and Clifton's (1984) findings that words with wrong stress placement were difficult to

recognise. In their study, Culter and Clifton (1984) distorted the word stress on different types of words. The participants were asked to semantically judge the words. The participants first listened to the words with correct stress placement; thereafter they were presented with a combination of words with correct stress placement and those with mis-stress. The participants were unable to recognise the words with distorted stress. This led Culter and Clifton (1984) to the conclusion that correct placement of word stress is vital in word recognition.

Further support of the importance of correct placement of lexical stress is given by Bansal (1966) cited in Culter (1984). Bansal (1966) participants listened to a recording of English spoken by Indians. Indian English is characterised by wrong placement of word stress (Cutler, 1984). The listeners interpreted the mis-stressed words to match with the stress patterns of words as represented in their mental lexicon. This resulted in the wrong perception of the words indicating that word stress is vital to the language processor. For example, words with stress on the first syllable were pronounced with second syllable stress as in *atmosphere*, which was interpreted as *must fear*, and *yesterday* as *or study* (Bansal, 1966 cited in Culter, 1984). Likewise when the stress was shifted from the second syllable to the initial syllable wrong perception of the words followed. For example, *prefer* was understood as *fearful*, *about* as *come out* (Bansal, 1966 cited in Culter, 1984). The incorrect word stress information precipitated an error of interpretation.

The findings of the reviewed studies seem to suggest that making use of data about stress patterns and the type of stressed syllable is a logical and effective way of comprehending speech. Stress information is useful in directing lexical access; that is, it allows those entries with suitable stress patterns to be fully retrieved (Cutler, 1984). Consequently, lexical stress is

fundamental in the correct pronunciation of words, which will facilitate word perception by the language processor (Cutler, 1984).

In light of the reviewed literature on the importance of word stress, it is plausible that shifting of syllable vowel length from the penultimate syllable (with exception of homographs, see section 2.4.1) which amounts to shifting of stress, could lead to wrong perception of the words as the penultimate syllable is where the stress of the Setswana word is realised.

Furthermore, the misplacement of the lexical stress could lead to changes in the phonetic segment duration making it difficult for listeners to make linguistic decisions. This is because the patterns of phonetic segment durations transmit information about the linguistic content of an utterance (Klatt, 1976).

Moreover, if the penultimate syllable vowel is not produced with the anticipated lengthening when a word is pronounced in isolation or when in sentence final and, if the most lengthening occurs when a word is in non-final sentence position, it could indicate foreign accent, which is why it is an appropriate phonetic element to examine in this study where the Setswana-English bilinguals are dominant in L2.

2.5 Tone in Setswana

Tone is another prosodic feature that contributes towards speech rhythm (Mok, 2011) and PSVL (see section 2.4.1). It is a phonological element, which indicates the difference between the meanings of words in Setswana (see section 2.4.1 examples 1 and 2 below). Katamba (1989) describes tone as the differences in the pitch level of a syllable, where pitch is the auditory sensation arising from the frequency of vibration of the vocal folds, the higher the vibration, the higher the pitch. Stress is the auditory prominence of a syllable (Katamba, 1989), which is established through loudness, length, pitch, and vowel quality (Roach, 2009). Therefore, stressed syllables tend to have a high pitch, longer duration and are louder than unstressed syllables (Katamba, 1989) and, in some languages where this is relevant (such as English), have a full vowel rather than a reduced one. Tone and stress are interrelated since pitch plays a significant role in each.

Although penultimate syllable length does not distinguish between the meanings of words, Hyman (2009) points out that the penultimate lengthening of the vowel has an effect on the tone. Setswana is a tonal language where syllabic pitch is used to distinguish between meaning of words at both lexical and grammatical level (Batibo & Mae, 1999). The following examples illustrate this, with a description of tones in Setswana following.

1. **Lexical level**

a. *Kae* /káı/ ‘where’

Kae /kaí/ ‘how many’

b. *Mafatlha* /mafátɬʰa/ ‘twins’

Mafatlha /mafatɬʰa/ ‘chest’

2. Grammatical

c.	*KeMpho*	/kɪmpʰɔ́/	'I am Mpho'	(Mpho is a person's name, it means gift)
	KeMpho	/kí mpʰɔ́/	'It is Mpho'	

d.	*O bua Setswana*	/ǒbúasetswána/	'He/she speaks Setswana'
	O bua Setswana	/ʊbúasetswána/	'You speak Setswana'

In a tone language, the distinction between the high (H) mid (M) and low (L) tone is realised in all syllables (Botswana, 2001) i.e., it is obligatory for a syllable to be associated with H, M or L tone (Botswana, 2001). However, the Setswana tone system is displayed by, the H and L tone distinctions making it a two-level tone language (Doke, 1954; cited in Zerbian, 2006; Botswana, 2001, Cole, 1955). As mentioned above, the acute accent (ˊ) on the vowels in the examples above indicates high (H) tone and the grave accent (`) low (L) tone. Since the majority of the tones are L tone they are usually left unmarked (Batibo & Mae, 1999); in example 1b above, the second instance of *mafatlha* ('chest') contains only low tones. The tone system is in such a way that only a few syllables are associated with H tones; the rest are toneless at the underlying level (Batibo & Mae, 1999; Botswana, 2001). However, to adhere to the principle that a syllable must be underlyingly associated with a tone, the Setswana tone rules, which are best described with reference to verb forms, state that the H tone should spread to the next two syllables to the right as illustrate in the example below:

	3) Underlying forms		**Spreading out**		
a.	*Rekisa*	/rɛ́kisa/	*rekisa*	/rɛ́kísa/	'sell'
b.	*Simolola*	/símɔlɔla/	*Simolola*	/símɔ́lɔ́la/	'begin'

This rule is not unique to Setswana but to most Bantu languages. (Zerbian, 2006, p. 147) points out that ‘a high tone does not only surface on the syllable it is associated with underlyingly, but also on succeeding syllables’. This is referred to as mobility of high tones.

According to Batibo and Mae (1999) and Botswana (2001), the mobility of the H tone is governed by the following rules:

a. The H tone cannot spread to a pre-pausal final syllable.

   Rekisa /rɛ́kisa/ ⟶ /rɛ́kísa/ NOT /rɛ́kísá/ ‘sell’

b. The H tone does not spread to a syllable preceding a syllable already associated with H.

   Go rekakgomo /χʊrɛ́kaqʰʊmó/ ⟶ /χʊrɛ́ká qʰʊmó/ **NOT** /χʊrɛ́ká qʰʊ́mó/

However, Botswana (2001) points out that, in the northern dialects of Setswana in Botswana, the H tone spreads to the penultimate syllable of a word regardless of the number of syllables to the right as illustrated below.

a. simolodisiwa	/símólódísí:wà/	‘be helped to begin’
b. Simolodisisa	/símólódísí:sà/	‘help to begin’

In light of the discussed, the tone distinction in Setswana is not between H and L at the underlying level but between toned syllables, associated with the H, and toneless syllables, which have no tonal connection at the underlying level (Batibo & Mae, 1999). And so in reference to the present study tone might play a significant role, as it is intrinsic in the penultimate syllable vowel length as well as speech rhythm focal research points of the present study.

2.6 Acoustic analysis of the Setswana vowels

The focus of the present study is on the prosodic features of speech rhythm and PSVL with a particular focus on the vowel. It is therefore, imperative to give a detailed comprehensive discussion of the Setswana vowels. As aforementioned Setswana has seven basic vowels (/ɪ, i, ɛ, a, ɔ, ʊ, u/), spelt graphically as [i, u, e, a, o, ê, ô] respectively. Recent literature does not conform to the use of the circumflex thus causing a confusion between /ɪ/ and /ɛ/ as well as between /ʊ/ and /ɔ/ for the South African dialect of Setswana, does not have the circumflex variants, the vowels are given as /i, e, ɛ, a, ɔ, o, u/ by Le Roux and Le Roux (2008) and Le Roux (2012); however, these are the same set of vowels with symbols /e/ corresponding with /ɪ/ and /o/ corresponding with /ʊ/ of Botswana Setswana. It is worth pointing out that the present study uses the Botswana Setswana vowels as the focus of the study is on Setswana spoken in Botswana. Early studies (e.g., Cole, 1949; Jones, 1928; Snyman, 1989; Ziervogel, 1967; cited in Le Roux & Le Roux, 2008) positioned the Setswana vowels on the vowel chart against the cardinal vowels (CVs) (figure 2.1) on the basis of auditory perception; as such there are some discrepancies (Le Roux, 2012; Le Roux & Le Roux, 2008). Due to these inconsistencies, Le Roux and Le Roux (2008) and Le Roux (2012) provided an acoustic analysis of the Setswana vowels, which lead to accurate positioning of the vowels on the vowel chart against the CVs (figure 2.2). The following figures show the position of the Setswana vowels on the vowel chart.

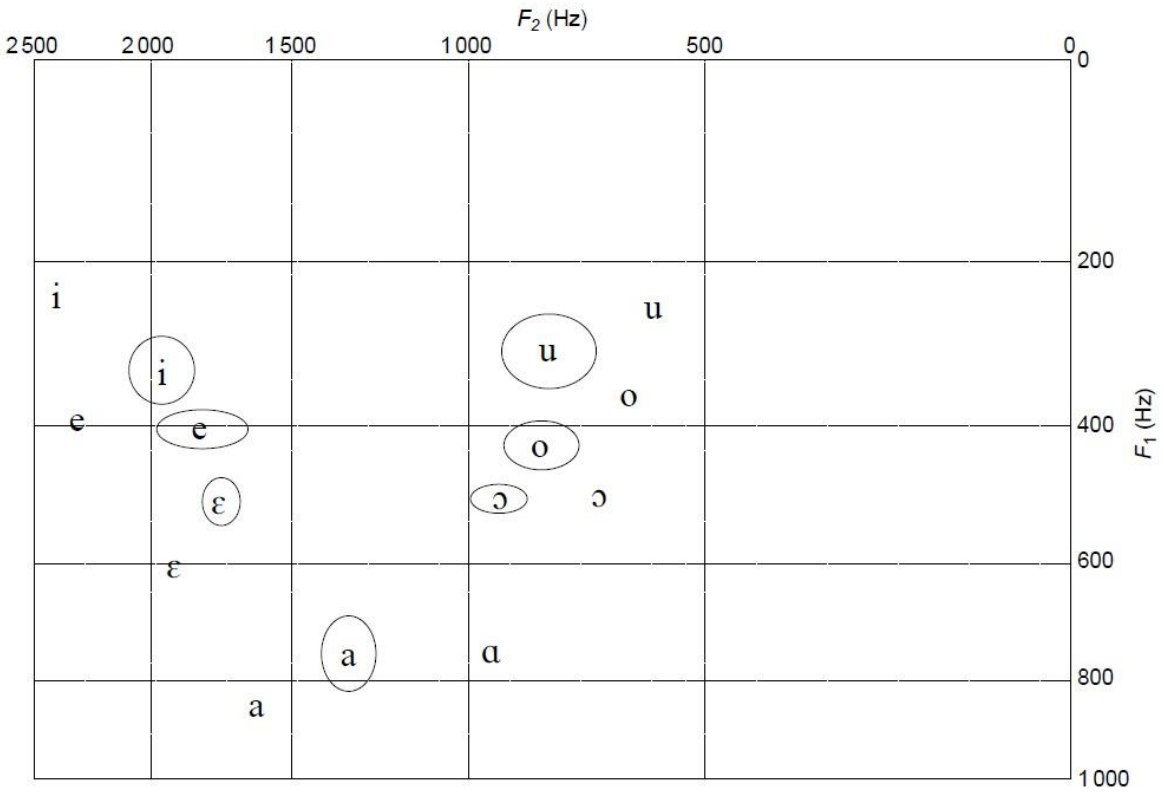


Figure 2. 1. Setswana vowels on the vowel chart.

Key: Circled phonetic symbols: Acoustically determined Setswana vowels Uncircled phonetic symbols: Acoustically determined cardinal vowels (Roux 2012, p.178)

Le Roux and Le Roux (2008) and Le Roux (2012) concluded that the Setswana high vowels (/i/ and /u/), mid-high vowels /e/, and /o/ are lower than the corresponding CVs. However the mid-high front vowel /e/ is marginally lower than its equivalent CV 2, Le Roux (2012). Whereas the mid-low front vowel /ɛ/ is higher than CV 3 the mid-low back vowel /ɔ/ is the same height as CV 6. It seems there are some inconsistencies regarding the placement of the mid-low back vowel /ɔ/ because in Le Roux and Le Roux (2008) chart the vowel is placed slightly higher than its counterpart CV 6. The low vowel /a/ is higher than its comparable CV (4). The researchers further assert that the Setswana front and back vowels should be placed a

significant distance from the horizontal extremities of the matching front and back CVs in the vowel chart.

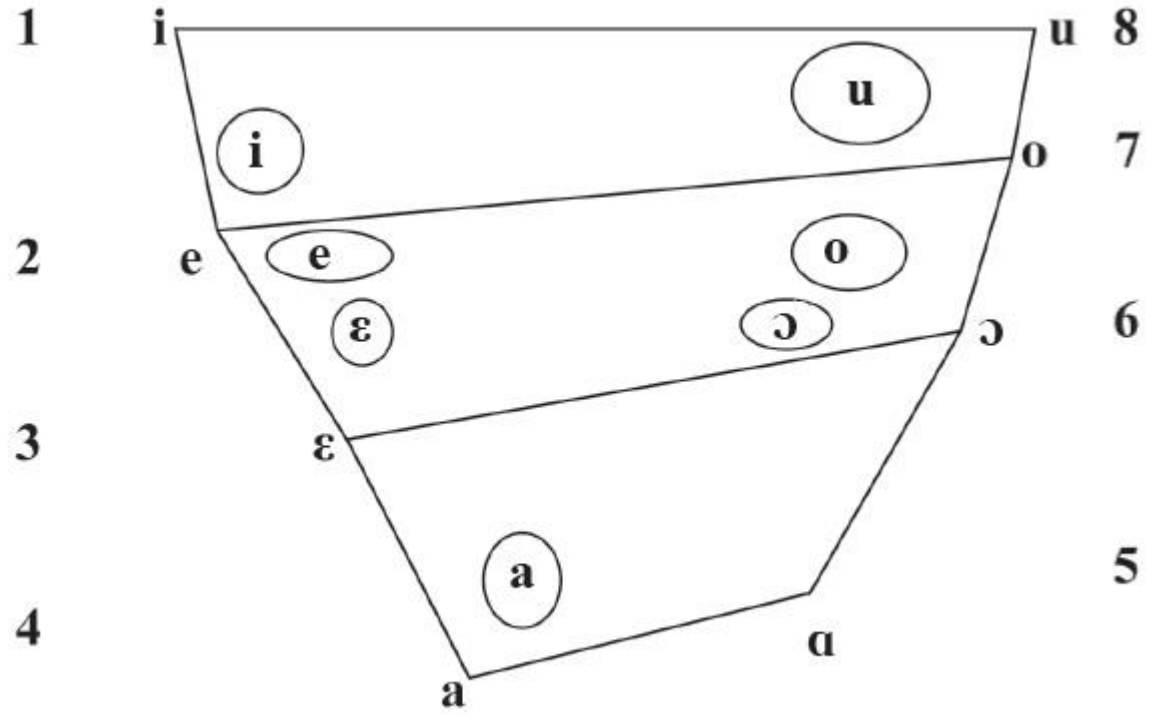


Figure 2. 2. The correct Setswana vowels chart.

Key: Encircled phonetic symbols = Acoustically determined Setswana vowels

Uncircled phonetic symbols = Acoustically determined cardinal vowels (Roux & Roux 2008, p.170).

It is worth noting that the data of Le Roux and Le Roux (2008) and Le Roux (2012) was collected from South African Setswana speakers. Though the Setswana spoken in South Africa and that spoken in Botswana are mutually intelligible, there are dialectal differences that might

have an effect on the data of the present study, as the data is solely collected from Setswana speakers living in Botswana.

2.7 Final syllable length in English

The rationale for discussing the final syllable lengthening in English, in the present study is because the study focuses on Setswana-English bilingual children who are dominant in the English language. It is probable that phonological features of the dominant English might have an influence on the vowel length of Setswana speech of these children resulting in the lengthening of the final syllable.

While research on the type of final lengthening in English gives inconsistent results, previous research has shown that final syllable lengthening is prevalent in utterances in the English language (Cambier-Langeveld & Turk, 1999; Klatt, 1975; Klatt & Cooper, 1975; Lehiste, 1973; Turk & Shattuck-Hufnagel, 2007; Yuen, Cox, & Demuth, 2014). Even though Turk and Shattuck-Hufnagel, (2007) are of the view that phrase final syllable rime receives more lengthening than any syllable of the word, they argue that the main stress syllable rime receives more lengthening even when it is not the final syllable. They concluded that the dissemination of syllable lengthening of the final word is not clear-cut in English.

Nonetheless, Yuen et al.'s (2014) study supported the finding that the final syllable length in English receives the most lengthening. Yuen et al. (2014) investigated the phonemic vowel length in adults and three years old children learning Australian English. The children were

able to maintain the adult-like pattern of the final syllable/boundary related lengthening. The findings of Yuen et al. (2014) show that final syllable lengthening is a prominent feature of the phonological system of English, as it has shown that it is acquired early in childhood by the age of three years. Similarly, Cambier-Langeveld and Turk (1999) found lengthening on the final syllable in English words.

Previous studies findings on the lengthening of the final syllable in English words, is very relevant to the present study which looks at vowel lengthening in the Setswana speech of Setswana-English bilinguals for whom English is a dominant language. This will enable the achievement of the study's objective of observing the effects of increased levels of English on the PSVL patterns of the Setswana-English bilinguals compared to their Setswana monolingual peers.

2.8 Speaking rate

The rate at which one speaks has been found to have an effect on the vowel length (Hirata, 2004; Megan & Blumstein, 1993; Port, 1977). Hirata (2004) examined the effects of speaking rate on the Japanese disyllabic non-words and real words by native speakers. The speakers produced the words in a carrier phrase at slow, normal, and fast rates. The results of the study indicated that the duration of vowels was longer on slow speech compared to normal and fast speech. The researcher also established that normal rate vowel durations were longer than that of fast rate. Similarly, Megan and Blumstein (1993) investigated the effects of speaking rate on Koreans' vowels duration. The finds showed that short vowels spoken at slow rate were

longer than those spoken at fast rate. Most interesting was the finding that short vowels spoken at a slow rate were almost the same length as long vowels spoken at a fast rate. The findings of Hirata (2004) and those of Megan and Blumstein (1993) clearly demonstrated the effects of speaking rate on the vowel duration. The findings of these studies have implications to the present study because the Setswana-English bilingual children might speak Setswana at a slow rate because they are unsure of what to say, as they might not be fluent in Setswana due to English being their dominant language. Speaking Setswana at a slow rate might result in long vowel durations in the Setswana speech of this group of children compared to their Setswana monolingual peers.

2.9 The age factor

This section reviews research into incomplete acquisition, acquisition delay and language attrition in L1. While this is not a central area of research in this thesis, it is hoped that the results may throw some light on each of these issues.

When considering how children become more or less effective in one or more languages, the key question is what develops linguistically at what age. At the centre of L2 acquisition is the age factor (Montrul, 2002, 2004, 2006, 2008). (Montrul, 2002, 2008, 2009) and Polinsky (2006) are of the view that the age at the onset of L2 is the most essential in determining whether there is a risk in the linguistic development of a child, which may result in L1 incomplete acquisition or L1 acquisition delay or L1 attrition. The age factor plays a role in the present study as the focus is on young bilinguals who acquired L2 English at an early age. For practical reasons it was not possible to include very young learners, as the groups studied here

were already in school. However, by comparing participants with less or more exposure to English, it may also be possible to explore if what could take place in the development of their L1 may be explained as L1 incomplete acquisition or L1 acquisition delay or L1 attrition.

2.9.1 L1 attrition

Seliger (1996) defines L1 attrition as the "temporary or permanent loss of language ability as reflected in a speaker's performance or in his or her inability to make grammaticality judgements that would be consistent with native speaker monolingual at the same age and stage of language development" (p.606). Similarly Pavlenko (2004) refers to L1 attrition as the "loss of some L1 elements seen in the inability to produce, perceive, or recognise particular rules, lexical items, concepts or categorical distinctions due to L2 influence" (p.47). L1 attrition is defined as the disintegration of an L1 as a result of L2 domination (Kopke & Schmid, 2004). These definitions of L1 attrition place emphasis on the loss of L1. The implication is that, that which is lost must have been fully acquired. In the same way Montrul (2002) argues that attrition implies that the language system was completely acquired before some aspects of it were lost. Yet for phonological and prosodic acquisition especially in less studied languages like Setswana, it remains unclear (for lack of adequate research) at what age relevant features are acquired, leaving this an open question to explore.

2.9.2 Incomplete acquisition

According to Montrul (2002, 2008) incomplete L1 acquisition occurs when properties of the language do not reach age-appropriate levels of proficiency due to intense exposure to L2 in childhood. Similarly, incomplete acquisition occurs when sequential bilinguals are not exposed to the best (L1) input during the age of prime linguistic development (Putnam and Sánchez (2013). Montrul (2002, 2008) contends that attrition occurs when the child has attained a native-speaker level of accuracy of a linguistic element. In light of Montrul's (2002, 2008) argument, it can be deduced that L1 attrition happens to older children (post-puberty) as most would have attained native-like proficiency of the language. L1 attrition in early childhood before the age of five is highly unlikely as most are "presumably on their way to acquiring full linguistic competence" (Montrul, 2002, p. 39). In view of Montrul (2002) the linguistic incompetence in the people who were exposed to intense L2 input in early childhood, like the Setswana-English bilinguals in the present study would be due to incomplete acquisition, not L1 attrition. Montrul (2002) argues that if it can be shown empirically that the linguistic element in question was acquired and mastered in childhood then losing that element later is L1 attrition (Montrul, 2008). One way to assess L1 attrition or incomplete acquisition is by comparing the development stage of a child's weaker language at a given age to that of a fluent bilingual or monolingual child of the same age and cognitive development (Montrul, 2008).

2.9.2.1 L1 attrition versus L1 incomplete acquisition

In spite of the insights provided by Montrul's (2002, 2008) regarding the dichotomy between L1 attrition and incomplete acquisition, there is still some inconsistency in the studies that have been carried out regarding the issue. Contrary to Montrul (2002, 2008), Kaufman and Aronoff (1991) reported L1 attrition in Hebrew by a child of 2.6 years of age who was fluent in Hebrew

when the family immigrated to the United States, where English is the dominant language. The dominant language in the home environment was Hebrew (L1), and English (L2) was acquired at school. The exposure to English, and intensity of English increased as the child grew and spent more time at school. The study maps stages in the child's linguistic journey from L1 fluency to non-production. The results indicated attrition of L1 in morphology and the lexicon within three months of arrival in the US, despite continued exposure to L1. Similarly, Nicoladis and Grabois (2002) described L1 attrition in the production and comprehension of Cantonese by a 17-month-old Chinese girl adopted by an English speaking family within three months of exposure to English. These studies purport that the linguistic elements they investigated were acquired prior to exposure to L2. However, based on Montrul (2002, 2008), this is highly unlikely, because at early childhood the children are still in the process of attaining full linguistic competence in L1. Therefore, the process that should have occurred is incomplete acquisition according to Montrul's (2002, 2008) definition.

Another study which has documented L1 attrition in children is (Ventureyra, Pallier, & Yoo, 2004). The study assessed the perception of L1 phonemic contrasts in a population of Korean adoptees by French speaking families. The results indicated that the Korean adoptees did not have easy access to the phonetic categories of the Korean language. The researchers concluded that this was a case of L1 attrition. Based on Montrul's (2002, 2008) definition, the conclusion of the study on L1 attrition is unconvincing because the participants' age at the time of adoption ranged from three to nine years. Therefore, some of the participants fall within the early childhood group; i.e., the critical period of language acquisition. Moreover, the participants were between 22 and 36 years old at the time of data collection. Since this was not a longitudinal study, the researchers met the participants at an adult age; they cannot ascertain that, indeed, the linguistic element they were investigating was fully acquired before exposure

to L2 (English). This should be a case of incomplete acquisition, not L1 attrition, based on Montrul's (2002, 2008) distinction of the two processes.

Consequently, the conclusion of the above studies on L1 attrition could have merit as other studies have indicated that phonological perception is acquired early in life (Dehaene-Lambertz & Houston, 1998; Nazzi et al., 1998; Nazzi et al., 2000). Dehaene-Lambertz and Houston (1998) investigated orientation latency towards native language in two months old American and French infants. They played the infants short English and French utterances over a loudspeaker. Dehaene-Lambertz and Houston (1998) found that the infants oriented faster to their native language utterances. The findings are in support of the notion that prosodic features of the native language are acquired early in life.

Nazzi et al. (2000) is yet another research, which demonstrates that prosodic, features such as speech rhythm are acquired early in childhood. They used the Headturn Preference Procedure to determine if 5 months old American infants are able to differentiate languages. Nazzi et al. (2000) found that the infants were able to separate pairs of languages from different rhythmic classes such as British English (stress-timed) and Japanese (mora-timed) but they were unable to discriminate between pairs of languages from an unknown rhythmic class such as Italian and Spanish which are both considered syllable-timed. Nazzi et al. (2000) further established that the infants were able to distinguish between pairs of languages from the same rhythmic classes if one of the languages is the native language or it's variant. For example, the infants were able to distinguish between British English and German and between British English and American English, all considered stress-timed. However, the infants were unable to distinguish between foreign pairs of stress-timed language such as Dutch and German. (A comprehensive

discussion of the different rhythmic classes is in section 2.3). The findings of Nazzi et al. (2000) demonstrate that the rhythm of the native language is acquired early in life.

Nazzi et al. (1998) demonstrate that prosodic features, in particular speech rhythm of the native language are acquired even earlier in life, as early as at new-born baby stage. In their study they investigated the ability on French new-born babies' ability to distinguish between sets of sentences from different languages with extraneous rhythmic classes. The babies were able to distinguish between English and Japanese but could not distinguish between English and Dutch both considered stress-timed. Nonetheless, the babies were able to discriminate between stress-timed and syllable-time languages such as English and Spanish. Nazzi et al. (1998) concluded that babies use prosodic information especially rhythmic information to characterise utterances into their specific rhythmic classes. Furthermore, Nazzi and Ramus (2003) also established that infants are perceptive to rhythmic classes from birth. Based on the findings of (Dehaene-Lambertz & Houston, 1998; Nazzi et al., 1998; Nazzi et al., 2000) it is arguable that any prosodic difference, particularly speech rhythm, in the speech of bilinguals compared to monolinguals could be due to L1 attrition. By comparing the speech of the Setswana-English bilingual children to that of Setswana monolinguals, this study thus hopes to shed light on the extent of any differences (noting that we cannot specifically identify if attrition may be the specific cause of the difference).

It is also plausible that any dissimilarities in the vowel length particularly PSVL in the speech of bilinguals and monolinguals could be attributed to L1 attrition. This assumption is based on the findings of Salidis and Johnson (1997) and Kehoe and Stoel-Gammon (2001). Salidis and Johnson (1997) found that by the age of 14 months infants are able to control vowel length in

their speech. Equally, Kehoe and Stoel-Gamman (2001) investigated vowel length errors in English children who were around two years of age. The results indicated that there was a low mean percentage of vowel length errors in the production of the children. The findings of Salidis and Johnson (1997) and Kehoe and Stoel-Gamman (2001) suggest that vowel length is acquired in early childhood. However, this might vary from one language to another. The present study thus also aims to find out the extent of any variances (if at all there is) in the PSVL in speech of Setswana-English bilinguals and Setswana monolinguals.

2.9.3 Acquisition delay

While studies like those of (Dehaene-Lambertz & Houston, 1998; Nazzi et al., 1998; Nazzi et al., 2000) have attributed the different perception of phonology in the speech of bilinguals and monolinguals to L1 attrition, other studies (Bunta & Ingram, 2007; Kehoe, 2002; Kehoe, 2015; Mok, 2011) have credited acquisition delay for the differences. Mok (2011) explored the acquisition of speech rhythm by three years old Cantonese-English bilingual children compared to their age matched Cantonese monolinguals and English monolinguals. Mok (2011) found that the speech rhythm of Cantonese-English bilinguals differed from that of the English monolinguals. The bilingual children's English had a low vocalic variability compared to monolinguals but it was higher than their Cantonese. This showed that the bilinguals' English rhythm was developing in the expected direction. Mok (2011) concluded that the phonological systems of the Cantonese-English bilinguals have interacted due to acquisition delay. Likewise, Kehoe (2002) surveyed the development of vowel systems of German-Spanish bilinguals to find out if the phonological systems of German and Spanish interact. The findings indicated that there was an interaction between the vowel systems of German-Spanish bilinguals. Kehoe (2002) concluded that the German-Spanish bilinguals displayed acquisition delay in the acquisition of vowel length. The present study aims at shedding some light on the notion of

acquisition delay in the prosodic elements of speech rhythm and PSVL in the speech of Setswana-English bilinguals compared to that of Setswana monolinguals (noting that the present study cannot assert acquisition delay).

In light of the discussed inconsistencies in the literature regarding the age that determines if the process that has taken place is incomplete acquisition, acquisition delay, or L1 attrition, it is imperative to employ literature on child language acquisition and development to shed light on the language milestone or landmark of a child. In view of this, the linguistic feature that the present study investigates is the prosodic feature of speech rhythm and PSVL. Studies such as Grabe et al. (1999) and Whitworth (2002) have demonstrated that children acquire the speech rhythm of their L1 late especially where their L1 is considered stress-timed. Grabe et al. (1999) asserts that it is after four years of age, whereas for Whitworth (2002) is after 11 years of age. However, later studies have shown that monolingual children acquiring rhythmically different languages (stress-timed and syllable-timed) exhibit distinct rhythm in their production at 3 years of age (Kehoe et al., 2011; Lleó et al., 2007; Mok, 2011). Moreover, studies have demonstrated that it is because of speech rhythm that babies are able to distinguish between languages (Dehaene-Lambertz & Houston, 1998; Nazzi et al., 1998; Nazzi et al., 2000) indicating that perception of speech rhythm is acquired early. Therefore, evidence of influence on L1 speech in Setswana children who acquire English, as a high diglossic and dominant second/bilingual language would potentially inform the competing claims of L1 attrition versus incomplete acquisition or acquisition delay. Since the present study focuses on children who were exposed to English after the supposed age of speech rhythm acquisition, this study would more likely relate to L1 attrition as the issue of incomplete acquisition or acquisition delay would not in theory arise. However, in view of the theoretical and empirical debates regarding what determines incomplete acquisition, acquisition delay and L1 attrition, and the different

claims over the age of speech rhythm acquisition, such an empirical focus may be too restrictive.

In addition, as accounts of child monolingual and bilingual speech patterns in Setswana are radically under-researched, there is little evidence for benchmarking what is or is not seen as normed stages of development of speech rhythm and PSVL for this target population. Therefore, the present study will focus on investigating the effects of bilingualism in the speech rhythm and PSVL of native Batswana children who also speak English. This will be measured at different ages (6-7 years old), different levels of exposure to English and levels of proficiency, within the frameworks of bilingual language processing, child L2 acquisition and diglossic dominance, but without necessarily restricting it to a scientific test of claims of incomplete acquisition, acquisition delay or L1 attrition as such. The study will merely compare what is in the literature with what is observed with the data of the present study regarding these language theories.

2.10. Summary of key issues

The reviewed literature indicates there is contention regarding the age at which one is exposed to L2 as this may determine any extent of L1 attrition or incomplete acquisition or acquisition delay. This contention also extends to the age at which a child is assumed to have acquired the speech rhythm of L1, as some studies state that it is after the age of 11 whereas others assert it is acquired by 3 years of age. It is for this reason that the present study will focus on the effects of English (L2) on the speech rhythm and PSVL of Setswana-English bilinguals without necessarily restricting it to incomplete acquisition or acquisition delay or L1 attrition. In addition, though the area of speech rhythm in bilinguals is under researched, African languages like Setswana are the ones that are investigated the least in the literature. This gives a clear rationale to address theoretical debates and empirical gaps in evidence by focusing on the speech rhythm and PSVL of Setswana-English bilingual children (6-7 years old) exposed to English at an early age (3 years and below) for whom English (L2) is a dominant language. The objective is to establish if knowledge of English has an effect on the timing of the Setswana syllable consequently affecting their speech rhythm and PSVL, which, in turn, may affect the intelligibility of this group of Setswana speakers.

It has emerged from the literature review that bilingual children who are 3 years of age merge the speech rhythm of their languages, while those who are between 4 and 5 years keep them distinct. It is therefore necessary to investigate the nature of speech rhythm of children older than 5 years of age growing up in their native environment but whose dominant language is L2, and compare them to monolingual children who have only limited exposure to L2. This

will enable me to find out if the children continue to keep the rhythm distinct, merge them or tend towards L2 rhythm as they become more proficient in the L2, and the differences between the bilingual children compared to monolingual children. The present study argues that the Setswana-English bilingual children will not keep the rhythm pattern of their two languages distinct contrary to studies that assert that older children keep the rhythmic patterns of their two languages separate as discussed in section 2.3. The rhythm pattern in the speech of this group of bilingual children is expected to deviate from that of monolingual Setswana group and monolingual English group checked by using baselines taken from existing literature on the acquisition of English by monolingual children.

The study also investigates the extent to which the penultimate syllable is lengthened in the speech of monolingual and bilingual children. The reviewed literature states that the Setswana penultimate syllable is the longest syllable as stress lengthens it to two moras compared to other syllables with a single mora (Cole, 1955; Hyman, 2009). The present study argues that the penultimate syllable in the speech of Setswana monolinguals will be longer than that of Setswana-English bilinguals.

There is also a question concerning whether bilingual children in Standard 2, who will have had increased exposure to English through school attendance, have different Setswana speech patterns to younger children in Standard 1, and how this compares with monolingual peers.

This leads me to ask four research questions (RQs), which will be examined through four related hypotheses.

2.11 Research questions

1. What is the pattern of rhythm timing of Setswana in the speech of Setswana-English bilingual children aged 6-7 years in comparison with monolingual peers?

2. What is the pattern of penultimate syllable duration in Setswana multisyllabic words in the speech of Setswana-English bilingual children aged 6-7 years in comparison with monolingual peers?

3. In the bilingual Setswana-English population, to what extent will the children in Standard 1, aged 6 years, have a different pattern of speech rhythm timing in Setswana in comparison with the children in Standard 2, aged 7 years, who will have had increased exposure to English?

4. In the bilingual Setswana-English population, to what extent will the children in Standard 1, aged 6 years, have a different pattern of penultimate syllable duration in Setswana in comparison with the children in Standard 2, aged 7 years, who will have had increased exposure to English?

2.12 Hypotheses of the study

The following hypotheses were formulated based on the reviewed literature.

1. The pattern of rhythmic timing of Setswana in the speech of Setswana-English bilingual children aged 6-7 will have a higher durational variability than that of the monolingual peers.

2. The pattern of the penultimate syllable duration in Setswana multisyllabic words in the speech of Setswana-English bilingual children aged 6-7 years will be different from their monolingual peers with the bilinguals not lengthening the penultimate syllable.

3. Setswana-English bilingual children aged 7 years who are in Standard Two will have a higher durational variability of Setswana in comparison with Setswana-English bilingual children aged 6 years who are in Standard One, because of increased exposure to English.

4. Setswana-English bilingual children aged 7 years who are in Standard Two will lengthen the penultimate syllable vowel in Setswana multisyllabic words **less** on average in comparison with Setswana-English bilingual children aged 6 years who are in Standard One, because of increased exposure to English by Standard 2.

The null hypotheses are:

1. There is no difference in the pattern of rhythmic timing of Setswana in the speech of Setswana-English speaking children aged 6-7 years in comparison with their monolingual peers.
2. There is no difference in the pattern of penultimate syllable duration in Setswana multisyllabic words in the speech of Setswana-English bilingual children aged 6-7 years in comparison with their monolingual peers.
3. There is no difference between Setswana-English bilingual children aged 7 years who are in Standard Two in terms of rhythmic variability of Setswana in comparison with Setswana-English bilingual children aged 6 years who are in Standard One.
4. There is no difference in the pattern of Setswana penultimate syllable vowel lengthening in multisyllabic words between Setswana-English bilingual children aged 7 years who are in

Standard Two and Setswana-English bilingual children aged 6 years who are in Standard One.

3. METHODOLOGY

3.1 Introduction

The previous chapter has shown the breadth and depth of research into speech rhythm and penultimate syllable vowel length, thereby providing a solid background of the nature of these prosodic elements. Unfortunately, it seems no research has been done on these prosodic elements in Batswana (citizens of Botswana) children particularly in the context of language contact and bilingualism – hence the novel focus of this research. The study aims at finding out the effects of English, the language given high status in Botswana, on the Setswana prosodic features of speech rhythm and penultimate syllable vowel length in the speech of native Batswana children (6-7 years old) who were exposed to English at an early age and attend private English medium schools. Montrul (2002, 2008) discussed in section 2.3.2, proposed that acquisition of bilingual language, here assessed in terms of the prosodic features of speech rhythm and PSVL are affected by timing, amount and quality of input which may also be affected by educational and societal diglossic factors.

The purpose of this chapter is to give a detailed description of the research design, research setting, participants, sampling procedure, ethical consideration, data collection: instruments, material, procedure, pilot study and statistical procedure used. In addition to the description of the research method, a detailed rationale for the research method is provided to demonstrate validity and reliability.

3.2 Research Design

The study adopted a quantitative data collection strategy of inquiry referred to as quasi-experimental research design. Quantitative research entails numerical data analysed using statistical methods (Creswell, 2009; Dörnyei, 2007). A quasi-experimental design and an experimental design are the same in every respect except that the quasi-experimental design does not randomly allocate participants to groups. For this reason, it is commonly used in applied linguistics research, as randomly assigned groups are hardly practical (Creswell, 2009; Dörnyei, 2007). A quasi-experimental design entails a cause-effect relationship, that is, it aims at ascertaining if a particular treatment or condition has an effect on the outcome (Creswell, 2009; Dörnyei, 2007). This design therefore was best suited to the objectives of this study of determining the effects of English on the speech rhythm and penultimate syllable vowel length on the Setswana speech of Setswana-English bilingual children.

One prominent feature of quasi-experimental design is the conscious manipulation of the variable in a controlled environment; therefore a quasi-experimental design usually has an experimental group that is manipulated or exposed to unique settings, and a control group (Dörnyei, 2007). The control group is used as a source of comparison with the experimental group. It should be noted that both the experimental group and control group must be similar in every respect except for one element or intervention that the experimental group has which the other groups do not have – i.e. the independent variable (Dörnyei, 2007). It is for this reason that the participants in the present study were matched for age and geographic area (for the Setswana monolingual group and the bilingual group) area to ensure homogeneity. The intervention in this study was that the experimental group at 6-7 years of age were chosen to represent the experience of children who receive intensive instruction in English at school

compared to the Setswana monolingual group. Thus, in this study the independent variables were age (6-7 years) and language (monolingual Setswana, and bilingual Setswana-English which was qualified by parental data which provided qualitative data on the quality and quantity of input) while the dependent variables were the target speech phenomena that might show effects of speech rhythm – i.e., Pairwise Variability Index scores, which measure vocalic intervals duration in seconds (s).

It is worth pointing out that studies on speech rhythm often make use of two control groups for each language that the experimental group participants speak; however, in the present study the English monolingual control group did not take part in the tasks as they cannot speak Setswana. Numerous studies (Bantu & Ingram, 2007; Kehoe et al., 2011; Mok, 2011) have demonstrated that English monolingual children start to consistently display the rhythm pattern of their language around the age of three years, the present study collected data from the Setswana-English bilingual children and Setswana monolingual children. The results of these two groups of children were compared to the results that have been published of English monolingual children' rhythmic patterns to determine if the rhythm pattern of Setswana-English bilingual children reflects the usual expected Setswana pattern of syllable timing and English pattern of stress timing.

3.3 Research Setting and Participants

The data was collected from primary schools (both private and public) in Francistown, one of the capital cities of Botswana the other capital city being Gaborone. Francistown was chosen because of its accessibility and the fact that it hosts a large number of schools, thus provided a large pool from which schools can be drawn for the study. In addition, Francistown was an ideal place to collect the main data as it is in the same geographical area the pilot study was conducted. This ensured similar results to that of the pilot study. A sample of twenty male and female participants was used to ensure full representativeness. A sample is a group of people empirically studied with the aim of generalising the results to the whole population (Dörnyei, 2007). The sample in the present study included ten Setswana monolinguals and ten Setswana-English sequential bilinguals, whose ages ranged from 6-7 years old. All the participants were matched for age as well as geographic area to match against dialectal differences and so ensure homogeneity.

The inclusion of the participants in the study depended on the parents' willingness for their children to participate in the study. Therefore, the study employed a convenience or opportunity sampling (Dörnyei, 2007). According to Dörnyei (2007), participants in a convenience sampling are chosen based on their accessibility to the researcher or their willingness to participate in the study. However, Dörnyei (2007) argues that convenience sample are not entirely convenience based, but they are also purposeful, as the participants must meet the conditions of the study. Convenience sampling was therefore appropriate for the present study.

The monolingual group provides an accurate representation of the potential linguistic performance in that particular language (Seliger, 1996). However, Cook (2003) points out that it is difficult to find pure monolinguals, as most people possess at least minimal knowledge of

a second language. Similarly, it was difficult to find pure monolinguals in Botswana, where the data for the Setswana monolinguals and Setswana-English bilinguals was collected, as it is a multi-lingual country (see section 1.2). In light of this, I retained the terminology of "monolingual" and "bilingual" children, to be consistent with existing studies in this field, but in practical terms, these groups are mapped on to a "low-high" proficiency distinction. The Setswana so-called "monolingual" group consisted of children who attend public schools whose proficiency in English is low. This is because English is not the main medium of instruction and communication in lower primary (see section 1.3.3), and so these children have only limited second-language knowledge of English by the time of testing (i.e. beginner or lower than the equivalent of Common European Framework of Reference for Languages-CEFR A1 level according to school tests). By comparison, the Setswana-English bilingual group was made up of children who attend private English medium schools where intensive learning of Setswana as a subject is in senior primary (after the age of 8, see section 1.3.3). Moreover, children at these schools are discouraged to speak Setswana during class time and are expected to use English outside class and at home; this makes English their dominant language of use and so they are more proficient in it compared to Setswana, despite early exposure to Setswana (L1) prior to school. This was verified by the social and language background questionnaire filled in by parents (see section 3.5.1).

All the Setswana monolinguals and Setswana-English bilingual participants resided in Botswana, the L1 country, and had not resided outside the country for a period more than a year, to avoid any confounding effects of long residence outside the country which might have an impact on the speech of the children (De Leeuw, Mennen & Scobbie, 2011).

3.4 Ethical considerations

Research in social science entails collection of data from human participants, therefore it inevitably involves ethical issues to protect the rights of the participants, and in turn the researcher develops a trust with them. However, Dörnyei (2007) points out that there are some ethical dilemmas and issues that the researcher is faced with such as "the amount of shared information, relationships, data collection methods, anonymity, handling the collected data, ownership of the data, sensitive information and testing" (p.65).

The ethical procedures of the Department of English Language and Applied Linguistics as well as that of the University of Botswana were followed to protect the rights of the participants through voluntary participation, informed consent, the right to withdraw, and openness about the purpose of the project, within the usual remit of needing to avoid observer paradox (see appendices 2, 3, 4, 5, 6, 7, 8).

3.4.1 Informed consent

Since the participants in my study were children under the age of 16, consent was obtained from the parents as well as from the school management, because data was collected from schools. In addition to the information sheet and consent form, letters were written to school management requesting access to study pupils at the school. The letters included the number of pupils to be studied and the extent of time it would take for each participant. Additional consent, referred to, as a research permit, which gives permission to carry out research in Botswana, was sought from the Botswana Ministry of Education as required by the laws of the country. Parents' consent forms were attached to the background information questionnaire to be completed by the parents and returned to schools. The parents who objected to the study did

not return the forms. In addition, the researcher went through a full CRB (criminal record background) check. The children were also asked for their permission informally as well as signing a consent form which the researcher read out to them at the time of data collection. Confidentiality of all those involved was also maintained. Data was kept on a secure password protected by computer and in a locked filing cabinet for the duration of the project. Access was available only to my project supervisors and me.

3.5 Data collection

This section discusses the instruments, tasks, procedure, pilot study, and statistical tests used in the research.

3.5.1. Data collection instruments

A questionnaire was chosen as the instrument of data collection for information about parental and child language usage because of its versatility and ability to collect large information within a short period of time, in a form ready for processing (Dörnyei, 2007). The Language and Social Background Questionnaire (LSBQ), adapted from (Bialystok, 2011) was used because it elicits the language use pattern of the participants as this determined their inclusion in the study. The questionnaire was found to be appropriate for the present study, which relies on the language background of the participants in order to ensure the sample fit the target criteria. This questionnaire was also adapted because it is widely used in bilingualism research (Bialystok, 2011) and has shown success in eliciting language background information. (See appendix 1 for a copy of the questionnaire).

The questionnaire was divided into four sections;

(1) Questions one to two: the date when the questionnaire was completed and the parent who completed it.

(2). **Part A:** Questions three to 11 demographic questions about the child and parents' background.

(3) **Part B**: Questions 12 to 17: language experience of the child.

(4) **Part C:** Questions 1 to 30: language in the home.

3.5.2. Tasks

The participants of the study were called upon to participate in two tasks, a narrative, and The Raven's Coloured Progressive Matrices. The rationale for using the narrative, where the participants narrated the story, was to be able to answer the research questions on the patterns of speech rhythm and the penultimate syllable vowel length in the speech of the Setswana-English bilingual children and Setswana monolingual children. Subsequently, the comparison of the Setswana-English bilingual children's speech rhythm and PSVL patterns will assist in determining if increased levels of exposure to English has had an effect on the rhythmic pattern and PSVL pattern of this group of children who are dominant in English (their L2).

The Raven's Coloured Progressive Matrices (Raven, 1982) were employed to determine if the Setswana-English bilingual children and Setswana monolingual bilinguals were of a similar cognitive level of cognitive development and therefore, suitable to use for comparison. Therefore, it was used to ensure homogeneity. Section 3.8 details the coding, analysis and findings of the Raven's Coloured Progressive Matrices scoring.

3.5.2.1 Spontaneous speech/ Narrative, "Frog where are you?"

For the principal phonological comparison data of rhythmic metrics and penultimate syllable vowel length, this study primarily uses spontaneous speech based on an oral narrative, in order to collect rich sets of comparable data produced in a naturalistic context. Narratives commonly describe an account of fictional or real successive events that gradually develop with a communicative objective that is to be attained (Engel, 1995; Trabasso & Rodkin, 1994). Narratives, like conversation, argument, exposition, and description are, therefore, a form of discourse as they involve production and or comprehension of a chain of spoken language. Production, that is, the number and variety of words, utterances and content of language displayed by a child, is an outstanding predictor of a child's expertise in a language (Reilly, Losh, Bellugi, & Wulfeck, 2004). Likewise, Fiestas and Peña (2004) noted narratives provide information about discourse organisation, productivity, and sentence organisation. This is because, among other things, the child is called upon to articulate complex, lengthier utterances than he or she would not normally produce in everyday conversation. In so doing the child also displays his or her competence in the phonology of the language such as speech prosody, which is the focus of the present study.

The present study makes use of the multi pictures elicitation based on the wordless picture storybook *Frog where are you?* (Mayer, 1969) (Hereafter *Frog Story)* which has been extensively used in linguistic research (see (Bayram & Wright, 2016; Reilly et al., 2004; Setter, Stojanovik, Van Ewijk, & Moreland, 2007) to determine the linguistic performance of participants. The intention was to use a semi-structured prompt, which was well known as a reliable tool for use with children which would allow a valid comparison of prosodic output on a finite set of lexical items in fairly predictable grammatical structures while allowing the

children to tell the story within their capacities.

The book does not contain words; so, it permits a rich setting to elicit a wide range of spontaneous oral language production. In addition, the story requires the children to make inferences about relationships between characters, their goals, thoughts, and feelings in a series of temporal sequenced events, which creates a wide range of structures and lexis even at the ages intended in this study (Reilly et al., 2004). The use of this book in the present study was thus deemed an appropriate tool to elicit and assess the linguistic performance in Setswana by Batswana (citizens) children growing up in Botswana. This will aid in the comparison of the Setswana-English bilingual children and Setswana monolingual children speech rhythm and PSVL patterns so that the research questions of the study could be answered.

3.5.2.1.1 Frog story procedure

The 24 pictures wordless storybook is about a boy, and a dog, and their pet frog, which went missing. While searching for the frog in the forest the boy and the dog met other animals such as an owl, bees and deer, which interfered with their search. They eventually found the frog with another frog and baby frogs. At the end of the story, the boy and the dog took one of the baby frogs home as their new pet.

The procedure used in the present study to administer the book followed that of Reilly et al (2004) and Berman and Slobin (1994). After an informal chat with the child to make them comfortable and at easy, the researcher showed the child the book and opened to the first page. She then told the child that the story is about a boy, dog, and a frog while pointing at them. The researcher told the child to first look through all the pictures of the book, and that after viewing

the pictures he/she will tell the story to the researcher while still looking at the pictures. The instructions were as follows: 'this book is a story about a boy, a dog and a frog, I want you to look at the pictures of the book up to the end; after that I want you to show me how good you are at story telling by telling me this story while you are looking at the pictures'.

The previewing of the pictures was necessary to familiarise the child with the sequence of the events. Moreover, as previously discussed, research has shown that previewing of the pictures allows the bottom-up process to take place enabling the child to tell a longer, complex, and coherent story (Shapiro & Hudson, 1991). During the telling of the story the child was in charge of turning the pages; when the child seemed to be having problems with this or skipped a lot of pages the researcher assisted the child. As a way of supporting and encouraging the child during the telling of the story prompts like 'okay, yes, tell me more, keep going, what happened next?, what is going on in this picture?, you are doing very well' were used. The children were audio recorded while they told the story.

The children were acquainted with the recorder during the informal chat to ensure a relaxed atmosphere. The task took an average of 10 minutes for monolinguals while for the bilinguals it took longer; almost twice the time because the bilingual children were not fluent in Setswana and so their narrative was full of pauses, hesitation, and repetition. This task took place at schools in one of the quiet classrooms. The children seemed to enjoy the task.

3.6 Recording environment

The recording of the children took place at schools in one of the rooms that were considered quiet as none of the schools visited had a soundproof room. A soundproof room is desirable in any acoustic study because excessive background noise can result in the formation of a distorted signal, which has a negative effect on the analysis of data. While every precaution was taken to keep the noise level to a minimum as much as possible (e.g., 'SILENCE' signs were displayed outside the room where the recordings were made), the existence of noise in this situation was inevitable.

3.7 Recording instrument

A Roland Edirol R-09HR recording device collecting data in wave format sampled at a rate of 44.1kHz, 16-bit stereo was used to collect data of the best possible quality and facilitate subsequent analysis. The recordings were saved on a memory card, which was installed in the recorder, and later transferred to a computer (MacBook Air) for analysis.

3.8 The Raven's Coloured Progressive Matrices data

This section discusses the RCPM, procedure involved in the coding and analysis of the data as well as the findings of the RCPM.

The Raven's Coloured Progressive Matrices (RCPM) test (Raven, 1982) created in 1947 and revised in 1956 (version currently used) for children 5 to 11 years of age, has been widely used in educational and clinical research (see, e.g Costenbader, & Ngari, 2001; Cotton, Kiely,

Crewther, Thomson, Laycock, & Crewther, 2005; Gray, Chabris, & Braver, 2003) as a measure of non-verbal intelligence, as such it is found to be an excellent component of Spearman's g-factor (Raven & Raven, 1998). Similar to Spearman's g-factor, RCPM uses psychometrics to measure cognitive abilities, particularly eductive ability. Eductive ability entails the capability to produce remarkable non-verbal schemata, which allows one to deal with complexity and comprehend disorder (Raven, 2000). RCPM's focus is on testing fluid intelligence that is the skill to handle new problems (Raven et al., 1998; Raven, Court, & Raven, 1990). It has been argued that RCPM is the best measure of fluid intelligence, especially for children with cognitive disability, reading, and language problems (Carver, 1990; Stanovich, Cunningham, & Freeman, 1984). However, Raven et al., 1998 recommends that to attain the best assessment of an individual's mental ability, RCPM should be used in conjunction with other tests, interviews, and assessment procedure. For this study RCPM was used together with a questionnaire (see section 3.5.1) and a speaking task (see 3.5.2.1). Research has also shown that RCPM is culturally reliable across a range of international settings (Carlson & Jensen 1981). For example, RCPM yielded reliable results in Africa, Asia, and India similar to those of the western countries such as United Kingdom, France, United States of America and so on, where it is commonly used (Costenbader, & Ngari, 2001). For these reasons, RCPM is suitable for my study, which focuses on children with different proficiency in Setswana whose cultural and ethnical background is different from the West countries where RCPM is normed. RCPM scores could be compared to ensure that the children were not statistically different on a cognitive level.

The RCPM test involves 36 items divided into 12 items arranged in three sets (A, Ab, B). Each item (matrix) consists of a pattern with a piece missing below it; there are six possible pieces to complete the pattern. The participants choose the piece they think completes the pattern (see

figure 1). The problems are easy at the beginning, but they increase in difficulty requiring greater cognitive ability to encode and analyse. Set A is less challenging while set B is the most difficult set, with B10 being the most challenging in the set. Similarly, item 10 is the most challenging in the other sets. It is argued that 'the three sets together provide three opportunity for a person to develop a consistent theme of thought and the Test of 36 problems as a whole is designed to assess accurately as possible mental development up to intellectual maturity' (Raven et al., 1998, p. 1). The items are colourful so that they can appeal to children as well as maintain their attention.

The researcher followed the administration procedure prescribed by Raven's et al. (1998) to administer the test to participants. Raven's et al. (1998) recommend that the test should be untimed, and that it should take between 15 to 30 minutes. There are two forms of administering RCPM, the Book Form, and the Board Form. The Board Form works like a board game puzzle. The sets A, Ab, B are put in different boxes; each set box contains an incomplete folder/board of the pattern and six possible moveable pieces to complete the pattern. The test takers choose the piece that they think completes the pattern and put it on the incomplete pattern; if it is not the right piece they try other pieces until they get the correct one. The Book Form involves using a copy of the RCPM test booklet. The Book Form can be administered to individually participants or to a small group of participants of not more than nine. The Book Form is widely used (see Cotton, Kiely, Crewther, Thomson, Laycock, & Crewther, 2005; Gabrieli, 1997) compared to the Board Form. One possible reason for this could be that it is easy to carry around compared to the Board Form which seem cumbersome as it means carrying a total of 36 boxes of sets with six pieces each used to complete the pattern making a total of 216 pieces, these could easily get misplaced or even lost especially when working with children.

For this study, the book was administered to each child individually because the participants were young (6-7 years old), the researcher felt they needed a one-on-one guidance to ensure that they understood the importance of looking carefully at the pattern to make sure that the piece chosen is the one that completes the pattern as well as ensuring they understood the general instructions of the test. Before the test commenced, the researcher entered the particulars of the participants on the answer sheet. Thereafter the researcher drew the test takers attention to A1, the first problem. The researcher pointed to the pattern and explained to the test taker that one of the six pieces below, pointing at them, completes the pattern. The participants were asked to pay particular attention to the shape as well as the pattern because the right shape does not necessarily mean it is the right pattern to complete the shape. For example, test taker's attention was drawn to set A1, piece number 6 (see figure 3.1) and was told that it was the right shape and that the pattern is almost right but it does not complete the pattern. The test taker was then asked to point at the correct piece, which completes the pattern. If they got it wrong the explanation was given again until they were able to get the correct piece. This ensured they fully comprehended the nature of the test. The test taker moved to A2, if he or she got it wrong the process was explained again.

The participants pointed to the piece that they thought would complete the pattern while the researcher recorded the equivalent number on the record sheet. Even though the test had no time limit, where the participants seemed to take a long time on an item they were advised to move to the next one and come back to the particular item of difficulty later because the following items might give the test taker an idea of what to do. If later they still found the item difficult they were advised to guess the answer. Raven's et al. (1998) argue that it is imperative to do this so that progress could be made. The participants were allowed to change their minds whenever they felt like. When this happened a cross was put on the previous answer, the

changed answer was not rubbed off as recommended by Raven's et al. (1998). The participants seemed to enjoy the task. The test took place at the schools in one of the classrooms.

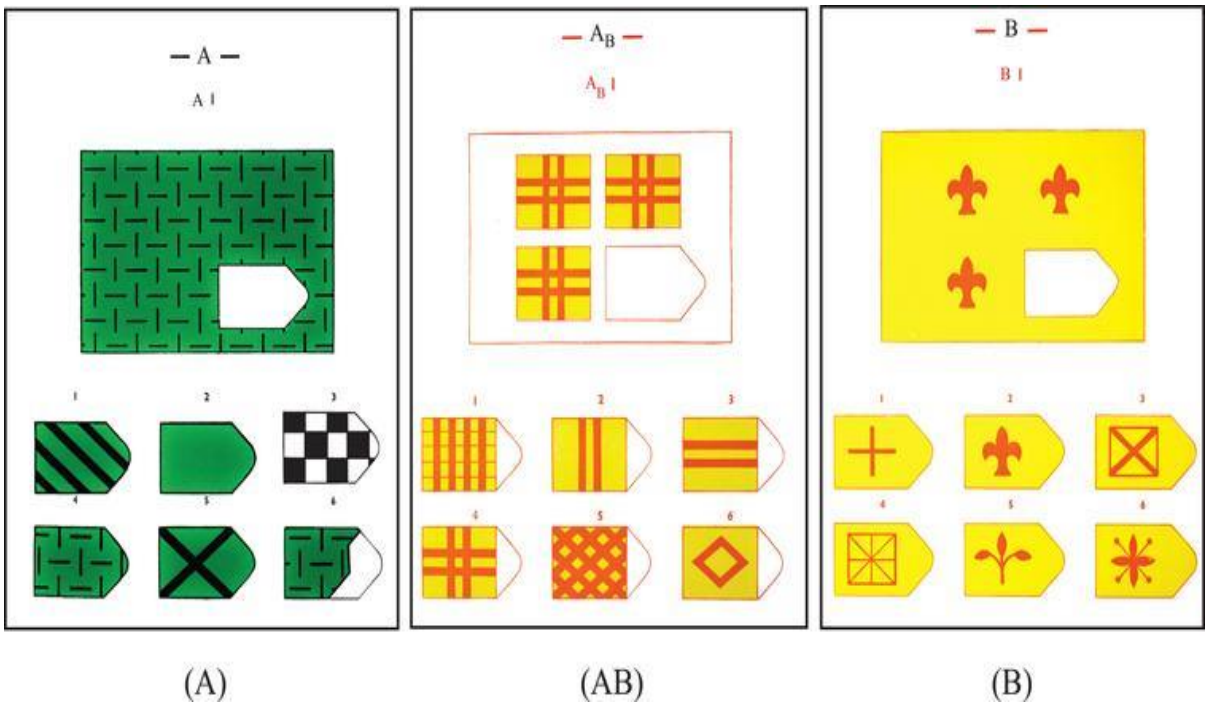


Figure 3. 1. An example of the Raven's Coloured Progressive Matrices.

3. 8. 1 Coding of the RCPM data

Every score sheet was given an identification code. The codes were necessary for entering the data into SPSS. All the score sheets from the public schools were coded 01 and participants from each school given codes 1 to 10 while the English medium private schools were coded 02 and the participants 1 to 10 codes. It was not necessary to code each item because performance is evaluated based on the overall score of the participant and the mean score of the group. The overall score determines the cognitive age of the individual child and that of the whole group.

3. 8. 2 Analysis of the RCPM data

The open response answer sheets were scored using the appropriate marking guide provided by Raven's et al. (1998). This followed Raven's et al.'s 1998 prescription that, if the test taker got the first five items of set A wrong, the results should be disregarded as it means the test taker did not fully understand the test. Since the test consists of 36 items, the final score was the total number of correct matrices out of 36. After the coding process discussed in section 3.8.2, above the scores for each child were entered on Microsoft Office Excel where the mean for each age group per school was calculated. For example, the mean score for private English medium school 6-year-old and 7-year-old were computed separately. Similarly, this was done with the public school data. The mean score of private English medium schools 6 years old children (bilinguals) were compared to that of 6 years old public school children (monolinguals). The same thing was done with the 7 years old children's mean scores. However, the final score was based on the comparison of the average of both the 6 years old and 7 years old from both the private English medium schools and public schools respectively.

3. 8. 3 Results of the RCPM data

The descriptive statistics results for the monolinguals' RCPM data are M=17.6, N=10, S.D =.4.4, Min=12, Max=28 whereas that of the bilinguals are M=22, N=10, S.D =.5.4, Min=12 Max=29. The inferential statistics for the between groups difference are $t(18)=2.003$, $p=.060$. This indicated that there is **no statistically significant difference in the cognitive level of the monolingual group and the bilingual group**, so any group differences are not deemed to be due to cognitive differences.

3.9 The questionnaire data

This section discusses the procedure employed in the coding and analysis of the questionnaire data as well as presents the findings of this data.

3.9.1 Coding of the questionnaire data

The codes are important for entering the data into SPSS. Each of the participants' questionnaires was given an identification code. For example:

- The public schools (monolinguals) were coded 01.
- The English medium private schools (bilinguals) were coded 02

All the questions were also given unique codes. See the appendix 10 for a detailed questionnaire coding system.

3.9.2 Analysis of the Questionnaire data

This section discusses the procedure followed in analysing questionnaire data. Once the coding frame (see appendix 10) was completed, all the coded data was tabulated and analysed to answer the relevant part of the research questions. Microsoft Office Excel and SPSS were used in the analysis of data.

3.9.2.1 Bio-data

This section gives information on the participants' bio-data collected through the questionnaire.

The selected participants had to meet the requirements of the study, which required that the children should be 6-7 years of age, should not have lived outside Botswana for a period more than a year, their dominant language should either be Setswana or English, and both the parents should be Batswana (citizens) by birth. This information was obtained from the questionnaire responses. A total of 70 questionnaires were handed out but, as with most survey research using questionnaires, not all were returned; only 47 of these were returned giving a response rate of 67%. Even though a number of reasons could have contributed to some of the questionnaire not returned, this was probably due in part to parents who did not want their children to participate in the study but largely due to the children losing the questionnaire or simply forgetting to give them to their parents. Of the 47, 26 were from private English medium schools while 21 were from public schools. Out of the 47 questionnaires, 40 participants were selected because the other seven did not meet the requirements of the study.

The initial plan was to have 40 participants but, due to the difficulty of collecting data from young children, 20 participants are included in this study. In addition, acoustic measures of rhythm are intensive and time consuming making it difficult to have a large number of participants. The problems associated with collecting data from younger children as well as the intensity of acoustic measures of rhythm could be the reason why most studies on children speech rhythm have less than 20 participants, for example Kehoe et al. (2011) had nine participants while Mok (2011) had 18 participants. In addition to the highlighted problems, the other problem the present study faced was that most Setswana-English bilingual children could

not speak Setswana thus also making it difficult to have a large number of participants in the study.

Tables 3.1 and 3.2 give the demographic details of the 20 participants who took part in the study.

Table 3. 1. *Background of Setswana-English bilingual children*

Participants	Age (years; months)	Gender	Standard (grade)	Country of birth	Age (years) started school
1	6;04	Female	1	Botswana	3
2	6;04	Female	1	Botswana	3
3	7;02	Female	1	Botswana	3
4	7;03	Male	1	Botswana	3
5	7;05	Female	2	Botswana	3
6	7;07	Male	2	Botswana	3
7	7;07	Male	2	Botswana	3
8	7;08	Female	2	Botswana	3
9	7;10	Female	1	Botswana	2
10	7;11	Male	2	Botswana	3

Table 3. 2. *Background of Setswana monolingual children*

Participants	Age (years; months)	Gender	Standard (grade)	Country of birth	Age (years) started school
1	6;05	Male	1	Botswana	3
2	6;06	Female	1	Botswana	3
3	6;07	Female	1	Botswana	3
4	6;09	Female	1	Botswana	3
5	6;09	Male	1	Botswana	4
6	6;11	Female	2	Botswana	3
7	7;02	Female	1	Botswana	3
8	7;09	Male	2	Botswana	3
9	7;10	Female	2	Botswana	2
10	7;10	Female	2	Botswana	2

The descriptive statistics results for the monolinguals' chronological age are M=6;5, N=10, S.D =.51, Min=6;05, Max=7;10 whereas that of the bilinguals are M=6;7, N=10, S.D =.43, Min=6;04 Max=7;11. The inferential statistics for the between groups difference are $t(18)=1.796$, p =.089. Thus, the difference is not statistically significant. Therefore, **the chronological age of the monolingual group and that of the bilingual group are not statistically different**.

3.9.2.2 A comparison of the STD 1 and STD 2 Setswana-English bilinguals' home language use.

This section gives the descriptive and inferential statistics of the home language use of the STD 1 and STD 2 Setswana-English bilinguals. These results are needed in answering research questions 3 and 4 (see section 2.11).

The descriptive statistics for the STD 1 group are: M=3.675, N=5, S.D =.370, Min=3.13, Max=4.13 whereas that of the STD 2 are M=3.550, N=5, S.D =.068, Min=3.50, Max=3.63. The results of the inferential statistics are Fischer's exact=.762, *p* =.468. Therefore, the difference is not statistically significant, meaning **the STD 1 and STD 2 bilingual groups' home language use is not statistically different**.

3.9.3 The results of the questionnaire data

This section gives the findings of the questionnaire data.

Home language used by the child: These results are based on the home language use questionnaire section where parents' rated features of the home language on a series of a 5-point scale where '1' indicated exclusive use of Setswana; '2' more Setswana, little English; '3' even use of Setswana and English; '4' more English, little Setswana; '5' exclusive use of English. A lower median indicated high use of Setswana. As shown in the table, the monolinguals have a lower median score of the language use at home. This showed that the language mostly used at home is Setswana. The bilingual group's median was higher than that

of the monolingual group suggesting that, that their home language use was a combination of English and Setswana with English being the dominant one.

Home language used by the parents: Like the home language used by the child variable, these results are based on the home language use questionnaire section where parents' rated features of the home language on a series of a 5-point scale where '1' indicated exclusive use of Setswana; '2' more Setswana, little English; '3' even use of Setswana and English; '4' more English, little Setswana; '5' exclusive use of English. A lower median indicated high use of Setswana. As it could be seen from the table the monolinguals' parents mostly used Setswana as indicated by the low median score while for the bilingual group home language use was divided evenly between Setswana and English.

Education of the parents: These results are based on the questionnaire section where parents' rated their education level on a series of an 8-point scale where '0' no education '1' indicated high school; '2'certificate; '3'diploma; '4' first degree; '5' masters; '6' PhD; '7' professor. A low median indicated lower education level. As it could be seen from the table the monolingual group's median was towards a lower level of education (between certificate and diploma level) while the bilingual groups' median was higher (around first degree level), indicating that the bilingual group's parents were more educated than the monolingual group's parents as may be found in other bilingualism studies.

The findings of the questionnaire data on the language use at home has shown that the bilinguals used English more than they used Setswana. There was a relationship between the education levels of the parents and the parents' language use at home. The more educated the

parents were the more they used English at home. It is plausible that this had contributed to the bilinguals' increased exposure to English, subsequently led to the bilinguals' dominant use of English, their L2. Consequently, affecting the Setswana speech rhythm and penultimate syllable vowel lengthening in the speech of the Setswana-English bilingual children.

Table 3. 3. *Statistical results of the questionnaire data*

	Group 1 (Setswana) N=10; 3 males	Group 2 (Setswana-English) N=10, 4 males	Between group difference
Child's fluency in the speaking of Setswana	Median=3.0 S.D=.52 Min=good. Max=excellent	Median=3.0 S.D=.74 Min=average. Max=excellent	Fischer's exact=3.364, *p*=.164
Child's understanding of Setswana	Median=3.5 S.D=.52 Min=good. Max=excellent	Median=3.0 S.D=.79 Min=average. Max=excellent	Fischer's exact=1.913, *p*=.656
Home language used by the child	Median=2.20 S.D=.51 Min=1.50 Max=3.13	Median=3.62 S.D=.25 Min=3.13 Max=4.13	Fischer's exact=16.59, *p*=.000
Home language used by the parents	Median=2.38 S.D=.41 Min=1.86 Max=3.43	Median=3.21 S.D=.40 Min=4.43 Max=3.43	Fischer's exact=4.5, *p*=.187
Education of the parents	Median=3.0 S.D=.92 Min=1 Max=4	Median=4.0 S.D=.45 Min=3.5 Max=5	Fischer's exact=11.4, *p*=.002

3.10 Data analysis of the spontaneous speech/narrative data; *Frog where are you*?

This section gives an in-depth description of the analysis of the spontaneous speech data.

3.10.1 Coding of the spontaneous speech data

Participants' recordings were anonymised through codes such as 010601 and 020601 which stands for Monolingual- 6 years old- participant number one and Bilingual- 6 years old – participant number one respectively.

3.10.2 Selection of the recordings

After the recording of 30 participants narrating the story, the recordings were transferred from the recorder memory card into the computer. The main researcher listened to all the recordings to make sure they were of good quality. Out of 30 recordings, only 20 (10 bilinguals and 10 monolinguals) were selected for analysis. This was due to some recordings having excessive background noise, which affected the quality of the recording, and so the recording had to be discarded. In addition, some of the private English medium participants' recordings were incoherent because they were not proficient in the target language (Setswana) and, as such, the recordings could not be included in the study.

3.10.3 Editing audio data using Audacity and Praat

The selected recordings were processed using the audio editing program Audacity. Audacity is a computer software application used to record and edit audio material (http://audacityteam.org/).

In the present study, Audacity was used to edit long pauses and reduce noise. Reducing the noise did not negatively affect the recordings, as the research's focus is not on pitch patterns or spectral aspects of the speech sounds. Audacity mitigates noise effects in speech because it can be used to remove static, hiss, hum or other persistent background noises. These features proved valuable to the present study because the recordings were not done in a soundproof room. Once the editing in Audacity was done, the saved sound files for each of the 20 participants were transferred to speech analysis software Praat (Boersma & Weenink, 2007), where the long pauses were further edited; once the data were transferred to Praat it became clear that some sound files, especially those from bilinguals, still had unnecessary long pauses which needed to be edited. Praat also allowed cutting out obstinate noise which Audacity could not remove. Praat was downloaded from http://www.fon.hum.uva.nl/praat/.

3.10.4 Acoustic analysis and data transcription

Praat was employed in the acoustic analysis of audio data and the orthographic transcription of the data. The features of Praat that were utilised in this section are spectrogram analysis, formant analysis, labelling, and segmentation. 60-seconds of the speech of each child was used in the analysis. The reduction of the recordings to 60 seconds was done on Praat by the researcher. The researcher listened to the recordings on Praat and selected the part that was audible and comprehensible. Like audacity Praat allows editing of the sound through cutting however, unlike audacity Praat is unable to handle large sound files. The rest of the recordings

that were more than 60 seconds long were discarded. The purpose of reducing the recordings to 60 seconds long speech, transcription, labelling and segmentation of data was for the calculation of rhythm through rhythm metrics such as the nPVI-V and Varco V (see section 3.11.4) as well as for measuring the vowel durations.

Below is a summary of the steps taken in the analysis of the spontaneous speech data.

1. Opened files prepared using Audacity and Praat.

2. Created Tier 1, 2 and 3 label files for transcription. Words were transcribed on (Tier 1), the vowels (Tier 2) and the penultimate and final syllables (Tier 3)).

3. Labelled vowels in the speech of each participant.

4. Used a script developed by UCLA to extract the vowel durations from PRAAT Tier 2. The script was downloaded from:

   www.linguistics.**ucla**.edu/faciliti/facilities/acoustic/**praat**.html

5. The vowel durations were put on Microsoft Office Excel program in preparation for the rhythm calculations.

It is worth noting that other studies on speech rhythm in bilingual children made use of between 20 to 30 intonation phrases / utterances of not less than five syllables for the analysis (see Kehoe et al., 2011; Mok, 2011; Mok, 2013,) while others used sentences that the children read out (see Bantu & Ingram, 2007). An intonation phrase is defined as 'a sense group separated by a pause and forming a prosodic whole' (Kehoe et al., 2011, p. 334). The question that arises from this definition is how long should the pause be? Furthermore, the positioning of intonation phrase boundary is a controversial issue where even native speakers of a language can differ about its placement (Grabe & Low, 2002). Since it seems there is nothing in the literature about

the Setswana intonation phrase boundary, it was safe to use the 60 seconds long utterances as it has been successfully used in other studies with children participants (see. Setter, Stojanovik, Ewijk, Moreland, 2007) as well as with adults (see Arvaniti, 2012).

The 60 seconds-long utterances used were free of pauses longer than 150ms. The limitation of pauses to 150ms and less is based on Fuchs' (2016). The use of utterances with pauses not more than 150ms resulted in utterances that were not less than five syllables. Grabe et al. (1999) suggested that utterances shorter than five syllables are not suitable for calculating the PVI (see chapter 2). As a result of this, a number of utterances were selected from each child, none of which was less than five syllables long, and used for analysis in the present study.

The sound files were labelled segmentally by the researcher through simultaneously listening to the recording as well as inspecting the waveform and spectrogram generated from the speech analysis software Praat. The labelling was divided according to three tiers inserted on the Praat display, where Tier 1 is the annotation or transcription of an utterance. The utterances were transcribed orthographically into Setswana and glossed in English by the researcher. Tier 2 was used to label the vowels, and Tier 3 was used for the different syllables of the word, where the penultimate syllable is highlighted so that it is easily searchable.

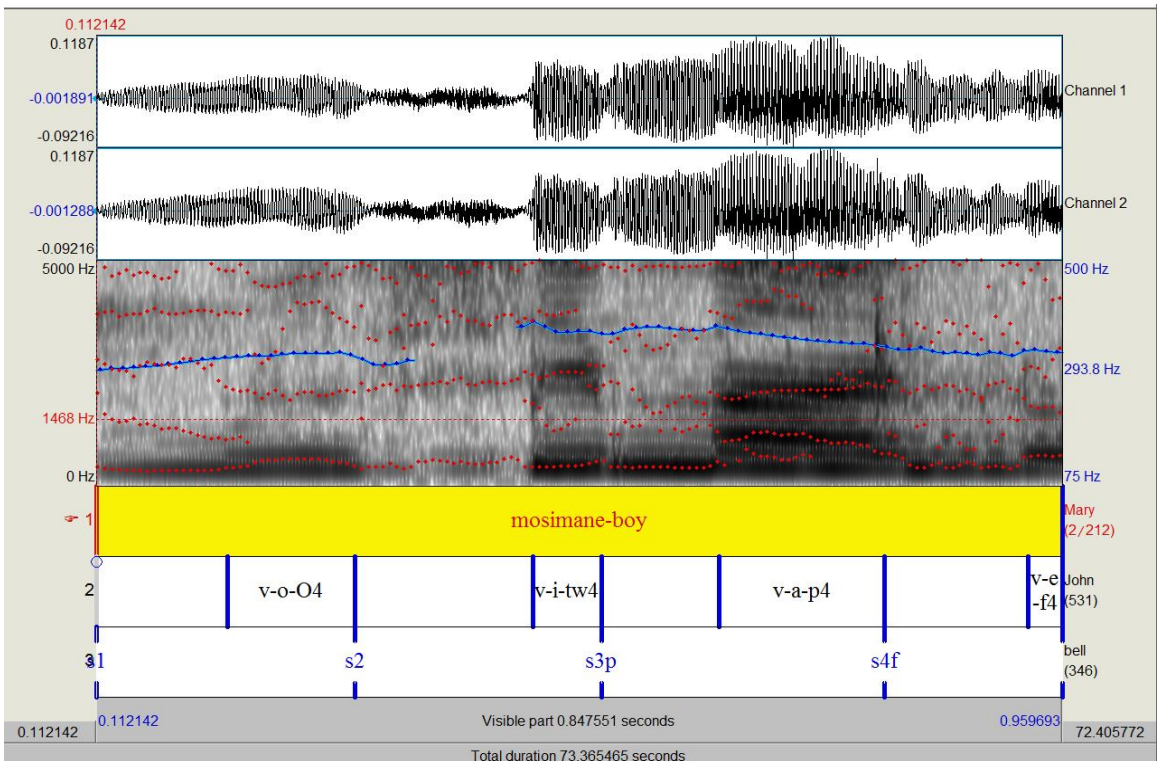


Figure 3.2. An example of the PRAAT window.

For example; the word *mosimane* (‘boy’) is on Tier 1.

On Tier 2 vowels are labelled as V-o-O4, V-i-tw4, V-a-p4, V-e-f4.

The coding system was done based on the different vowels and syllables of the word. It was necessary to have codes, which encompass individual vowels to determine if there was a specific vowel length differences.

For example: (see appendix 11 for a detailed coding system).

V-o-O4

- V stands for vowel.
- o stands for vowel (o).
- O stands for syllable number one of the word.
- Number 4 means the word is a four-syllable word.

Tier 3 is the different syllables of the word. The word *mosimane* (boy) has four syllables, and these are labelled as s1, s2, s3p, sf4. Each syllable of the word was given a unique code based on the order in which they appear in a word for easy identification of the syllables when the penultimate syllable vowel length is calculated.

For example: (see appendix 11 for a detailed coding system)

- s1 stands for syllable one of the word which is (mo).
- s2 stands for syllable two of the word which is (si).
- s3p stands for syllable 3, penultimate syllable of the word which is (ma).
- s4f stands for syllable 4, final syllable of the word which is (ne).

This labelling was chosen, as it was easy to remember and identify when the vowel durations were extracted by a Praat script and put on Microsoft Office Excel program to prepare them for rhythm calculation and penultimate syllable length. It is worth noting that, in bi-syllabic words, the penultimate syllable is also the first syllable. For example, the underlined syllables in the words below are penultimate syllables:

Bona-see

Kopi-cup

The measurement and segmentation criteria for vocalic intervals (vowels) followed that of Grabe and Low (2002), which are based on those of Peterson and Lehiste (1960).

> "The vocalic intervals were defined as the stretch of signal between vowel onset and vowel offset, characterised by vowel formants, regardless of the number of vowels included in the section (a vocalic section could contain a monophthong, […] or, in some

> cases, two or more vowels spanning the offset of one word and the onset of the next). […] In fricative-vowel sequences, the onset of the vowel was taken to be the onset of the second formant. In vowel-voiceless fricative sequences, the vowel was considered terminated where the noise pattern began. In 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" (Grabe & Low, 2002, p.524).

Similar to Grabe and Low (2002), an acoustic point of view was followed regarding glides and liquids; where they were not distinguishable from the vowels, they were taken as part of vocalic intervals; otherwise they were included as consonants, particularly when they were at word initial position. For example, in the word *wena* ('you') the glide /w/ was taken as a consonant while /w/ in the word *segogwane* ('frog') it could either be counted as part of the vocalic portion or as a consonant depending on how distinguishable it was from the vowel. The decision was aided by visual cues based on waveform, amplitude, and formant structure on Praat. Figure 2 of Praat above shows the segmentation and labelling as well as transcription of the data on Praat.

The duration in seconds (s) of vocalic intervals was extracted from the relevant label files (Tiers 2) using a Praat script developed by UCLA. The vowel durations were put in Microsoft Office Excel program to prepare them for rhythm calculation through the use of rhythm metrics as well as for vowel length calculations.

3.10.5 Calculation of rhythm

To answer the research questions shown in chapter 2, the study utilised existing rhythmic metrics nPVI-V and Varco V, which were computed for each measurement to get a broad perspective of the participants' rhythmic performance, thereby allowing a comprehensive investigation of the participants' Setswana speech rhythm. The nPVI-V was successfully used by Arvaniti (2012), Bantu and Ingram (2007), Fuchs (2016), Grabe and Low (2002), Kehoe et al. (2011), Knight (2011), Mok (2011), Tan and Low (2014), White and Mattys (2007a). Varco V by, Arvaniti (2012), Knight (2011), Mok (2011), Tan and Low (2014), White and Mattys (2007a) to investigate the speech rhythm of a language spoken by monolinguals and bilinguals or to compare languages. Only vowel durations were considered in the present study, because previous studies have shown that consonant duration did not produce significant results in distinguishing the speech rhythm of languages (Arvaniti, 2012; Bantu & Ingram, 2007; Fuchs, 2016; Grabe & Low, 2002; Kehoe et al., 2011; Knight, 2011; Mok, 2011; Tan & Low, 2014; White & Mattys, 2007a).

The utilisation of more than one matrix followed the work of Loukina, Kochanski, Shih, Keane, and Watson (2009) and Tan and Low (2014), who established that incorporating two matrices was more successful in classifying the rhythm of languages compared to using one matrix. However, they argued that the use of more than two matrices does not add much value in terms of the success rate in classifying languages. It is for this reason that the present study utilised these two matrices because they have been successfully in highlighting the differences between monolingual and bilingual speech rhythm as well as speech rhythm differences in the different varieties of a language (see Fuchs, 2016; Kehoe, 2011; Lleo et al., 2007; Low et al., 2000; Mok, 2011; Ordin, 2014, 2015; Tan & Low, 2014). In addition, since the standard deviations and the PVI measure different aspects of durational variability, that is globally and locally respectively, it is imperative to manipulate both global and local durational variability for an all-inclusive

investigation because there is a possibility of an utterance to score high in global variability but low in local variability (Mok, 2011). Global durational variability measures the whole utterance while local durational variability measures between successive units (Mok, 2011). The global and local metrics employed in the present study are Varco V and nPVI-V respectively.

nPVI-V

Grabe et al.'s (2000) and Grabe and Low (2002) nPVI-V is the normalised Pairwise Variability Index, which measures variability in vocalic intervals between successive vowels (locally). The (n) in the PVI stands for normalisation. A number of studies have shown that raw metrics for vowels interval are affected by speech rate, which has an effect on the values acquired, therefore, normalisation is obligatory (Barry, Andreeva, Russo, Dimitrova, & Kostadinova, 2003; Dellwo & Wagner, 2003). Languages considered stress-timed have a higher nPVI because they have greater variability in the duration between successive vowels in an utterance while languages considered syllable-time have a low nPVI due to less variability in the duration of vowels in a sentence (Grabe et al., 2000, Grabe & Low, 2002, Tan & Low, 2014). (see section 2.3).

Normalised Pairwise Variability Index for vocalic intervals (nPVI-V) Formula:

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

VARCO V

VarcoV is the normalised standard deviation of vocalic interval durations divided by the mean, multiplied by 100 White and Mattys (2007a). It has been successful in distinguishing between L1 and L2, vigorous for speech rate variation and differentiates between languages perceived to belong to different rhythm classes. Similar to the nPVI, a higher value of Varco V is

indicative of stressed-timed language due to more durational variability while a low one is syllable-timed language (Mok, 2011; White & Mattys, 2007a). Varco V captures global durational variability. (see section 2.3).

Varco V fomula:

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

Table 3. 4. *Rhythm metrics*

Metrics	Description
VarcoV	Coefficient of variation of vocalic interval duration (i.e normalised standard deviation of vocalic interval durations divided by the mean vocalic duration) multiplied by 100
nPVI-V	Normalized pairwise variability index for vocalic intervals. Mean of the differences between successive vocalic intervals divided by sum, multiplied by 100

The data was put on the spreadsheet with the rhythm metrics formulae entered in it.

3.10.6 Calculation of the penultimate syllable vowel length

The penultimate syllable and the non-penultimate syllable vowel durations (s) in bi- and multi-syllabic words from the spontaneous speech data of both the bilingual and monolingual children's data were extracted using the same Praat script used in section 3.7.3.3 for the extraction of vowel durations. The values were entered into Microsoft Office Excel. Thereafter, the mean vowel duration of each syllable in the same position in multisyllabic words (that is syllable one, two, three, penultimate, final and so on) was calculated.

For example the word *mosimane* (boy) is made up of four syllables, mo-si-ma-ne:

- Mo-first syllable,
- Si-second syllable
- Ma-third syllable which is also the penultimate syllable.
- Ne-fourth syllable which is also the final syllable.

The word *segogwane* is also made up of four syllables.

- Se-first syllable
- Go-second syllable
- Gwa-third syllable which is also the penultimate syllable.
- Ne-fourth syllable which is also the final syllable.

Non-penultimate syllables *mo* and *se, si* and *go,* and *ne* and *ne* from these words were therefore grouped and averaged together along with all other non-penultimate syllables, and penultimate syllables *ma* and *gwa* were grouped and averaged together along with all other penultimate syllables. This was done separately for the monolingual and bilingual children.

In addition, the mean vowel durations of all first syllables from all the words produced by bilinguals and monolinguals were calculated (e.g., *mo* and *se* in these examples), as were the means of all syllables falling in the same position in the word (i.e., all second syllables, third syllables, etc.), and the means of all syllables containing similar vowels. The purpose of this was to compare the penultimate syllable vowel duration with the vowels of other syllables in Setswana multisyllabic words to establish:

1) If the penultimate syllable contains the most lengthened vowel in each speaker group. For example: In the word *mosimane-boy,* the vowel length of the first syllable *mo-*,

second syllable –*si*- and final syllable –*ne*- were compared to that of the penultimate syllable –*ma*.

2) Whether the vowel in the syllable affected the syllable length. For example, the different vowels /a, e, i, o, u/ were compared to determine the most lengthened vowel.
3) To compare the durations of vowels in multi-syllabic words with different number of syllables to find out if the number of syllables the word is made up of has an effect on the penultimate vowel length. For example, durations of two syllable words, three syllable words, four syllable words, and five syllable words.

It should be noted that, within the context of the utterances selected, which are at minimum five syllables in length, none of the children produced single words, which were more than five syllables. The aim of the comparison of the mean of the penultimate syllable vowel duration with non-penultimate syllables was to look for cross-linguistic transfer effects in relation to the research questions on the patterns of penultimate syllable vowel durations in the speech of Setswana-English bilinguals compared with their monolingual peers.

3.11 Pilot study

A pilot study was used in the present study. A pilot study can either be a feasibility study or a pre-testing of the research instruments (Teijlingen & Hundley, 2002). A feasibility study is a small-scale research study undertaken before the main study to test the reliability and validity of methods and procedures of the main study (Dörnyei, 2007; Teddlie &Tashakkori, 2009). Teijlingen and Hundley (2002) argue that the pilot study is an extremely important component of research. However, they are quick to point out that it does not guarantee success for the main

study but it increases the possibility of success (Teijlingen & Hundley, 2002). This is because it allows the researcher to identify any difficulties that may occur during the main study such as when to disregard the research protocol and whether the research instruments are appropriate for the research objectives to be achieved (Teijlingen & Hundley, 2002). This present study employed both types of the pilot study, a feasibility study and pre-testing of research instruments. The pilot study was conducted in Botswana at one private English medium school and one public school.

3.11.1 Pilot study data collection

The pilot study followed most of the process of data collection discussed above such as ethical consideration, the questionnaire, and the narrative task. Different from the main study, the other task that the pilot study used was sentences, which were read aloud by participants. The pilot study results showed that most of the children were unable to read Setswana as such the reading of sentences task was not used in the main study. The Raven's Coloured Progressive Matrices were not used in the pilot study as these were suggested during the mini viva that took place after the pilot study.

3.11.1.1 Pilot study ethical consideration

The ethical consideration procedures outlined in the ethical consideration section 3.4 were followed. After consultation with the school management in person as well as through a letter giving details of the study and permission requesting to carry out the study at the schools, questionnaires together with the consent forms were submitted at schools for pupils to give to their parents.

3.11.1.2 Pilot study data collection instruments

The questionnaire already discussed in section 3.5 was used. Pupils in standard (grade) one to three were given the questionnaires to give to their parents. During the analysis of the questionnaires it became apparent that some of the children in these classes were older than the required age of 6-7 years old. As such, during the main study, with the help of the teachers, the questionnaires were given to only those who met the required age. As with most studies not all the questionnaires handed out during the pilot study were returned. After being questioned by the teachers about the whereabouts of the questionnaires, it was discovered that some did not return them because their parents did not want them to take part in the study but most forgot to give to their parents while some children lost the questionnaires. The children who forgot to give the questionnaires to their parents were asked to do so and those who had lost them were given other questionnaires to give to their parents. Even though some questionnaires were still not returned the second time around, most were. To overcome this problem, in the main study more days were allocated to the data collection so that the children had more time to give the questionnaire to their parents.

During the pilot study, the teachers suggested that the wording of part B of the questionnaire, where the parents rated the child's language experience as 'poor', 'fair', 'good', or 'excellent', should be changed to 'below average', 'average', 'good' and 'excellent'. This was because terms with negative connotations such as 'poor' were discouraged at schools, especially when grading pupils' performance, and so the parents may not be pleased with these terms and so they might be reluctant to judge their children's language experience using the terms with negative connotations. Their suggestions were taken on board during the main study.

3.11.1.3 Pilot study tasks

This section discusses the pilot study tasks of storytelling and reading of sentences.

3.11.1.3.1 Pilot study spontaneous speech / narrative; Frog story

The procedures of administering the narrative task already discussed in section 3.5 were followed. It was apparent that the bilingual group spent a long time narrating the story. Their narration had long pauses between sentences, a lot more hesitations, and repetition than anticipated. It was clear they had limited Setswana vocabulary, also reflected in the large amount of code switching between Setswana and English. Therefore, they needed a lot more support and encouragement in terms of prompts like 'okay', 'well done', 'keep going', and 'what do you thinking is going on this page?' Even with the prompts, some still produced incoherent stories, and some could only utter a few Setswana words even though the responses to the questionnaires stated that they could speak Setswana.

3.11.1.3.2 Pilot study Sentences

The pilot study also made use of sentences as it was thought the Frog Story may not elicit all the target sounds. The participants read out a total of six sentences consisting of certain targeted test words focusing on different Setswana syllable and vowel types to augment the more spontaneous Frog Story data. The syllable type was based on the syllable structure in Setswana, e.g., V (vowel), CV (consonant, vowel). The vowel types in Setswana are short vowels with one mora and long vowels with two moras (see section 2.4). Even though syllabic consonants can be the peak of a syllable (section 2.4), they were excluded as they are difficult to measure (White & Mattys, 2007a). However, lengthened syllables such as the penultimate syllable (see section 2.4) were included. Grabe et al. (1999) recommended that final syllables, which are usually lengthened, should be excluded from the analysis as these have an impact on the vocalic

PVI. However, Bantu and Ingram (2007) have demonstrated that their inclusion does not affect the results when using vocalic PVI (see section 2.3), and so these were also included. Coloured pictures depicting the content of the sentence to aid the children in the reading as well as make the task attractive and interesting accompanied the sentences.

The children were asked to read the sentences to themselves first before reading them aloud to the researcher. They were first familiarised with the recorder and comfortably seated to ensure a relaxed atmosphere, then audio recorded while they were reading. Most children from both the private English medium school and public school in Standard One could not read and so turned to describe the picture which, at times, was totally different from the wording of the sentence accompanying the picture. Doing so meant that they were not reading the targeted test word, which rendered the reason for including the read sentences useless. The children's inability to read could be attributed to them not doing Setswana as a subject in standard one in private English medium schools. Even though Setswana is one of the taught subjects from standard one in public schools, at standard one they have just been introduced to phonics and reading of single words, not sentences, and thus they were unable to perform in this task. While some of the children in public schools who were in standard two and three could read the sentences, the same could not be said about private English medium schools children of the same age (bilinguals), because Setswana is only introduced as a taught subject in later standards depending on the school. For these reasons, the sentences were not used in the main study.

3.11.1.3.3 Coding pilot study data

The questionnaires and the recordings of the participants were coded as M-06-01 and B-06-01 for monolingual 6 years old participant number one and bilingual 6 years old participant number one respectively. Since only two participants were used in the pilot study it was not necessary to do a detailed coding of the questionnaire and the spontaneous speech data.

3.11.1.3.4 Pilot study data analysis

The questionnaire was used to select the participants to include in the study. Because they were only two participants it was not necessary to compute the mean of the participants' language background.

The Pilot data was analysed from two samples: one participant from the bilingual group (private English medium school) and one from the monolingual group (public school), using both the experimental utterance task and *Frog Story*. For the purposes of trialling the methodology of syllable analysis described above, I analysed their samples of the Frog Story, using Praat. The steps followed in the analysis of the main study (see section 3.11) were followed.

The penultimate syllable data was not examined in the pilot study because the point of the pilot study was to test the practicability of the instruments for data collection and that the demoing of the Praat technique was part of the piloting. The analysis of the spontaneous speech showed

that vowel durations can be extracted from Praat therefore it was not necessary to analyse the data for the penultimate syllable vowel length.

Analysing the resulting scores for the two speakers, each speaker had 109 number of vocalic intervals (vowel segments), and nPVI-V (mean duration) for each speaker's set of vocalic intervals was calculated. The nPVI-V of the monolingual speaker was 49.22s and for the bilingual speaker 39.88s. Even though statistical differences is not viable on this small pilot study, it is clear that this participant's bilingual rhythm pattern is noticeably different from their monolingual Setswana peer. While the results of the pilot study could not be generalised to the whole population because of the small number of participants, the findings support the argument of the study that older bilinguals who acquired L2 at an early age (where the L2 becomes the dominant language of use) will not retain both rhythmic patterns of their two languages even when they still reside in the L1 environment. The finding is contrary to the findings of Bunta and Ingram (2007), Kehoe et al. (2011) who concluded that older bilinguals keep the rhythm pattern of their two languages separate regardless of the circumstances. In order to ensure a more robust result in the main study Varco V was incorporated.

The aim of the pilot study was to trial the assumptions and methodological design so there was need to run the linguistic tasks and analysis formulae relating to the chosen age group to check ease of recruitment and assess implications for validity and reliability. Hence from the narrative analysis the nPVI-V formula worked, as such it was maintained in the main study. However, even though the sentence task was well designed in line with conceptual framework, it was found to be advanced for the chosen group as they could not yet read.

3.12 Statistical analysis

Statistical Package for the Social Sciences (SPSS) was employed for descriptive and inferential statistics. Descriptive and inferential statistics supported the findings of the study. Through descriptive statistics the distribution of data was summarised by means of graphs and tables to show the mean and standard deviation of the groups used in the study. The inferential statistics were used to determine if the mean differences between the two groups, bilinguals (private English medium school), and monolinguals (public school) were statistically significant. The inferential statistics therefore were used to provide information on statistical significance to help support or refute the hypotheses of the study.

3.13 Validity and Reliability

Validity and reliability are two concepts that are essential in every scientific research such as the present research.

3.13.1 Validity

Validity is basically the legitimacy and quality of the research. Dornyei (2007) distinguishes between two types of validity, which are research validity, and measurement validity. Research validity is further divided into internal validity and external validity. The internal validity looks at whether the findings of the research are due to the different variables and treatment factors measured while external validity addresses the generality of the results of the study to other situations beyond the studied sample (Dornyei, 2007). Measurement validity refers to the extent to which a test measures what it is intended to measure (Dornyei, 2007).

Bachman (2004b) argues that perfect validity cannot be proven however it is imperative to give evidence of plausible research, which demonstrates the validity of the research. In support, Dornyei (2007) states that validity is shown through providing evidence against all that may deem the research invalid such as inadequate sampling. For this present study the in-depth discussion of the methodology of the study provides evidence for the validity of the study.

3.13.2 Reliability

Reliability refers to the extent to which results of the study obtained through elicitation instruments are consistent in a given sample in varying circumstances (Dornyei, 2007). There are different ways to gauge the reliability of the study such as inter-rater reliability, intra-rater reliability, and so on. For this study both intra-rater and inter-rater reliability were employed. The intra-rater and inter-rater reliability included data from four participating children, two bilinguals, and two monolinguals, which constituted 20% of all the spoken data. This data was randomly selected for analysis. The inter-rater and the intra-rater labelled the durations of the vowels without reference to the initial set of labels for the vowels on the Praat grid; i.e., they created new label files for the vowels in the selected data.

3.13.2.1 Intra-rater reliability

Intra-rater reliability is the degree of constancy noticed when a measurement is repeated under the same circumstances by a single rater (Dornyei, 2007). Intra-rater reliability scores were calculated on the duration of the vowels to determine consistency in the measurements obtained by the researcher.

The main researcher re-labelled the vowels in the subset of the recordings about a year after the initial measurement (see Appendix 13).

The results were put into SPSS and correlations were calculated. A Spearman's Rho correlation test was run to determine if there was a statistical significant relationship between the original measurement and the intra-rater reliability one. The results are as follows:

Monolingual 1: Spearman's Rho: $rs = .962$; $p < .001$, indicating a significant strong positive relationship between the original measurement and the intra-rater reliability measurement.

Monolingual 2: Spearman's Rho: $rs = .965$; $p < .001$, indicating a significant strong positive relationship between the original measurement and the intra-rater reliability measurement.

Bilingual 1: Spearman's Rho: $rs = .937$; $p < .001$, indicating a significant strong positive relationship between the original measurement and the intra-rater reliability measurement.

Bilingual 2: Spearman's Rho: $rs = .946$; $p < .001$, indicating a significant strong positive relationship between the original measurement and the intra-rater reliability measurement.

3.13.2.2 Inter-rater reliability

Inter-rater reliability is the processes of determining an agreement between two sets of scores from different raters (Dornyei, 2007). After a discussion about the methodology adopted in this research, an individual trained in phonetics, especially acoustic analysis, independently labelled and measured vowel duration measurements in the data of the four participating children, as indicated above. New vowel labels were created in Praat without reference to the previous set of vowel labels. Any issues arising from the labelling and measurement procedures during the discussion of the methodology adopted in the present study were discussed fully

before the independent labelling and measurement took place. As with the intra-rater reliability, the results were put into SPSS and correlations were calculated. A Spearman's Rho correlation test was run to determine if there was a statistically significant relationship between the original measurement and the inter-rater reliability one. (See appendix 12). The results are as follows:

Monolingual 1: Spearman's Rho: $rs = .909$; $p < .001$, indicating a significant positive relationship between the original measurement and the inter-rater reliability measurement.

Monolingual 2: Spearman's Rho: $rs = .933$; $p < .001$, indicating a significant positive relationship between the original measurement and the inter-rater reliability measurement.

Bilingual 1: Spearman's Rho: $rs = .821$; $p < .001$, indicating a significant strong positive relationship between the original measurement and the inter-rater reliability measurement.

Bilingual 2: Spearman's Rho: $rs = .879$; $p < .001$, indicating a significant strong positive relationship between the original measurement and the inter-rater reliability measurement.

3.14 summary of the chapter

This chapter has given a detailed discussion and the rationale for the methodology employed in this study. The discussion focused on the research design, research setting and participants, ethical consideration, data collection under which data collection instruments and tasks were thoroughly described. The chapter also provides an elaborate description of the recording environment and the recording instrument. The chapter further explores the procedure employed in the selection of the participants, coding of data as well as data analysing. The analysis of data section gives a detailed description of how the recordings were selected and the computer software used to edit speech (audacity and Praat). Furthermore, the analysis

section examines the acoustic analysis of spontaneous speech. The acoustic analysis focuses on the segmenting and labelling of vowels and syllables as well as the annotation/transcription of the speech, which was done on Praat. The acoustic analysis of data further scrutinises the extraction of the vowel duration from Praat and the speech rhythm matrices used to calculate the rhythm of the monolingual and bilingual participants, to analyse each variable appropriately and address each research question. The methodology chapter also reviews in detail the pilot study, statistical analysis of the data, and the validity and reliability of the research. Reliability of the study particularly focuses on intra-rater reliability.

4. RESULTS

4.1 Introduction

This chapter presents the findings of the study. The study investigates the speech rhythm pattern and the penultimate syllable vowel length in the Setswana speech of private English-medium educated early sequential Setswana-English bilingual children aged 6-7 years growing up in Botswana, a country with a diglossic setting, where English is the dominant high-status language in educational and public contexts. For this group of children (bilinguals), taught full-time in English from the age of 3 years, the L2 becomes their dominant language through exposure to English-medium education. The study aims to ascertain a) if the prosodic patterns (speech rhythm and penultimate syllable vowel lengthening) of this group of children mirror those of monolingual children educated in public schools for whom English is a learner language or b) if the dominant English has an effect on prosodic patterns in comparison with monolingual children. There are 20 participants in this study, 10 monolinguals, and 10 bilinguals. In order to achieve the objectives of the study, the study employed a language background questionnaire. In addition, spontaneous narrative data was collected to test speech rhythm and PSVL, to check the type of input in case of potential diglossic. Data was also collected through a language background questionnaire, which was completed by the parents. The Raven's Coloured Progressive Matrices are a sub-test to ensure homogeneity.

4.2 Statistical procedures

In research, statistics are numbers or quantities that have been collected on a sample and are used to estimate the results of the whole population (Perry, 2011). The study employed descriptive statistics and inferential statistics (also called inductive statistics).

4.3 Spontaneous speech

This section gives the results of the analysis of spontaneous speech, looking at speech rhythm and penultimate syllable vowel length.

4.3.1 The amount of vocalic intervals produced

The 60 seconds long utterances that were analysed resulted in different vocalic intervals between the bilinguals and monolinguals. The vocalic intervals produced by the Setswana – English bilinguals ranged from 104 to 201 while the vocalic intervals of the Setswana monolinguals stretched from 153 to 301. In total, speakers produced between 104 and 301 vocalic intervals in spontaneous speech.

4.3.2 Speech rhythm

This section gives the results of the rhythm metrics used in the study, which are the Pairwise Variability Index Vocalic (nPVI-V) and Varco V. The section answers the research questions as well as provides evidence for the hypothesis given in sections 2.10 and 2.11.

4.3.2.1 Pairwise Variability Index-Vocalic (nPVI-V)

The descriptive statistics were performed to give a summary of the participants' nPVI-V as well as to establish how data is dispersed within the sample. The results of the nPVI-V are N=20, M=49.29, SD=6.47, range=22.88, minimum=39.09, maximum=61.97. In order to find out how this data is distributed between the groups the descriptive statistics for the monolingual group and bilingual group were compared (see table 4.1).

Table 4. 1. *nPVI-V descriptive statistics for the monolinguals and bilinguals group*

	N	**Std. Dev.**	**Median**	**Minimum**	**Maximum**	**Range**
Monolinguals	10	4.45	53.80	49.07	61.97	12.90
Bilinguals	10	2.81	44.10	39.09	47.73	8.64
Total	**20**	**6.47**	**48.40**	**39.09**	**61.97**	**22.88**

The results of the means as indicated in figure 4.1 show that the bilingual group has a lower nPVI-V compared to the monolingual group. To test the hypothesis that the bilinguals and monolinguals have a statistical significant different nPVI-V value, an independent samples *t*-test was performed. The decision to use the independent *t*-test was based on the skewness and kurtosis results. The skewness < 2.0 (skewness = .402) and kurtosis < 9.0 (kurtosis = .696) results point towards the normality of the distribution. Likewise, the Kolmogorov-Smirnov (p = .200) and Shapiro-Wilk (p = .703) tests results, verify the normality of the distribution as both are p> .05. Furthermore, assumption of homogeneity of the variances was tested and verified by Levene's F test, $f(18) = 2.7$, p = .117.

The independent samples *t*-test showed a statistically significant effect, $t(18) = 6.284$, p = .001. Therefore, the bilingual group was associated with a statistically significantly smaller nPVI-V

value than the monolingual group. Cohen's d was computed to determine the effect size. The results are, cohen's *d* = 2.81 indicating a large effect size according to Cohen (1992) recommendations. A graphical comparison of the bilinguals and monolinguals nPVI-V means is displayed in figure 4.1.

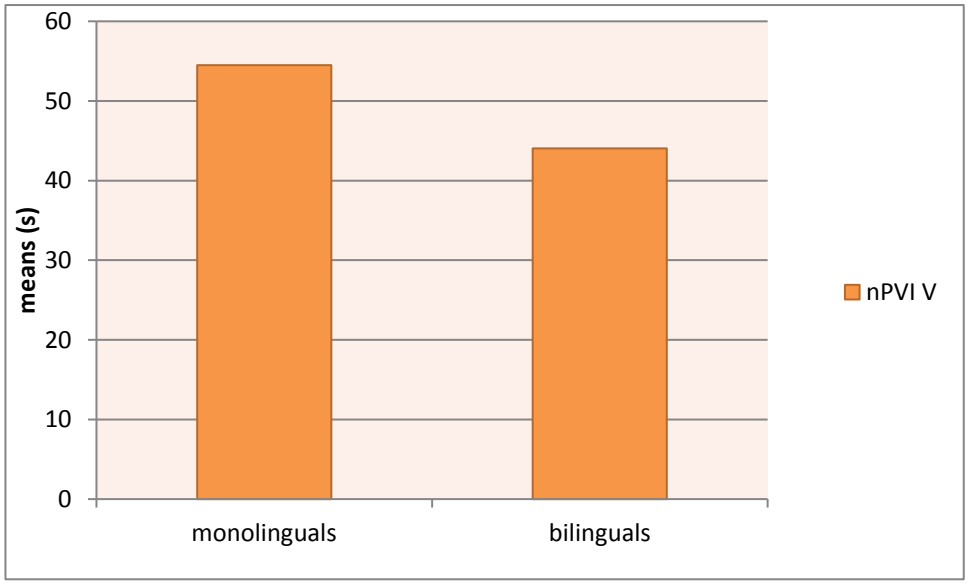


Figure 4.1. nPVI-V means for monolinguals and bilinguals.

4.3.2.2 Varco V

The descriptive statistics for the variable Varco V were calculated to give a numerical summary of the data. The results are N=20, M=50.20, SD=5.09, range=20.40, minimum=38.20, maximum=58.60. In order to find out how this data is distributed between the groups, the Varco V of the monolingual group and bilingual group were compared. Table 4.2 gives a visual representation of the descriptive statistics.

Table 4. 2 . *Varco V descriptive statistics for the monolingual group and bilingual group*

	N	Std. Dev.	Median	Minimum	Maximum	Range
Monolinguals	10	3.94	53.54	47.64	58.60	10.96
Bilinguals	10	4.41	47.18	38.20	52.86	14.66
Total	**20**	**5.09**	**50.26**	**38.20**	**58.60**	**20.40**

In addition, figure 4.2 graphically represents the Varco V means of the monolingual group and the bilingual group.

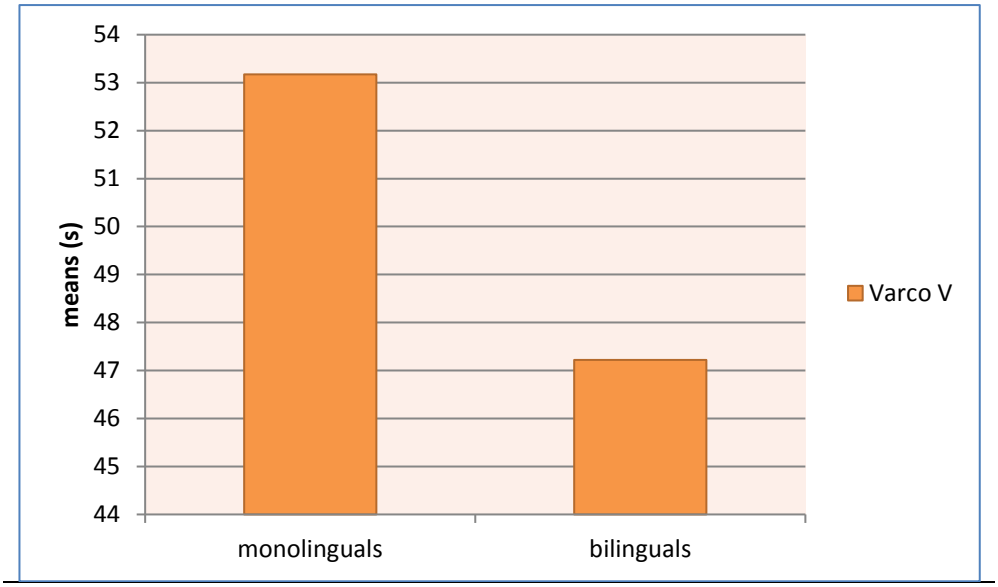


Figure 4.2. Varco V means for monolinguals and bilinguals.

The results indicate that the bilingual group has a lower Varco V mean value compared to the bilingual group. To determine if the bilingual group and the monolingual group are statistically different, an independent samples *t*-test was run. Computing the independent samples *t*-test was based on the skewness and kurtosis results that verify the normality of the data distribution. The results are, the skewness ($p < 2.0$; skewness = -.409) and kurtosis ($p < 9.0$; kurtosis = .334). Similarly, Kolmogorov-Smirnov ($p = .200$) and Shapiro-Wilk ($p = .780$) test results indicate that the data is normally distributed. The homogeneity of variances is further verified by the Levene's *F* test, $f(18) = .02$, $p = .896$. The independent samples *t*-test showed a statistically significant effect, $t(18) = 3.179$, $p = .005$. Therefore, the bilingual group was associated with a

statistically significantly smaller Varco V value than the monolingual group. The Cohen's *d* is 1.42 which is a large effect size based on Cohen (1992) guidelines.

4.3.2.3 Correlation

A Pearson correlation test was run to determine if there was a statistical significant relationship between the nPVI-V and Varco V variables. The results are Pearson *r*: $r = .783$; $p < .001$, indicating a significant strong positive relationship between the nPVI-V and Varco V. The relationship is graphically represented by the scatterplot below. The Data points are in a straight line going from lower left to upper right, indicating a strong correlation.

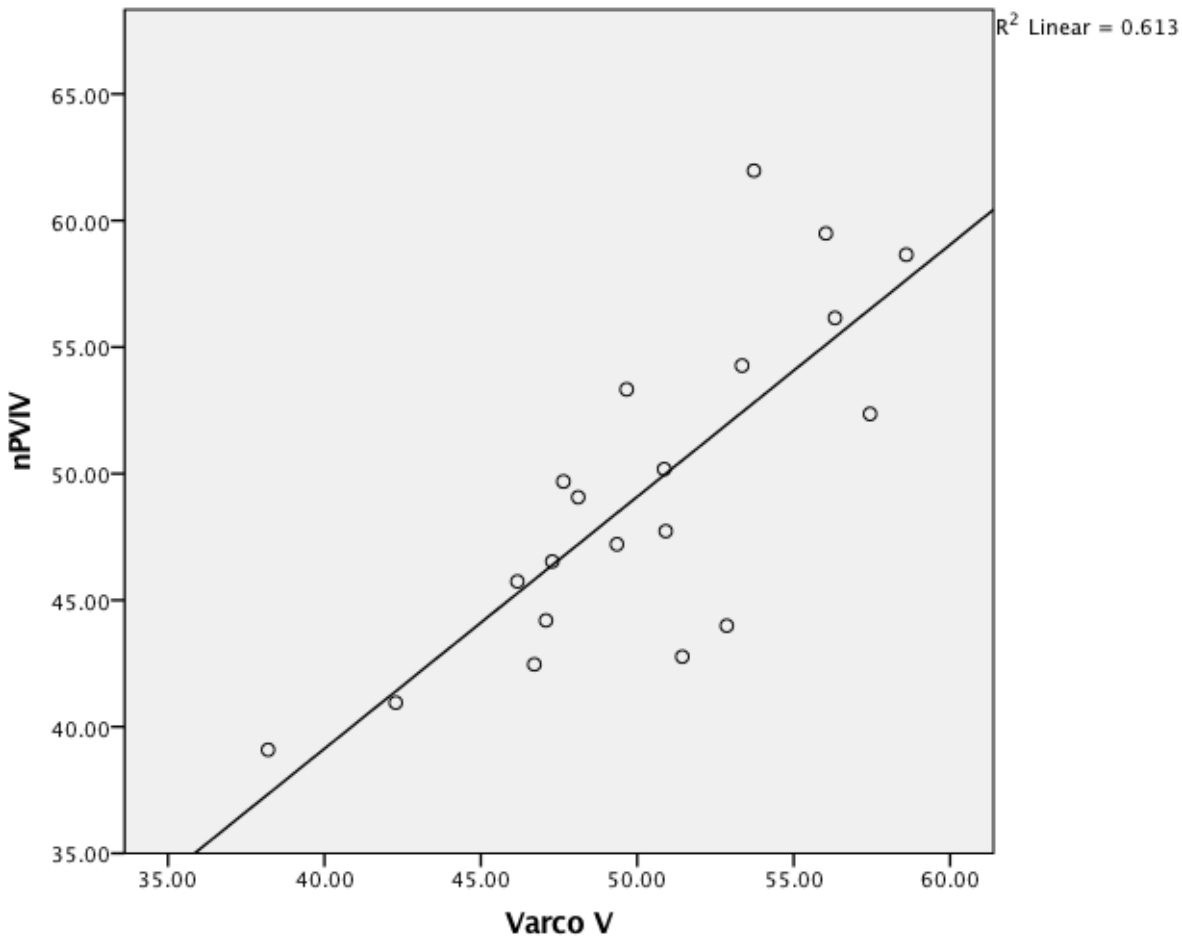


Figure 4. 3. Scatterplot for nPVI-V and Varco V.

4.3.2.4 A comparison of the STD 1 and STD 2 bilinguals nPVI-V and Varco V

The descriptive statistics for the variable nPVI-V and Varco V were calculated. Table 4.2 gives a visual representation of the descriptive statistics.

Table 4. 3. *Descriptive statistics results for the STD 1 and 2 bilingual groups' nPVI-V and Varco V*

Group	**Metrics**	**Number**	**Mean**	**SD**
STD 1	nPVI V	5	43.80	2.80
	Varco V	5	46.45	4.09
STD 2	nPVI V	5	44.33	3.11
	Varco V	5	48.01	5.04

To determine if the STD 1 group and the STD 2 group are statistically different, an independent samples *t*-test was run. Computing the independent samples *t*-test was based on the shape of the bell, which is approximating a bell-shaped curve of the distribution of the data on the histogram. The independent samples *t*-test showed a non-statistically significant effect, for both the nPVI-V and Varco V. The nPVI-V results are $t(8) = 283$, $p = .784$. The Varco V results are $t(8) = 537$, $p = .606$. Therefore, the STD 1 group and the STD 2 group's nPVI-V and Varco V are not statistically significantly different.

4.3.3 Penultimate syllable vowel length

This section presents the results of the penultimate syllable vowel length. In addition it provides evidence for the hypothesis provided in chapter 2.

4.3.3.1 A comparison of the penultimate syllable vowel length in the speech of monolinguals and bilinguals

The results of the descriptive statistics for the penultimate syllable vowels duration in Setswana multisyllabic words for the monolingual group and the bilingual group are N=20, M= 0.1210, SD=0.01524, range = 0.05, minimum = 0.10, maximum=0.15. In order to find out how this data is distributed between the groups the results of the monolingual group and bilingual group were compared. Table 4.4 gives a visual representation of the descriptive statistics of the monolingual and bilingual groups. The results indicate that the bilingual group has a shorter mean of the penultimate syllable vowel duration compared to the monolingual group.

Table 4. 4. *Penultimate syllable vowel length for monolingual group and bilingual group*

	Mean	**N**	**Std. Dev.**	**Median**	**Minimum**	**Maximum**	**Range**
Monolinguals	.1218	10	.01565	.11	.04	.15	.1218
Bilinguals	.1203	10	.01657	.10	.04	.14	.1203
Total	**.1210**	**20**	**.01524**	**.10**	**.05**	**.15**	**.1210**

An independent samples *t*-test was computed to find out if the bilingual group and the monolingual group are statistically different. Before computing the independent samples *t*-test the normality tests were run. The skewness ($p < 2.0$; skewness = -0.401) and kurtosis ($p < 9.0$; kurtosis = -1.134) results verify the normality of the data distribution. Similarly, Kolmogorov-Smirnov ($p = .200$) and Shapiro-Wilk ($p = .150$) test results are both $p > .05$ indicating that the data is normally distributed. The homogeneity of variances is further verified by the Levene's *F* test, $f(18) = .242$, $p = .628$. The independent samples *t*-test showed that the difference is not

statistically significant $t(18) = 214$, $p = .833$. Therefore, the bilingual group and the monolingual group penultimate vowel duration in Setswana multisyllabic words are not statistically significantly different.

4.3.3.2 A comparison of the penultimate syllable vowel duration with the vowels of other syllables in Setswana multi-syllabic words

The durations of other syllable vowels in Setswana multi-syllabic words were calculated to determine if the penultimate syllable vowel was the most lengthened vowel in the speech of Setswana-English bilinguals and Setswana monolinguals.

4.3.3.2.1 First syllable vowel duration

The results of the descriptive statistics for the first syllable vowel durations in Setswana multisyllabic words for the monolingual group and the bilingual group are N = 20, M = 0.1203, SD=0.18919, range = 0.87, minimum = 0.05, maximum = 0.92. The results of the monolingual group and the bilingual group were compared to determine how the data is distributed between the groups. Table 4.5 gives a visual representation of the descriptive statistics.

Table 4. 5. *First syllable vowel duration for the monolingual group and bilingual group*

	N	**Std. Dev.**	**Median**	**Minimum**	**Maximum**	**Range**
Monolinguals	10	.00870	.05	.03	.08	.0731
Bilinguals	10	.26557	.06	.86	.92	.1676
Total	**20**	**.18919**	**.05**	**.87**	**.92**	**.1203**

In addition, figures 4.4 graphically represents the first syllable vowels duration means of the monolingual group and the bilingual group.

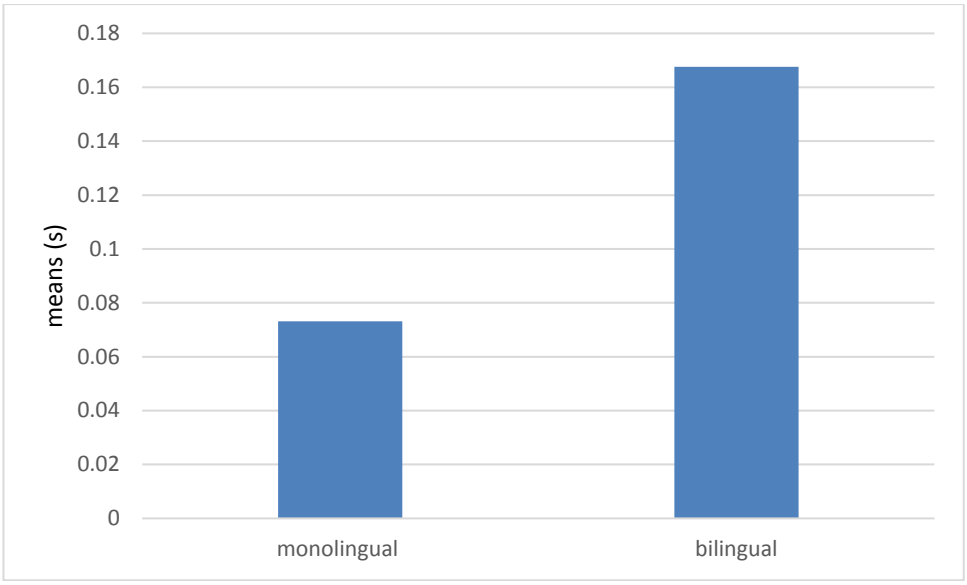


Figure 4. 4. First syllable vowel duration for the monolingual group and bilingual group.

The results indicate that the bilingual group has a longer mean of the first syllable vowel duration compared to the monolingual group. This necessitated computing inferential statistics to determine if there is a statistically significant difference between the monolingual group and the bilingual group. To make an objective decision on the normality of the data the skewness (p > 2.0; skewness = 4.446) and kurtosis (p > 9.0; kurtosis = 19.835) values were considered and they verify that the data is unsymmetrical. The unsymmetrical distribution of the data is further indicated by the Kolmogorov-Smirnov (p = .001) and Shapiro-Wilk (p = .001) test results, which are both p < .05. The Mann-Whitney U test was carried out to find out if there is any significant difference between the groups. There was a statistically significant difference, p < 0.05, (Mann-Whitney U = 40.000, p =.019), in the first syllable vowel durations in Setswana multisyllabic words for the monolingual group and the bilingual group.

4.3.3.2.2 Second syllable vowel duration

The results of the descriptive statistics for the second syllable vowel durations in Setswana multisyllabic words for the monolingual group and the bilingual group are N = 20, M = 0.0725,

SD = 0.01714, range = 0.06, minimum = 0.05, maximum = 0.10. The means of the monolingual group and the bilingual group were compared to determine how the data is distributed between the groups. Table 4.6 gives a visual representation of the descriptive statistics.

Table 4. 6. *Second syllable vowel length for the monolingual group and bilingual group*

	Mean	**N**	**Std. Dev.**	**Median**	**Minimum**	**Maximum**	**Range**
Monolinguals	.0682	10	.01736	.05	.06	.10	.0682
Bilinguals	.0768	10	.01667	.05	.05	.10	.0768
Total	**.0725**	**20**	**.01714**	**.05**	**.06**	**.10**	**.0725**

The results indicate that the bilingual group has a longer mean of the second syllable vowel duration compared to the monolingual group.

This necessitated computing inferential statistics to determine if there is a statistically significant difference between the monolingual group and the bilingual group. In order to make an objective decision on the normality of the data the skewness ($p < 2.0$; skewness = 0.313) and kurtosis ($p < 9.0$; kurtosis= -1.065) values were considered and they verify the normality of the data distribution. Similarly, Kolmogorov-Smirnov ($p = .200$) and Shapiro-Wilk ($p = .310$) test results are both $p > .05$ indicating that the data is normally distributed. The homogeneity of variances is further verified by the Levene's *F* test, $f(18) = .157$, $p = .697$. The independent samples *t*-test showed that the difference is not statistically significant $t(18) = -1.125$, $p = .275$. Therefore, the bilingual group and the monolingual group second vowel duration in Setswana multisyllabic words are not statistically different.

4.3.3.2.3 Final syllable vowel

The descriptive statistics for the final syllable vowel duration were calculated to give numerical summary of the data. The results are N = 20, M = 0.1362, SD = 0.5722, range = 0.16, minimum = 0.06, maximum = 0.23. To find out how this data is distributed between the groups the results of the monolingual group and bilingual group were compared (table 4.7).

Table 4. 7. *Second syllable vowel length for the monolingual group and bilingual group*

	N	**Std. Dev.**	**Minimum**	**Maximum**	**Range**
Monolinguals	10	.01264	.06	.10	.04
Bilinguals	10	.02550	.13	.23	.09
Total	20	.05722	.06	.23	.16

Additionally, figure 4.5 shows a graphic representation of the final syllable vowel mean of the monolingual group and the bilingual group.

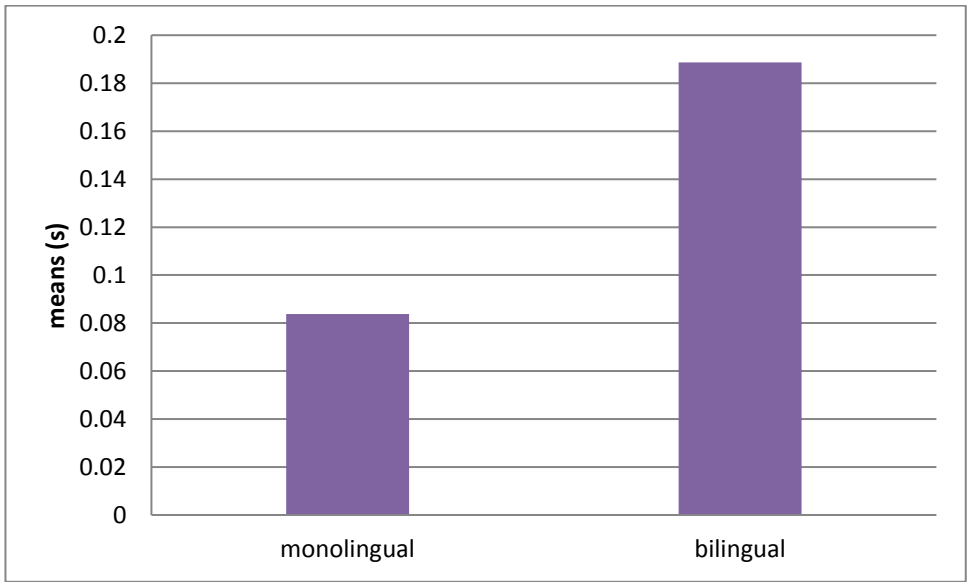


Figure 4. 5. Final syllable vowel duration for the monolingual group and the bilingual group.

The results show that the bilingual group's final syllable vowel is longer than that of the monolingual group. To determine if the bilingual group and the monolingual group are

statistically different, an independent samples *t*-test was run. The decision to run the independent samples *t*-test was based on the skewness ($p < 2.0$; skewness = 0.186) and kurtosis ($p < 9.0$; kurtosis = -1.768) results verify the normality of the data distribution. The homogeneity of variances is further verified by the Levene's *F* test, $f(18) = 1.525$, $p = .233$. The Levene's test for equality of variances *p* value is p > .05 showing that the variances are homogeneous. However, Kolmogorov-Smirnov ($p = .020$) and Shapiro-Wilk ($p = .010$) test results indicate that the data is not normally distributed. Therefore the Mann-Whitney U test was also run. The independent samples *t*-test showed a statistically significant effect, $t(18) = -11.646$, $p = .001$. The Mann-Whitney U test (Mann-Whitney U=.000, p=.001), also showed a statistically significant difference between the group. Therefore, the bilingual group was associated with statistically significantly longer final syllable vowel duration than the monolingual group.

4.3.3.2.4 A summary of the group's penultimate syllable vowel duration and non-penultimate syllable vowels duration

Table 4. 8. *A comparison of the penultimate syllable vowels with non-penultimate syllable vowels in the utterances of monolinguals and bilinguals*

		First syllable vowels	**Second syllable vowels**	**Penultimate syllable vowels**	**Final syllable vowels**
	Number	**Mean**	**Mean**	**Mean**	**Mean**
Monolinguals	10	0.0731	0.0682	0.1218	0.0838
Bilinguals	10	0.1676	0.0768	0.1203	0.1886

Table 4.8 shows that the monolingual group lengthens the penultimate syllable vowel more than any other vowel in a word. The bilinguals seem to lengthen all the other vowels of the syllables more than the monolinguals except for the penultimate syllable vowel.

4.3.3.3 Comparing the duration of the different penultimate vowels in Setswana multisyllabic words in the monolingual group speech.

The descriptive statistics show that the most lengthened vowel is the /*a*/ vowel followed by the /*e*/ vowel while the /*o*/ vowel is the least lengthened vowel. Figures 4.6 gives a visual representation of the data.

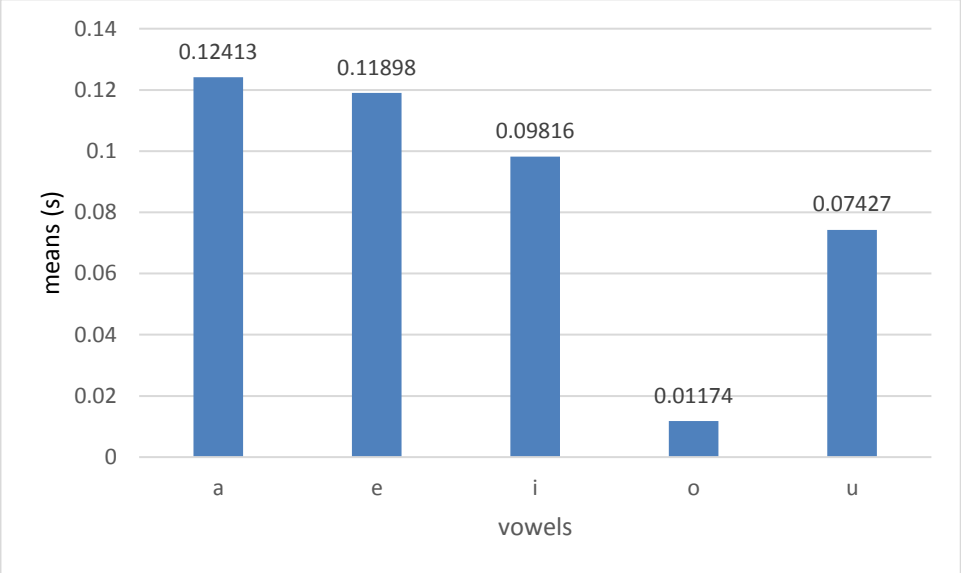


Figure 4. 6. A comparison of the durations of different penultimate vowels in Setswana multi-syllabic words in the monolinguals' speech.

4.3.3.4 Comparing the different final syllable vowels durations in Setswana multisyllabic words in the speech of Setswana-English bilingual children

The descriptive statistics clearly show that the /*a/* is the most lengthened vowel followed by the /*o/* while the /*u*/ is the least lengthened in Setswana multisyllabic words in the speech of the bilingual group. Figure 4.7 graphically represents the different vowel means.

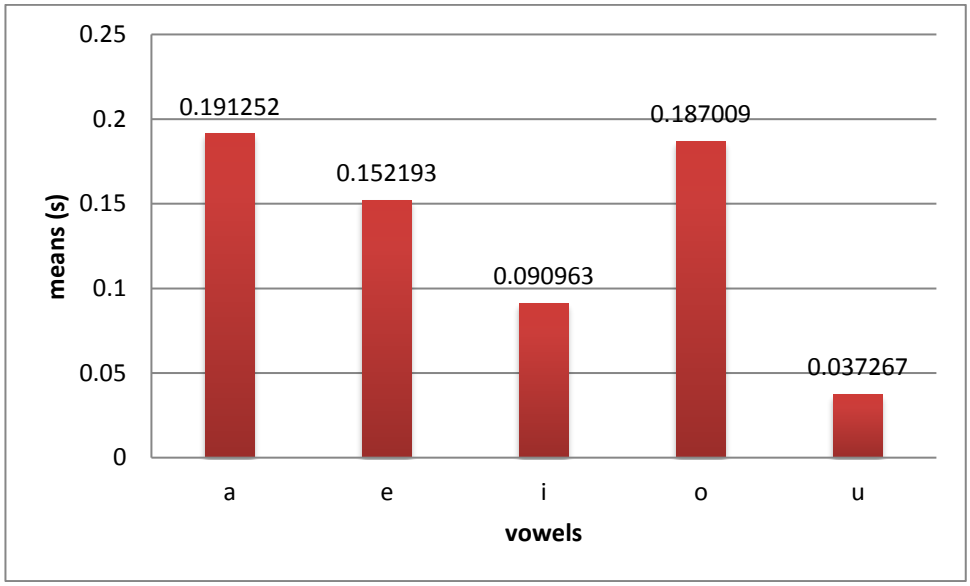


Figure 4. 7. A comparison of the different final syllable vowels durations in Setswana multi-syllabic words in the speech of the Setswana-English bilingual children

4.3.3.5 A comparison of the STD 1 and STD 2 Setswana-English bilinguals' penultimate syllable vowel length

The descriptive statistics show that the STD 2 group mean of penultimate syllable vowel length is more than that of the STD 1 group. Therefore, the STD 2 bilinguals lengthen the penultimate syllable more than the STD 1 bilinguals. Table 4.9 gives a visual presentation of the descriptive statistics.

Table 4. 9. *A comparison of the STD 1 and STD 2 Setswana-English bilinguals' penultimate syllable vowel length*

STD 1 & STD 2 bilinguals	**Mean**	**N**	**Std. Dev.**	**Median**	**Minimum**	**Maximum**	**Range**
1.00	.0813	5	.00630	.0792	.08	.09	.02
2.00	.0991	5	.00750	.0980	.09	.11	.02
Total	**.0902**	**10**	**.01143**	**.0920**	**.08**	**.11**	**.03**

The inferential statistics were run to determine if the difference was statistically significant. The independent samples *t*-test showed a statistically significant effect, $t(8) = -4.064$, $p = .004$. Therefore, the STD 2 bilingual group was associated with statistically significantly longer penultimate syllable vowel duration than the STD1 bilingual group.

4.3.3.6 A comparison of the STD 1 and STD 2 Setswana-English bilinguals' final syllable vowel length

The descriptive statistics for the final syllable vowel duration were calculated to give a numerical summary of the data. The result of the STD 1 group mean is less than that of the STD 2 group mean as shown on table 4.15. The independent samples *t*-test showed that the difference is not statistically significant $t(8) = -.068$, $p = .948$. Therefore, the STD 1 and STD 2 bilingual groups' final syllable vowel duration in Setswana multisyllabic words are not statistically different.

Table 4. 10 . *A comparison of the STD 1 and STD 2 Setswana-English bilinguals' final syllable vowel length*

		N	**Mean**	**Std. Deviation**	**Std. Error Mean**
STD 1 & STD 2 bilinguals	1.00	5	.1407	.02687	.01202
	2.00	5	.1416	.01614	.00722

4.3.3.7 An indication of the length of the words used for penultimate syllable vowel analysis

This section gives a summary of the length of the words used in the present study. In addition, it gives the number of words for each multisyllabic words used. For example, how many bi-syllabic words were employed in the present study and so on?

Table 4. 11. *Words used according to the syllables*

	Words			
	2 syllables	3 syllables	4 syllables	5 syllables
Total	347	221	366	13
Penult vowels average (s)	0.11	0.12	0.12	0.14

Table 4.11 shows that four syllable words were the most used by the participants, whereas five syllable words were the least used. While two syllable words come second, at 347, after four syllable words, it should be noted that they have the least number of vowels on average. This suggests that the penultimate syllable of the majority of these words were not vowels. Syllabic consonants were not considered in the present study. It is worth noting that, in bi-syllabic words, the penultimate syllable is also the first syllable. The dual role of the first or penultimate syllable in these words is a limitation of the study, and an area for further research, which is not followed up here.

4.4 Summary of the chapter

This chapter presented the findings of the study based on spontaneous speech. The spontaneous speech findings are reported under speech rhythm and penultimate syllable vowel length. The findings provided evidence for the hypotheses, which ultimately answered the research questions. The findings of the study indicate that the bilingual group speech rhythm based on the nPVI-V and Varco V rhythm metrics results is more syllable-timed compared to that of the monolingual group. It is possible that the increased level of English exposure at school and at home has had an effect on the development of the Setswana-English bilinguals' speech rhythm and PSVL. Montrul (2008) is of the view that high L2 input in childhood, dominating over a prior L1, affects the development of L1. Previous studies (Allen & Hawkins, 1980; Grabe et al., 1999; Mok, 2011; Ordin & Polyanskaya, 2014, 2015; Payne et al., 2012) have shown that speech rhythm at an early stage of development has a low vocalic variability. Therefore, the more syllabled-timed speech of bilinguals compared to monolinguals could mean their speech rhythm is still developing.

While the monolingual group lengthened the penultimate syllable vowel, the bilingual group lengthened the final syllable vowel. The lengthening of the final syllable vowel by the Setswana-English bilinguals could be due to the high English exposure because syllable final syllable lengthening is prevalent in the English language (Turk & Shattuck-Hufnagel, 2007; Yeun, 2014).

5 DISCUSSION

5.1 Introduction

This chapter provides an interpretation and a discussion of the findings presented in chapter four in order to answer the research questions of the study. The research questions are:

1. What is the pattern of rhythm timing of Setswana in the speech of Setswana-English bilingual children aged 6-7 years in comparison with monolingual peers?

2. What is the pattern of penultimate syllable duration in Setswana multisyllabic words in the speech of Setswana-English bilingual children aged 6-7 years in comparison with monolingual peers?

3. To what extent will the Setswana-English bilingual children aged 7 years who are in standard two, have a different pattern of rhythm timing of Setswana in comparison with Setswana-English bilingual children aged 6 years who are in standard one, because of increased exposure to English?

4. To what extent will the Setswana-English bilingual children aged 7 years who are in standard two have a different pattern of penultimate syllable duration in Setswana multisyllabic words in comparison with Setswana-English bilingual children aged 6 years old who are in standard one, because of increased exposure to English?

5.2 The pattern of rhythm timing of Setswana in the speech of bilingual children in comparison with their monolingual peers

The research question on the pattern of rhythm timing of Setswana investigates possible differences and or similarities in the pattern of rhythm timing of Setswana in the speech of Setswana monolingual children and Setswana-English bilingual children aged 6-7 years. To answer this research question, data elicited through the telling of the Frog Story was analysed. The analysis involved calculating the rhythm of each speaker using the rhythmic metrics nPVI-V and Varco V. These measures of the variability of vocalic durations showed robust differences between the Setswana speech of the monolingual group and the bilingual group, with the bilingual group having less variability than the monolingual group. The lower the number under means the more syllable-timed the speech. The statistical analysis of the nPVI-V and Varco V yielded statistically significant differences between the monolingual group and the bilingual group means. These statistically significant results of the nPVI-V and Varco V are in line with previous studies such as that by Bunta and Ingram (2007) and Fuchs (2016). Bunta and Ingram (2007) reported nPVI-V scores for monolingual English younger children, older children, and adults as 63.58, 74.62, and 79.68 respectively. For bilingual English they reported nPVI-V scores as 58.74, 66.17 and 74.00 for younger children, older children, and adults respectively. Bunta and Ingram (2007) also reported nPVI-V scores for monolingual Spanish younger children, older children, and adults as 39.76, 37.78, and 39.43 respectively. The nPVI-V scores for bilingual Spanish younger children, older children, and adults were 38.56, 41.72, and 43.00 respectively (Bunta & Ingram, 2007). Fuchs (2016) reported nPVI-V scores for British English in read speech and spontaneous speech as 61.3 and 58.3 respectively. The Varco V scores for the same British participants for read and spontaneous speech was 53.2 and 51. 7 respectively. Fuchs' (2016) Indian-English bilinguals' nPVI-V scores for read and

spontaneous speech were 55.6 and 52.4 respectively while the Varco V scores were 46.3 and 45.7 respectively. It is clear from both Fuchs (2016) and Bunta and Ingram (2007) that the monolingual English scores have a high variability than the Spanish monolinguals and Spanish-English bilinguals in Bunta and Ingram (2007) and Indian-English bilinguals in Fuchs (2016).

5.2.1 Setswana-English bilinguals acquisition of speech rhythm

Similar to previous studies (Bunta & Ingram 2007; Grabe et al., 1999; Lleo et al., 2007; Mok, 2011; Whitworth, 2002), the findings of the present study show that there is dissimilarity in the monolinguals' and the bilinguals' development of speech rhythm as shown by the nPVI–V and Varco V durational measurements. While it is arguable that the results of the present study support the findings of the previous research regarding children keeping the speech rhythm of their two languages distinct (Bunta & Ingram, 2007) the findings themselves are not in the direction anticipated. This is because the Setswana-English bilinguals' speech rhythm is more syllable-timed than that of Setswana monolinguals, as evidenced by the lower nPVI-V and Varco V means for the bilingual group, that is, they had lower durational variability of syllables in comparison with the monolinguals. It could be said that, in so doing, the bilinguals kept the rhythm of Setswana, which is considered to be syllable-timed; however, their more syllable-timed Setswana compared to the monolinguals raises questions. At the age of 6-7 years the monolingual children in the present study are old enough to display native-like Setswana rhythm. Therefore, we can expect them to have adult-like Setswana rhythm. This expectation is based on the findings of Mok (2011), who established that monolingual Cantonese children and monolingual English children who were 3 years of age showed distinct rhythm patterns in their respective languages. Moreover, the monolingual and bilingual children in Bunta and

Ingram (2007), who were around 5 years of age and below, were also able to separate the rhythm of their two languages.

Previous research has shown that, at the early stages of speech rhythm development, children's rhythm compared to that of adults is syllable-timed regardless of the rhythm of their language (Allen & Hawkins, 1980; Grabe et al., 1999; Mok, 2011; Ordin & Polyanskaya, 2014, 2015; Payne et al., 2012). Stress timing is acquired later because the children have to learn to reduce syllables with full vowels (Grabe et al., 1999). The findings of the present study are in support of previous studies on the notion that the speech rhythm of children develops from a low durational variability syllable-timed rhythm because a less vocalic variability in rhythm timing is easier than one with more variability (Allen & Hawkins, 1980; Grabe et al., 1999; Kehoe et al., 2011; Mok, 2011; Ordin & Polyanskaya, 2014, 2015; Payne et al., 2012). The nPVI-V and Varco V of the Setswana-English bilinguals produced lower durational variability in the Setswana speech rhythm compared with the Setswana monolinguals. Based on these results, it is possible that the Setswana-English bilinguals who are 6-7 years old in the present study are still at an early stage of Setswana rhythm development, that is, they are exhibiting incomplete or delayed acquisition of their L1 (Setswana). Most of the children in the previous studies (Bunta & Ingram, 2007; Kehoe et al., 2011; Lleo et al., 2007; Mok, 2011) are younger than the children in the present study, therefore the expectation is at the age of 6-7 years the bilingual children's speech rhythm should be fully developed to produce a statistically similar results to that of monolinguals of the same age, particularly for a language considered syllable-timed like Setswana. Especially, that all the children selected for this study spoke Setswana as their first language. They were introduced to English at the age of 3 years when they started nursery school as per the questionnaire data provided by the parents. In addition, a number of studies have shown that variability in children's speech increases with age (Bunta & Ingram, 2007;

Ordin & Polyanskaya, 2014; Payne et al., 2012). Bunta and Ingram's (2007) monolingual English adults' nPVI-V scores were higher than that of older children (3.9-5.2 years old) while those of older children were higher than that of the younger children. Therefore, 6-7 years old bilingual children in this study should display higher durational variability similar to that of their monolingual peers.

While the findings of the present study support the position in other research that the learning of any language whether L1 or L2 develops from a lower durational variability towards a higher durational variability (Ordin & Polyanskaya, 2014), the Setswana-English bilingual children's low durational variability compared to monolinguals in the present study demonstrates that this does not only occur when the language being acquired is stress-timed. Even when the target language is an L1 and it is considered syllable timed, learning develops from a low durational variability. Previous studies (Bunta & Ingram, 2007; Grabe et al., 1999; Kehoe et al., 2011; Lleo et al., 2007; Mok, 2011; Ordin & Polyanskaya, 2014) reported lower variability only when the language being acquired is stress-timed. When the language is syllable-timed there is no significant difference in the rhythm scores of learners compared to that of advanced speakers, as shown by monolingual Spanish and Spanish-English bilingual speakers in Bunta and Ingram (2007). Therefore, the findings of the present study are in contrast with previous studies such as that of Bunta and Ingram (2007) and Mok (2011) which did not find a statistically significant difference in the rhythmic patterns of the bilinguals and monolinguals when the languages being compared are considered syllable-timed. The only study to date, known to the researcher, which showed statistically significant differences between monolinguals and bilinguals' rhythm timing was Kehoe and Lleo (2005), which compared the rhythm patterns of 3 years old German-Spanish bilinguals growing up in Germany with that of monolinguals of the two languages. They did not find any statistically significant difference in the German rhythm of

bilinguals compared to that of monolinguals. However, they found a statistically significant difference in the Spanish rhythm of bilinguals compared to monolinguals. They found that the bilinguals' Spanish rhythm (syllable–timed) was similar to that of stress-timed German. This finding is also in contrast with the findings of the present research, because the Setswana-English bilinguals' speech rhythm is more syllabled-timed than that of Setswana monolinguals even though the bilinguals are dominant in stress-timed English. There is also a possibility that the bilinguals in the present study are still developing, and so are exaggerating the durational properties of the syllables while they figure out, consciously or otherwise, how much stress and length is in fact needed for each language.

In addition, the findings of Kehoe and Lleo (2005) are in contrast with the findings of other studies (Allen & Hawkins, 1980; Bunta & Ingram, 2007; Grabe et al., 1999; Lleo et al., 2007; Mok, 2011), which have found that, due to a larger variation of syllable types and more complex syllable structures in languages which tend to have stress-timing, features of stress timing are not easy to acquire compared to syllable-timed languages, especially at an early age. A possible explanation to Kehoe and Lleo's (2005) different results could be due to the small number of participants used in the study, i.e., one Spanish monolingual, two German monolinguals, and two German-Spanish bilinguals. Kehoe et al. (2011) argued that the difference in the Spanish rhythm of bilinguals and monolinguals in Kehoe and Lleo's (2005) study could possibly be due to idiosyncrasy instead of the differences in the population. Kehoe et al. (2011) further stated that the difference could be attributed to the language environment in which the bilinguals grew up. Since the bilinguals grew up in Germany they were exposed to more German than Spanish, which could explain why the bilinguals' Spanish rhythm was moving towards that of German. To test the validity of the effect of language environment in the acquisition of speech, Kehoe et al. (2011) used German-Spanish bilingual children growing

up in Germany and those growing up in Spain. They did not find any statistically significant differences in the rhythm patterns based on the country of upbringing.

The results of the present study like Kehoe et al. (2011) support the idea that the language of the larger community does not contribute to the rhythm pattern of the bilinguals. The participants of the present study grew up in a country (Botswana) where the majority of the people speak Setswana. Moreover, the participants had never lived outside Botswana, according to the questionnaire answers provided by the parents. But growing up in an environment where the majority of the people speak Setswana does not seem to have contributed towards the Setswana speech rhythm of the bilinguals. If the language of the larger community has an effect on the acquisition of speech rhythm then there would not be a statistically significant difference in the Setswana rhythm patterns of the bilinguals and that of monolinguals. Even though both the groups' rhythm is syllable-timed, the bilinguals more syllable-timed rhythm compared to monolinguals implies that the language of the larger community had not contributed towards the bilinguals' speech rhythm development because, if it had, then the speech rhythm of the bilinguals would be similar to that of monolinguals.

The findings of the present study further demonstrated that there are some inconsistencies regarding the age at which a high variable speech rhythm is fully acquired. As already stated, Bunta and Ingram (2007), suggested that, by the age of around 5 years, bilingual children have acquired the rhythm patterns of their respective languages because the data they collected indicated that the rhythm of their two languages were distinct. Therefore, the bilinguals in Bunta and Ingram's (2007) were able to keep the rhythm of their two languages separate. The participants in the present study are older (6-7 years old) than those in Bunta and Ingram's

(2007) study; the expectation, based on Bunta and Ingram's (2007) results, is that by the age of 6-7 years they should have acquired the rhythm pattern of Setswana to a point where their rhythm pattern is similar to that of the Setswana monolinguals of the same age.

The results of the present study could be interpreted as being in support of Whitworth (2002); even though she did not find statistically significant differences between the German and English of bilinguals compared with monolinguals of these languages, she noted that complete acquisition of speech rhythm was not evident until around the age of 11 years.

The main finding of the present study assumes that bilinguals' complete acquisition of a high vocalic variability rhythm, or acquisition that is close to that of age matched monolinguals, is later than the age of 7 years particularly in Setswana. It is plausible that this finding could apply to other languages as well based on the phonological system of a language. While the present study did not look at children in a range of ages, the data collected from the 6-7 years old children compared with other studies (Bunta & Ingram, 2007; Kehoe et al., 2011; Lleo et al., 2007; Mok, 2011) give reason to believe that the acquisition of high durational variability rhythm by bilingual children similar to that of monolinguals is after the age of 7 years. In displaying less vocalic variability than their Setswana monolingual peers, the rhythmic pattern of the Setswana-English bilinguals in the present study who are 6-7 years old is similar to that of 3 year olds in studies by Mok (2011) and Kehoe et al. (2011). Kehoe et al.'s (2011) participants showed a less distinct difference between their two languages. The rhythm patterns of Kehoe et al.'s (2011) bilinguals pointed towards a less vocalic variable in German compared to that of monolingual German. Similarly, the participants in Mok (2011) displayed a similar rhythmic pattern in their two languages tending towards less vocalic variability in English.

Mok (2011) concluded that there is language interaction between the two languages of the bilinguals that might be due to language delay. It is probable that acquisition delay and/or any of the cognitive theories of incomplete acquisition and L1 attrition could have taken place in the speech of the Setswana-English bilinguals which resulted in low vocalic variability compared to that of Setswana monolinguals'. However, the data of the present study cannot ascertain which of these cognitive theories is relevant, as there is nothing in the literature that indicates when exactly the phonology of Setswana is acquired. In addition, the study did not use younger monolingual control group, which would allow in ascertaining if the Setswana-English bilinguals' underdeveloped speech rhythm is due to acquisition delay, incomplete acquisition, and or L1 attrition.

The conclusion drawn is that, unlike bilinguals in Bunta and Ingram's (2007) study, who were able to keep the rhythm of their two languages separate at the age of around 5 years, acquisition of Setswana rhythm by Setswana-English bilinguals similar to that of age matched Setswana monolinguals is later than the age of 7 years.

Another main finding of the present study is that acquisition of speech rhythm by bilinguals similar to that of monolinguals of the same age might not necessarily depend on the rhythm of the language under investigation (whether syllable-timed or stress-timed). The participants of the present study are acquiring Setswana, a language considered to be syllable-timed. Since the language has low durational variability, the expectation is that the bilinguals' and monolinguals' speech rhythm patterns would match, similar to the findings of previous studies (Bunta & Ingram, 2007; Mok, 2011) which, showed that when the language that is being acquired by bilinguals is syllabled-timed (Cantonese in the case of Mok, 2011 and Spanish for

Bunta & Ingram, 2007 participants) the speech rhythm patterns of the monolinguals and bilinguals are similar. However, when the language being acquired by bilinguals is stress-timed the speech rhythm patterns of the two groups are dissimilar with the bilinguals' rhythm tending towards a low vocalic variability. The present study demonstrates that bilinguals display low variability even when the language is considered syllable-timed. Therefore, in displaying rhythm patterns different from that of monolinguals in a language considered to be syllable-timed the findings of the present study could suggest that acquiring rhythm pattern similar to that of monolinguals has little to do with the rhythm type of the language being acquired. The present study has established that a low durational variability by bilinguals occurs in the first language of bilinguals even when that language is considered syllable-timed.

The question then is, what is it that influences acquisition of rhythm patterns similar to that of monolinguals? This is a research question that needs to be explored further in future research.

In light of the discussed, one of the main contributions of the present study to the field is that it seems that bilingual children's acquisition of the rhythm of the language similar to that of age matched monolinguals may not necessarily depend on the age but, rather, on the phonology of the language under investigation.

The other main contributions to the field are that the rhythm type of the target language and the language environment of the bilinguals' upbringing may not necessarily have a strong effect in the acquisition of a high variability rhythm. If age, the rhythm type of the language being acquired, and the environment of the larger community had a strong influence in the acquisition of rhythm patterns similar to that of monolinguals, then the bilingual children in the present

study would have produced similar statistically significant vocalic measures to that of monolinguals. This is because the bilingual children in the present study are older than those in previous studies (Bunta & Ingram, 2007; Kehoe et al., 2011; Lleo et al., 2007; Mok, 2011). Moreover, bilinguals in the present study are acquiring a linguistically less marked syllable-timed language, which is considered easier to acquire (Allen & Hawkins, 1980; Grabe et al., 1999; Kehoe et al., 2011; Ordin & Polyanskaya, 2014). Furthermore, the Setswana-English bilinguals are growing up in an environment where the target language is the dominant language of the larger community, which should have contributed to their rhythm pattern matching those of their monolingual peers. The question then is what are the conditions necessary for the bilinguals' complete acquisition of speech rhythm or at least acquisition similar to that of age matched monolinguals?

5.2.2. Language dominance

While the present study could not ascertain what could have taken place in the development of speech rhythm in the speech of Setswana-English bilingual children because no study has investigated the age at which Setswana's rhythm is fully acquired, it is probable that language dominance has played a major role in the different ways in which rhythm patterns in the bilinguals and monolinguals speech developed. Language dominance is closely related to the degree of language input the child receives; an increased input in one of the languages the child speaks and a reduced input in the other results in dominance in the language that receives more input (Döpke, 1998). Language dominance is often determined by computing Mean Length of Utterance (MLU) for each language the bilingual speaks (Yip & Matthews, 2000). MLU is the number of morphemes or words in a child's intelligible spontaneous utterance. Since the focus of the present study is on phonology rather than morphology, MLU was not measured.

While the present study did not measure MLU, the language background questionnaire information provided by the parents, and through the interaction the researcher had with the participants, it was apparent that English was the dominant language of the bilingual group. To verify this, some of the Setswana-English bilinguals who were struggling in their Setswana were asked to tell the same story (Frog where are you?) in English. They did not experience the problems of long pauses and code switching which were prevalent in their Setswana speech. According to Timothy (2009), language dominance has an effect on the development of the bilinguals' speech rhythm. The results of the present study are in support of Timothy (2009) findings.

Even though the speech rhythm of the bilingual group is not stress-timed as one might expect given that English is their dominant language, it should be noted that stress-timing is difficult to master (Allen & Hawkins, 1980; Grabe et al., 1999; Mok, 2011; Ordin & Polyanskaya, 2014, 2015; Payne, Post, Astruc, Prieto, & Vanrell, 2012). Even English monolinguals children's English rhythm develops from syllable-time as already discussed (see section 5.2.1). Therefore, the Setswana speech of the Setswana-English bilinguals could not be stress-timed because they are still at a developmental stage of Setswana (see section 5.2.1). This finding continues to give support to Ordin and Polyanskaya (2014) results that the learning of a language begins from a low durational variability regardless of the speech rhythm. In contrast, Mok (2011) found that Cantonese, which was the dominant language of the participants, influenced their English. It is worth noting that Cantonese is considered syllable-timed. Therefore, Mok's (2011) participants' English being syllable-timed might be a universal developmental pattern due to the difficulty of stress timing (Allen & Hawkins, 1980; Grabe et al., 1999; Mok, 2011; Ordin & Polyanskaya, 2014, 2015; Payne et al., 2012) rather than a specific CLI effect from the influence of Cantonese.

In conclusion, the findings of the present study clearly show that linguistic input, which led to language dominancy, is crucial in the acquisition of speech rhythm. Even though the dominant language of the larger community is Setswana, for the bilingual group, English is the dominant language because of the high English input they are exposed to at school, at home with their parents and with their friends. As such, their everyday communication is mostly carried out in English, even though they have not shown English stress-timing in their Setswana. The suggestion here is that this is because they are still on their way to native-like rhythm of Setswana. Since the development of any language begins from a low vocalic variability towards a high vocalic variability, this study proposes that English timing could not have influenced the Setswana speech of the bilinguals. However, the dominant English in the bilingual's language environment could possibly have attributed to the divergence in the bilinguals and monolinguals Setswana rhythm.

It is worth noting that there were individual differences, as some of the bilingual participants' rhythm tended towards a high durational variability. However, this was only noticed with the Varco V scores and not with nPVI-V. Mok (2011) and Low et al. (2002) state that metrics that measure durational variability globally (whole utterance) such as Varco V usually have high scores than metrics, which measure durational variability locally (between successive vowels) like the nPVI-V. The individual differences could be attributed to the Setswana exposure these children received but, with the rhythm metrics not producing the same scores in the speech rhythm of these children, it is difficult to ascertain this.

While the monolinguals and bilinguals Setswana rhythm differ, one interesting thing is that the monolinguals' rhythm is very close to stress timing at 54.51 nPVI-V and 53.17 Varco V, even

though Setswana is considered syllable-timed. Based on the findings of Bunta and Ingram (2007) and Fuchs (2016), stressed-timed English scores for their English participants was 50 and above. This raises the question: is Setswana really syllable-timed? If so, then what could have caused this stress-timing in the monolingual group who are exposed to minimal stress-timed English input? This is something that should be explored further.

5.2.3 The robustness of the nPVI-V and Varco V

Previous studies have questioned the usefulness of rhythm metrics in determining the speech rhythm of languages (Arvaniti & Ross, 2012; Deterding, 2012). Arvaniti and Ross (2012) argue that rhythm metrics are not reliable in distinguishing languages into rhythmic classes. This is because the different rhythmic metrics gave inconsistent results, which led Arvaniti (2012) to the conclusion that rhythm metrics are highly susceptible to elicitation method and syllable complexity. Arvaniti and Ross (2012) further argue that due to this inconsistency, cross-linguistics distinctions based on rhythm metrics are not vigorous because rhythm scores vary within a language. Similarly, Deterding (2012) questions the robustness of the PVI's in measuring speech rhythm because it is highly vulnerable to measurements of the duration of long vowels and short vowels. Nonetheless, a number of studies (Bunta & Ingram, 2007; Fuchs, 2016; Kehoe et al., 2011; Knight, 2011; Lleó et al., 2007; Mok, 2011; White & Mattys, 2007a, 2007b) have demonstrated the reliability of rhythm metrics in distinguishing languages into rhythm metrics. In particular, the nPVI-V and Varco V have been successfully in distinguishing the speech of monolinguals from that of bilinguals. The present study continues to demonstrate the effectiveness of the nPVI-V and Varco V in distinguishing monolinguals' and bilinguals' speech. The statistical analysis showed that there was a correlation between the n PVI-V and Varco V; a lower variability measured by the nPVI-V correlated to a low Varco V in the speech of bilinguals. In the same way, a higher variability in the monolinguals speech compared to

bilinguals measured by these two metrics correlated. However, it is worth noting that the Varco V of bilinguals was slightly higher than their nPVI-V but the difference was not statistically significant. This is not surprising as Varco V measures durational variability global which usually produces higher scores than nPVI-V which measures durational variability locally (Low et al., 2002; Mok, 2011). Fuchs (2016) also had different values for the nPVI-V and Varco V however; different from the present study Fuchs (2016) Varco V values are lower than those of the nPVI-V at 40's and 50's respectively.

5.2.4 A comparison of the standard 1 and standard 2 Setswana-English bilinguals' speech rhythm

This section provides answers to the research question:

> To what extent will the Setswana-English bilingual children aged 7 years who are in standard two, have a different pattern of rhythm timing of Setswana in comparison with Setswana-English bilingual children aged 6 years who are in standard one, because of increased exposure to English?

The result of the study has shown that the Setswana-English bilinguals' Setswana rhythm has low vocalic variability as measured by nPVI-V and Varco V compared with that of Setswana monolinguals. A possible answer to this is the high English input in the bilinguals' environment compared to monolinguals for whom English is a learner language (see section 1.3.3). As already stated, the language background questionnaire information provided by the parents indicates that the participants of the present study spoke Setswana as their first language (see

section 5.2.1). They were introduced to high input of English at the age of 3 years when they started nursery school.

Since exposure to high English input has an effect in the speech of the Setswana-English bilinguals compared to Setswana monolinguals, the aim of this section is to determine if increased levels of exposure has had an effect in the speech rhythm of 7 years old STD two Setswana-English bilinguals compared to 6 years old STD one Setswana-English bilinguals. The rationale for this comparison was that being a year older and in STD 2 means that this group of bilinguals have been exposed to English for longer since they are older and STD 2 is a higher STD. The results did not produce a statistically significant difference. This could mean that even though this group of bilingual children are in different STDs, the level of STD 1's English is at a point where it already has an effect on their Setswana speech rhythm. The increased levels of exposure to English in the Setswana-English bilinguals is only noticeable when the nPVI-V and Varco V scores of the bilinguals are compared to those of their monolingual peers but not within the bilingual group.

5.3 Penultimate syllable length

This section of the discussion chapter answers the following research questions:

> 2. What is the pattern of penultimate syllable duration in Setswana multisyllabic words in the speech of Setswana-English bilingual children aged 6-7 in comparison with monolingual peers?

4. To what extent will the Setswana-English bilingual children aged 7 years who are in standard two have a different pattern of penultimate syllable duration in Setswana multisyllabic words in comparison with Setswana-English bilingual children aged 6 years old who are in standard one, because of increased exposure to English?

5.3.1 The pattern of the penultimate syllable vowel length in the speech of monolinguals and bilinguals.

The research question on the pattern of the penultimate syllable duration in Setswana multisyllabic words investigates possible differences and or similarities in the lengthening of the penultimate syllable of Setswana multisyllabic words in the speech of Setswana monolingual and Setswana-English bilingual children aged 6-7 years old. To answer this research question, data elicited through the telling of the Frog Story was labelled using Praat and analysed in SPSS.

The results show that the monolinguals lengthen the penultimate syllable vowel (see figure 5.1) as per the phonological requirement of the Setswana phonological system, while the bilinguals do not; they lengthen the final syllable instead, an effect observed in English (and other languages). It is, therefore, likely that L2 English is having an effect on the production of L1 Setswana.

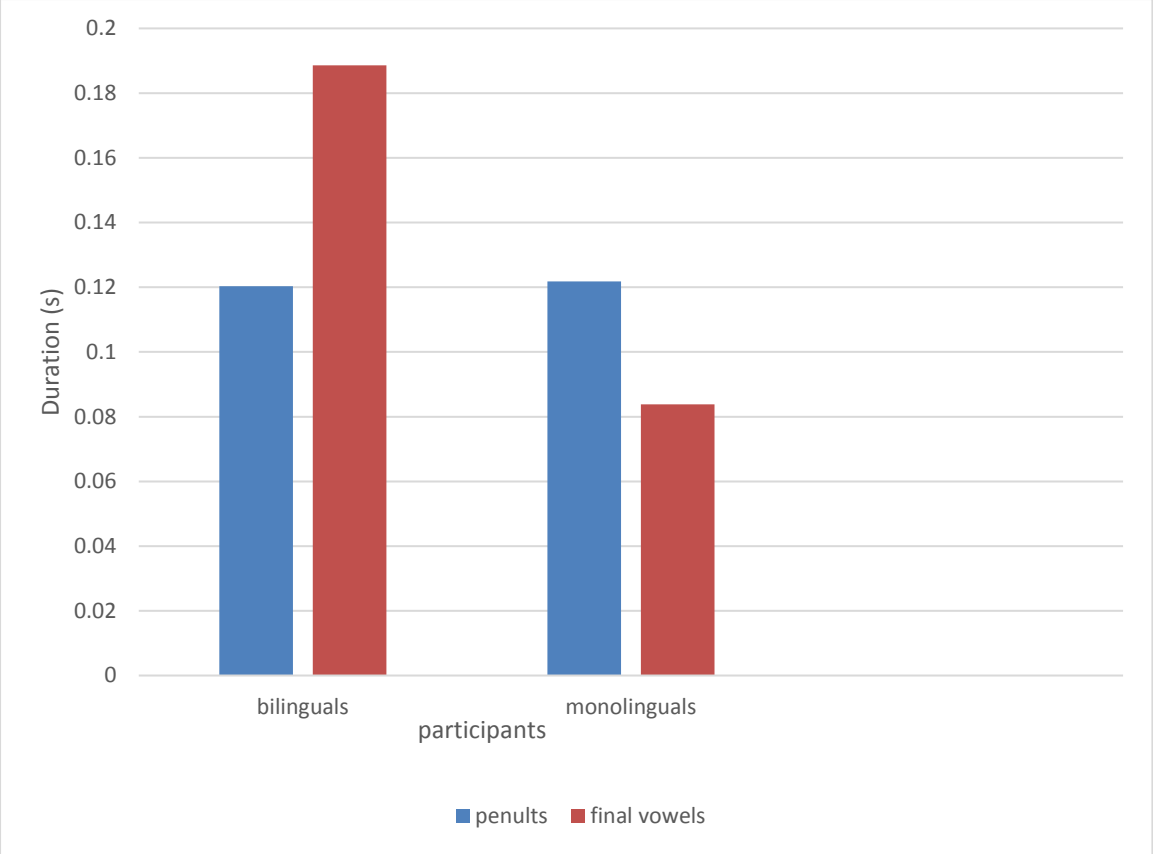


Figure 5. 1. A comparison of the monolinguals and bilinguals penultimate syllable vowels mean length versus final syllable vowels mean length in seconds.

In addition, the Praat windows below (figures 5.2 and 5.3) clearly show the pattern of syllable lengthening in the speech of monolinguals and bilinguals. In the monolingual Praat window figure 5.2, the *'a'* of the penultimate syllable *'ma'* in the word *mosimane –boy* is lengthened more than any other syllable in the word.

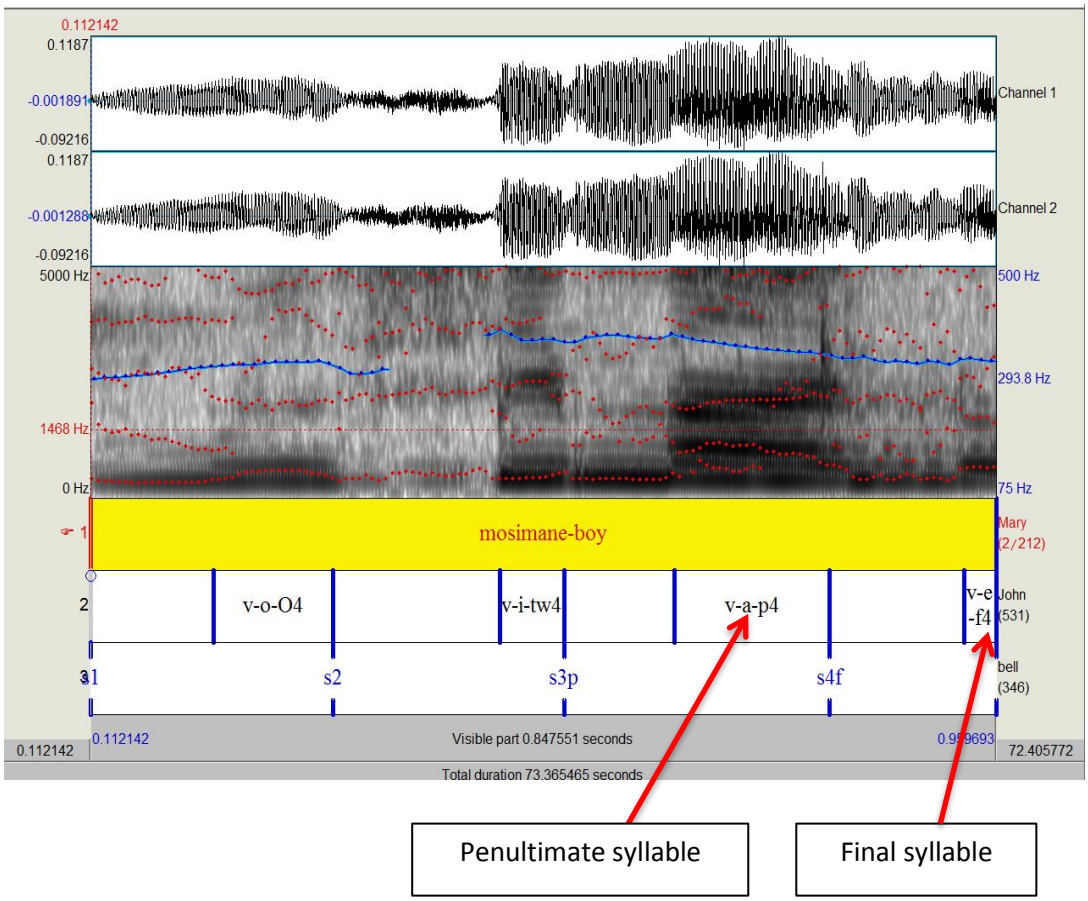


Figure 5. 2. Praat window showing a monolingual child producing the word *mosimane* (boy).

Different from the monolingual pattern, the bilingual Praat window (figure 5.3) indicates that the penultimate syllable is not the most lengthened; instead the vowel *'e'* of the final syllable *'ne'* in the word *mosimane-boy* is the one that has attracted the most lengthening (see chapter 4 for the full explanation of the abbreviations on the Praat window).

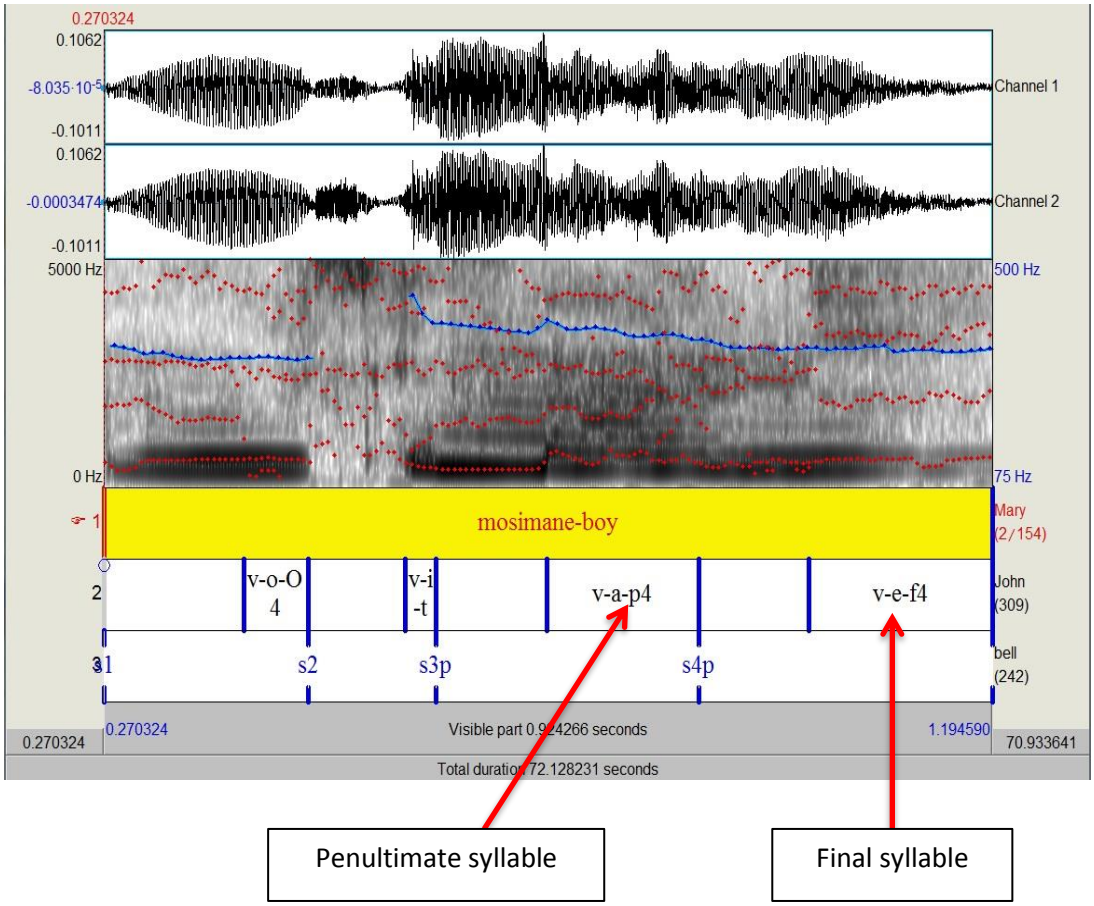


Figure 5. 3. Praat window showing a bilingual child producing the word *mosimane* (boy).

While the difference between the monolinguals' and bilinguals' penultimate syllable vowel is not statistically significant, it should be noted that what is important is that the most lengthened syllable vowel in the speech of Setswana multi-syllabic words should be the penultimate syllable vowel as obligated by the phonology of Setswana. By lengthening the final syllable vowel more than the penultimate syllable vowel the bilingual group is violating the requisite of the Setswana phonology.

The penultimate syllable length occurs in all Setswana multi syllabic words; however, full length is achieved when a word is pronounced in isolation or when it is in sentence final position (Cole, 1955; Hyman, 2009). When the word is in the middle of the sentence it still

maintains the length but to a lesser degree (Cole, 1955; Hyman, 2009). That is, it is still the longest syllable in a word. The monolingual speech pattern in the present study is in support of Cole's (1955) and Hyman's (2009) findings.

However, contrary to Cole (1955) and Hyman (2009), Zerbian (2016) argues that penultimate syllable lengthening does not occur in all cases of Setswana utterances. Setswana ideophones (which are words considered onomatopoetic, including descriptions of colour, manner, smell, state, appearance, action or intensity) exhibit an absence of penultimate syllable lengthening; rather, they prolong lengthening of the final sounds due to intonation (Zerbian, 2016). She gives the following example to illustrate; *Go nó go dídímetse gó ríle tú.- it was dead quiet.* Presuming that the underlined syllables are the lengthened ones it is not surprising that these are lengthened as the majority of them are monosyllabic words, and the only vowel in a monosyllabic word will be lengthened. It is not clear why the first syllable vowel of *dídímetse* has attracted lengthening instead of the penultimate syllable, as should be expected, or the final vowel, because the example sentence is meant to illustrate final lengthening on ideophones.

Nonetheless, Zerbian (2016) is of the view that penultimate syllable length occurs in imperatives and declaratives sentences as well as pause lists (example of pause lists: *Ó réká dilépé, dibúká, nama, bojalwá lé bogóbe- he is buying axes, books, meat, beer and porridge).* Even though Zerbian (2016) does not explicitly state it, as she did with the ideophones, the conclusion drawn from this is that the penultimate syllables of words which are not in pause lists, as well as imperatives and declaratives sentences, are not lengthened. While the present study did not look at different types of sentences such as the imperatives and declaratives that Zerbian (2016) analysed, and neither did it look at pause lists and ideophones, the results are

in contrast with her findings as the means of the vowels in the speech of monolinguals indicated that the penultimate syllable is the one that is lengthened the most.

Since ideophones are not regularly used, so do not constitute a large number in speech (Cole, 1955), it is possible that these could have been produced in the present study, and the large number of other instances where the penultimate syllable vowel length occurs could have resulted in the overall large mean of the penultimate syllable length.

The present study's focus was on the measurement of the vowel in all syllables rather than the length of the entire syllable. Future research should compare the duration of syllable nuclei with whole syllables, as this might have an effect on the results.

5.3.1.1 Individual differences in the pattern of the penultimate syllable vowel length and final syllable length in the speech of monolinguals and bilinguals

It is worth noting that there were individual difference regarding the PSVL with some of the Setswana-English bilingual participants particularly those in STD 2 exhibiting similar PSVL to that of the Setswana monolinguals. This could have been due to an increase to Setswana exposure at STD 2 when more Setswana is introduced as a subject at school. This was not noticed with final syllable vowels; none of the bilinguals' final syllable length was similar to that of monolinguals. On average, the bilinguals' final syllable vowel length was above 0.13s whereas that of the monolinguals was below 0.10s. This clearly shows that while the exposure to Setswana had an effect on the STD 2 bilinguals' PSVL it did not have an effect on their final syllable vowel lengthening. This could be attributed to the point that, at STD 2 they have been

exposed to English for longer since they have been receiving high English input from when they were at nursery school based on the language and background information provided by the parents. Sections 5.3.1.2 and 5.3.1.3 give a clear illustration of this finding.

5.3.1.2 A comparison of the STD 1 monolinguals and STD 1 bilinguals penultimate syllable vowels with the final syllable vowels

The results of the previous section on the individual differences of the patterns of the PSVL in the speech of the bilinguals' necessitated a comparison of the bilinguals and monolinguals by STD to determine if the effect was common in both the STDs or it was peculiar to just one STD to try to identify any effect of the length of exposure in the bilingual group.

As can be seen in Figure 5.4 the STD 1 bilinguals lengthen the final syllable vowel more than they lengthen the penultimate syllable vowel. The monolinguals lengthen the penultimate syllable more than they do the final syllable vowel thereby fulfilling the requirements of the Setswana phonology.

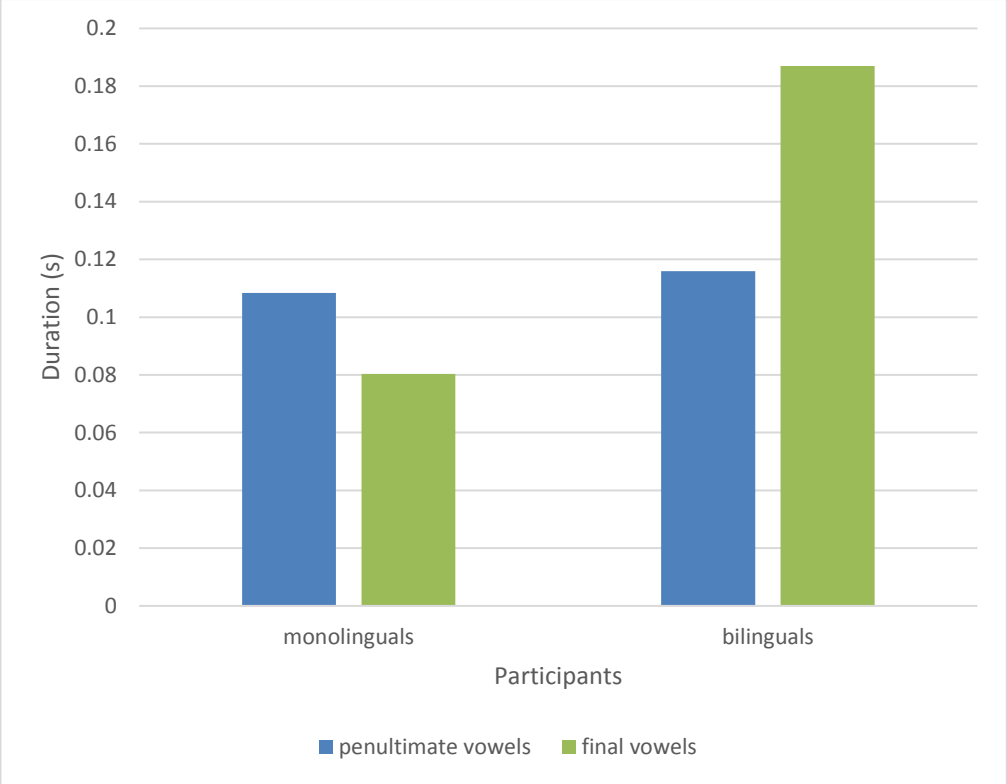


Figure 5. 4. A comparison of the STD 1 monolinguals' and STD 1bilinguals' penultimate syllable vowels with final vowels.

What is interesting is that the bilinguals seem to be lengthening the vowels of both of the syllables more than monolinguals. The bilinguals' mean penultimate syllable length is 0.12s, while that of the monolinguals is 0.11s. Even though the bilinguals' penultimate syllable vowels mean is higher than that of the monolinguals it should be noted that the syllable vowel that should be lengthened the most is the penultimate syllable. In the case of the bilinguals it was not; rather, the final syllable was the one that received the most lengthening. The bilinguals' longer penultimate syllable compared with that of monolinguals might be due to their lack of fluency in Setswana which resulted in slower speech, contributing to longer syllable duration on average compared to the monolinguals.

The findings of the present study are consistent with that of Hirata (2004), Magen and Blumstein (1993), Port (1978). Magen and Blumstein (1993) established that speaking rate has an effect on the duration of the vowels. Slow speaking rate resulted in longer vowels on average compared to normal and faster speaking rate. The utterance of the bilinguals in the present study was very slow and was also accompanied by long pauses due to their lack of proficiency in Setswana. For example, the word *mosimane-boy* was in some cases produced as *mo-si-ma-ne*. The dashes at the end of a syllable represent the pauses. It is possible that the pauses could also have contributed towards longer vowel durations in the syllables of the bilinguals' utterances compared to monolinguals. This assumption is based on the finding that phonetic components before a boundary such as at the end of a sentence or at the end of an intonational phrase attract lengthening (Turk & Shattuck-Hufnagel, 2007; Yuen et al., 2014). It is plausible that the pauses in between the syllables could have been interpreted as signifying the end of a segment and thereby resulting in the lengthening of the syllables.

5.3.1.3 A comparison of the STD 2 monolinguals and STD 2 bilinguals penultimate syllable vowels with the final syllable vowels

The STD 2 monolinguals' and STD 2 bilinguals' penultimate syllable vowel means were compared with the final syllable vowel means to determine the lengthening of the penultimate syllable vowel and final syllable vowel by the STD 2. Figure 5.5 illustrates this.

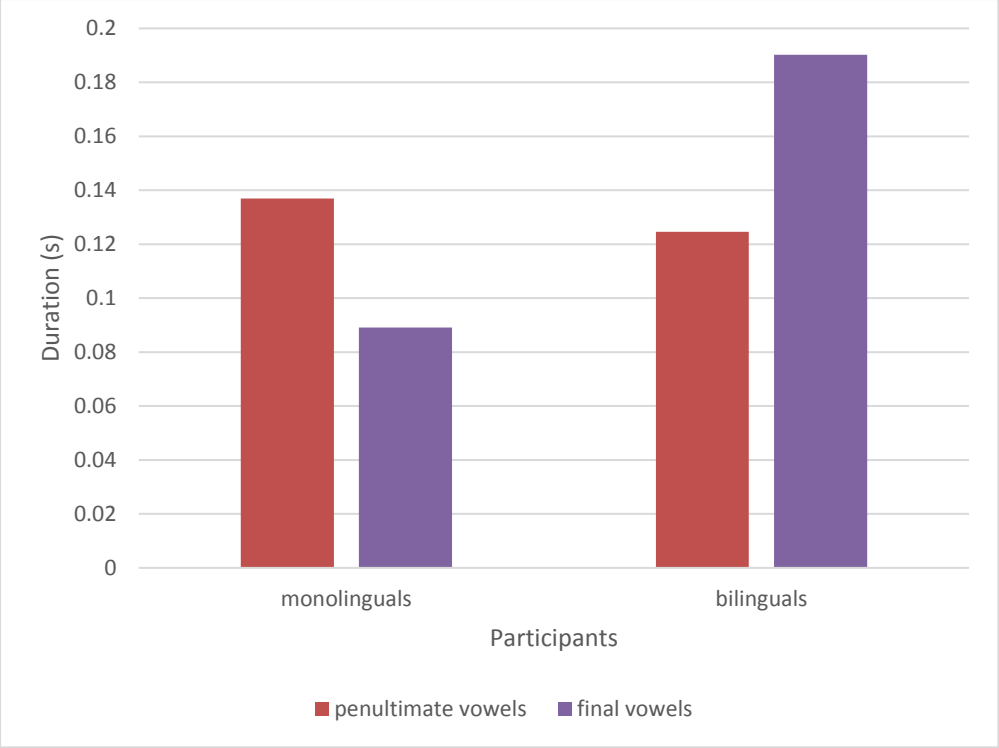


Figure 5. 5. A comparison of the STD 2 monolinguals' and STD 2 bilinguals' penultimate syllable vowels with final syllable vowels in seconds (s).

The results indicated that compared to the STD 2 monolinguals, the STD 2 bilinguals lengthen the final syllable vowel more than they lengthen the penultimate syllable vowel. In the same way, the STD 2 monolinguals maintain the lengthening of the penultimate syllable vowel compared to any other syllable in the word. Therefore, the PSVL and the final syllable lengthening patterns in the speech of the monolinguals and bilinguals are not unique to one STD, but apply to both STDs. What is worth noting is that, at 0.136953s, the STD 2 monolinguals' penultimate syllable vowel length is longer than that of STD 2 bilinguals, which is 00.124638s long (see section 5.3.1.2). This is different from the STD 1 bilinguals' penultimate syllable vowel length, which is longer than that of the STD 1 monolinguals. The STD 1 bilinguals' longer penultimate vowel could be attributed to their low proficiency in Setswana (see section 5.3.1.2). It is noteworthy that the STD 1 bilinguals' final syllable vowel mean was longer than that of their penultimate syllable vowel mean (see section 5.3.1.2).

5.3.1.4 A comparison of the penultimate syllable vowels versus non-penultimate syllable vowels in the utterances of monolinguals and bilinguals

It is worth mentioning that each syllable vowel in the utterances of the monolinguals and bilinguals was measured to determine if the penultimate syllable vowel in case of monolinguals and the final syllable vowels for the bilinguals were the most lengthened. The results produced a statistically significant difference signifying that the penultimate syllable vowel in all the words (even di-syllabic words where the penultimate syllable is also the first syllable) and the final syllable vowel were undeniably the most lengthened in the speech of monolinguals and bilinguals respectively. Figure 5.4 illustrates this.

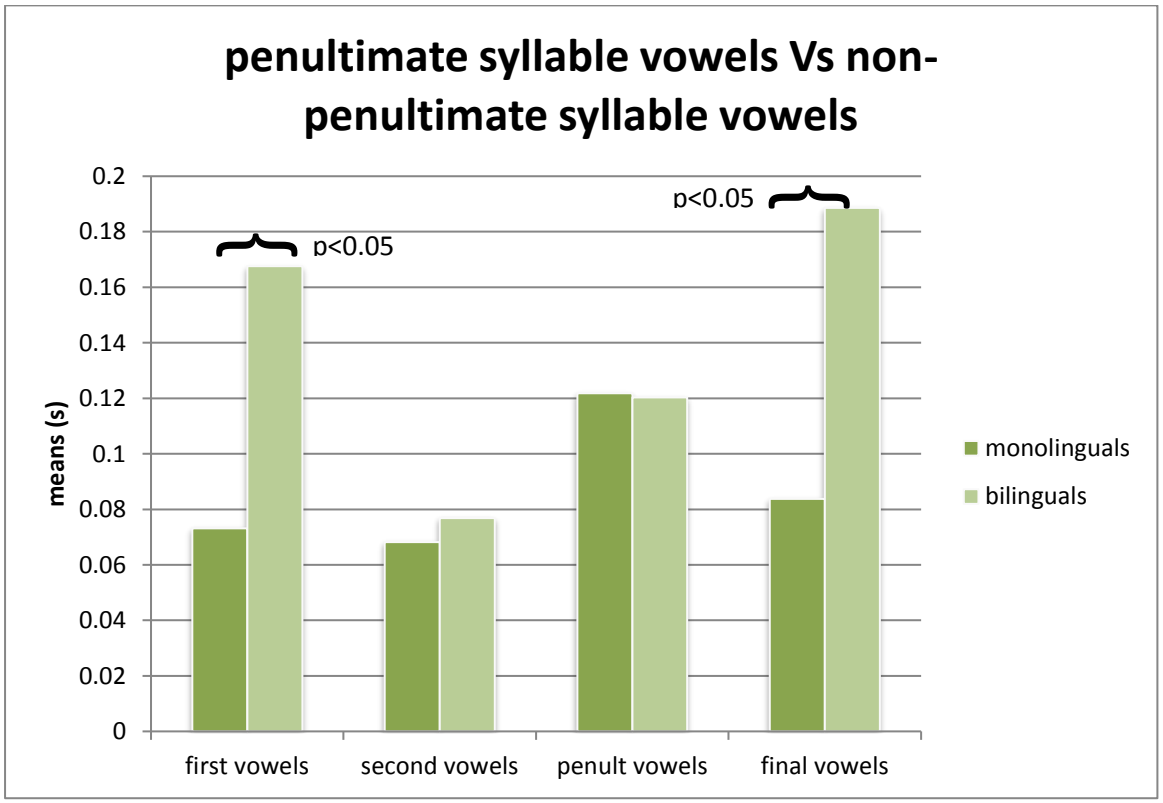


Figure 5. 6. A comparison of penultimate syllable vowels versus non-penultimate syllable vowels in the utterances of monolinguals and bilinguals.

5.3.1.5 A comparison of the different penultimate syllable vowels durations and the final syllable vowel durations in Setswana multi-syllabic words

The different vowels of the penultimate syllable and final syllable were compared to find out if there may be a specific vowel difference. The different vowels [a, e, i, o, u] are represented phonemically as /a, ɪ, ɛ, i, ɔ, ʊ, u/ in the order given, in the phonology of Setswana (see section 2.6). The [e] vowel is represented phonemically as /ɪ / or /ɛ/. Likewise [o] is symbolised phonemically as /ɔ, ʊ/. Therefore, the vowels [e] and [o] have variants or allophones. The results of the study show that the /a/ vowel is the most lengthened vowel in the speech of monolinguals while the /o/ is the least lengthened. Similarly, the /a/ is the most lengthened in the speech of the bilinguals. Different from the monolinguals the /u/ is the least lengthened by bilinguals. The /a/ vowel being the most lengthened with the /ʊ/ and /u/ as the least lengthened in the speech of monolinguals and bilinguals respectively in the present study is consistent with the phonetic universals (Catford, 1977; Hirata, 2004; Maddieson, 1999) that high vowels such as /ʊ/ and /u/ are shorter than low vowels such as /a/. Moreover the results of the present study are in line with Maddieson's (1999) findings that a vowel that precedes a voiced consonant is lengthened more than its equivalent preceding a voiceless consonant. The most frequently used word in the speech of the monolinguals and bilinguals is *mosimane-boy*. The /a/ vowel which is the most lengthened by far precedes the alveolar nasal /n/. Since /n/ is voiced, it is probable that it could have contributed to /a/ receiving the most lengthening in the monolinguals and bilinguals in the present study. In addition, /a/ appears in a penultimate syllable and so this could have resulted in it being the most lengthened.

5.3.2 The lengthening of the final syllable vowels by bilinguals

The statistical analysis of the results significantly indicated that the bilingual group lengthened the final syllable vowel (as shown by Figure 5.1) in their Setswana speech instead of the penultimate syllable vowel as required by the phonology of Setswana. The bilingual Praat window (Figure 5.3) also gives a clear picture of this.

A possible explanation to this could be the high English input in the bilinguals' language environment. Previous research has shown that final syllable lengthening is prevalent in the English language (Turk & Shattuck-Hufnagel, 2007; Yuen, 2014). Turk and Shattuck-Hufnagel (2007) distinguishes three types of phrase final duration. These are structure, content, and hybrid (see chapter 2). The type of final syllable lengthening observed in the present study is the structure-based view of lengthening, i.e., where the final syllable vowel in a CV syllable structure is lengthened. For example, in the word *mosimane (boy)* the vowel of the final syllable *–ne* is the most lengthened. While research on the type of final lengthening in English gives inconsistent results, the results of the present study are consistent with the findings of Cambier-Langeveld (2000), who found lengthening on the final syllable in English words. It is therefore probable that the lengthening of the final syllable in the Setswana multisyllabic words in the speech of bilinguals is due to the dominant English language in their environment.

5.3.3 Effects of increased levels of English on the penultimate syllable vowel length in the speech of Setswana-English bilinguals

This section addresses the research question: To what extent will the Setswana-English bilingual children aged 7 years who are in standard two have a different pattern of penultimate syllable duration in Setswana multisyllabic words in comparison with Setswana-English bilingual children aged 6 years old who are in standard one, because of increased exposure to English?

To answer this research question, the labelled Frog story data was again interrogated. As already discussed, unlike the monolinguals, who lengthened the penultimate syllable vowel, the bilingual group lengthened the final syllable vowel. In so doing, the bilinguals are going against the prerequisite of the Setswana phonology that dictates that the most lengthened vowel in a word should be the penultimate syllable vowel.

The aim of this section is to determine how the increased exposure to English experienced by the bilingual children has had an effect on the bilinguals non-lengthening of the penultimate syllable and lengthening of the final syllable instead.

5.3.3.1 A comparison of the STD 1 and STD 2 bilinguals' penultimate syllable vowels with the final syllable vowels

The STD 1 bilinguals' and STD 2 bilinguals' penultimate syllable vowel means were compared with the final syllable vowel means to determine if the STD the participants are in has an influence on the lengthening of the vowels of these two syllables. The rationale for this comparison was that being a year older and in STD 2 means that this group of bilinguals have been exposed to English for a longer time since they are older and STD 2 is a higher STD. Conversely, their exposure to Setswana increases as they are introduced to more Setswana learning as a subject at STD 2 (see chapter 1). Nonetheless, the results indicated that the STD 2 bilinguals still lengthen the final syllable vowel more than they lengthen the penultimate syllable vowel. It is not surprising that the STD 2 still maintain the lengthening of the final syllable vowel because the English input they receive still surpasses that of Setswana, assuming English is having an effect on their prosodic patterns, as suggested in the preceding sections. The children only receive a one-hour lesson of Setswana a week (see chapter 1). This finding mirrors that of Montrul (2008), that high L2 input at the expense of L1 affects the development of L1.

The results of the comparison between the STD 1 bilinguals and STD 2 bilinguals show that the STD 2 bilinguals lengthen the penultimate syllable vowels and the final syllable vowels more than the STD 1 bilinguals. However, there is significantly more PSVL at STD 2 than at STD 1. This difference could be due to the fact that the STD 2 bilinguals' exposure to both Setswana and English had increased. Therefore, the STD 2 bilinguals' lengthening of the penultimate syllable vowel more than the STD 1 bilinguals could be that their Setswana fluency had improved and so had the rate of speaking Setswana (see section 5.3.1.2). The improvement

in their Setswana also meant fewer pauses between syllables (see section 5.3.1.2). In addition, as the exposure to Setswana increased they became better at executing the requirements of the Setswana phonology. At the same time their exposure to English had increased so was the influence of English on the lengthening of the final syllable vowel. However, whereas the difference in the penultimate syllable vowel length by the STD 1 and STD 2 bilinguals is statistically significant, that of the final syllable vowels is not.

This finding indicates that increased language input is fundamental in the acquisition of a language (Montrul, 2008; Ordin & Polyanskaya, 2014; Ordin & Polyanskaya, 2015). The statistically significant difference in the penultimate syllable vowel length by STD 1 and STD 2 might mean that the PSVL of the STD 2 is developing in the expected direction though the final syllable vowel is still the most lengthened. The findings suggest that the phonological systems of the Setswana-English bilinguals have interacted possibly due to acquisition delay. This conclusion is based on Kehoe (2002) and Mok's (2011) view that when the languages of bilinguals influence each other it could be due to acquisition delay. However, it should be noted that acquisition delay in both the Cantonese-English bilinguals in Mok (2011) and German-Spanish bilinguals in Kehoe (2002) was only found in the bilingual children's English and German (both considered stress-timed) but not in their Cantonese and Spanish (both considered syllable-timed) respectively. Kehoe (2002) attributed reported acquisition delay in the acquisition of the German vowel length contrast relative to monolinguals to the more marked vowel system of German, which was a source of difficulty for the bilinguals to acquire, whereas Spanish, which is less marked in terms of vowels, was easier to acquire.

Since Setswana, like Spanish and Cantonese, is considered syllable-timed the expectation is that the Setswana-English bilinguals' acquisition of the penultimate syllable vowel length should not exhibit acquisition delay but should resemble that of Setswana monolinguals. However, the findings indicate that it does not resemble that of the monolinguals. The question then is what could have happened to the Setswana-English bilinguals' development of PSVL? A possible answer to this question could be L1 attrition or L1 incomplete acquisition. However, because there is nothing in the literature regarding when children acquire the phonological system of Setswana, and that the present study did not use young monolingual control group, the present study is not in a position to draw conclusions from such cognitive acquisition theories that could have resulted in the dissimilarity in the PSVL of the Setswana-English bilinguals and Setswana monolinguals.

5.3.3.2 A comparison of the STD 1 bilinguals and STD 2 bilinguals' home language use

The STD 1 and STD 2 bilinguals home language use based on the questionnaire data given by parents were compared. The aim was to find out if there was a relationship between the home language use and their non-lengthening of the penultimate syllable compared to their lengthening of the final syllable vowel. The home language use was measured on a scale of 1 to 5 where 1 was the exclusive use of Setswana, 5 the exclusive use of English and 3 the use of both Setswana and English. The results of the bilinguals' STD 1 and bilinguals' STD 2 indicated that they use both Setswana and English at home. However, the mean score of home language use shows that the bilinguals' use is more English than it is Setswana with the score at 3.678 for STD 1 and 3.552 for STD 2. While both the STD 1s and STD 2s home language

use is more English, it is apparent that the STD 1 group uses more English at home than the STD 2's.

The reason for the STD 1 group using more English could be that their exposure to Setswana is minimal compared to the STD 2 group because the STD 1 students are in a lower class (STD). They still have not been exposed to more Setswana as a subject at school. However, the difference in the language use at home by STD 1 and STD 2 bilingual children is not statistically significant.

The STD 1s' and STD 2s' home language use is related to their patterns of penultimate syllable vowel lengthening as well as the final syllable vowel lengthening. The STD 2 bilinguals lengthen the penultimate syllable more than the STD 1 bilinguals. It is possible that their exposure to Setswana at school when Setswana was introduced as a subject resulted in them speaking more of Setswana at home, which in turn caused their lengthening of the penultimate syllable length to be more similar to patterns in L1. It should be noted, however, that the final syllable vowel is still lengthened more than the penultimate syllable vowel. In so doing, the STD 2 bilinguals are still going against the phonological requirements of Setswana (see section 5.3.1). The only difference is that their penultimate syllable vowel length is more than that of the STD 1 bilinguals. This goes to show that increased exposure has an effect on the lengthening of the penultimate syllable vowel length. However, according to the questionnaires information, exposure to English still exceeds that of Setswana. That could explain why the STD 2 bilinguals' final syllable vowel is still lengthened more than that of the penultimate syllable vowel. The results of the present study are therefore in support of Ordin and

Polyanskaya (2014) and Ordin and Polyanskaya (2015), that proficiency has an effect on the development of prosody.

5.3.4 The possible impact of lack of lengthening the penultimate syllable vowels in the speech of bilinguals

This sections looks at the possible effects of non-lengthening of the penultimate syllable vowel length by bilinguals on the listeners' perception of the bilinguals' utterance.

In Setswana, stress is manifested in the lengthening of the penultimate vowel (Hyman, 2009). The shifting of lexical stress to the final syllable vowel by bilinguals may affect the vowel quality and so has the possibility of affecting word recognition. This assumption is based on Culter and Clifton's (1984) findings that words with incorrect stress placement were difficult to recognise. Culter and Clifton (1984) concluded that lexical stress information played a vital role in word recognition. In addition, Culter and Clifton (1984) found that multi-syllabic words pronounced in isolation were only recognised by listeners if the lexical stress was correctly placed. Further support of the importance of correct placement of lexical stress is given by Bansal (1966). The participants in Bansal's study listened to Indian English speech, which has differing stress patterns to English. As a result the listeners misinterpreted the words with wrong stress placement to match with the stress patterns of words as represented in their mental lexicon. The incorrect word stress information precipitated an error of interpretation. Wrong or different placement of lexical stress by the bilinguals in the present study might result in mispronunciation of words, which could make it difficult for listeners to comprehend the Setswana speech of the Setswana-English bilinguals.

Furthermore, the misplacement of the lexical stress by bilinguals in the present study could lead to changes in phonetic segment duration, which can make it difficult for listeners to make linguistic decisions. This is because the patterns of phonetic segment durations transmit information about the linguistic content of an utterance (Klatt, 1976).

While this study continues to show the effects of high L2 input at the expense of L1 input, the main contribution that this study is making to the field regarding vowel length is that even the vowel length of a less marked syllable-timed language like Setswana is susceptible to L2 influence when the L2 input surpasses that of the L1. Previous studies such as that of Kehoe (2002) found that the bilinguals' vowel length matches that of the monolinguals when the language is less marked such as Spanish (considered syllable-timed) but they do not match that of monolinguals' when the language is marked like German (considered stress-timed). It is note-worthy that the participants in Kehoe (2002) are simultaneous bilinguals and so could have been receiving somewhat equal input of both of their languages to some extent; that could have resulted in similar Spanish vowel length with monolinguals.

Further contribution to the field by the present study on vowel length is that it seems age has little influence on when children acquire the vowel length of a language. Kehoe and Stoel-Gammon (2001) and Salidis and Johnson (1997) found vowel lengthening in early childhood, suggesting vowel length differences are early acquired. The findings of the present study suggest otherwise. This is because if vowel length was acquired early in life then the Setswana-English bilinguals in the present study would not display distinctive PSVL patterns from those

of the Setswana monolinguals. This is because they had acquired Setswana appropriate for their age before they were introduced to English at the age of 3 years old when they started nursery school (based on the language background information provided by the parents). Therefore, by the time they were introduced to English, their PSVL should have been in place. Because the Setswana-English bilinguals displayed unique PSVL it could mean that PSVL is not fully acquired. This implies that age might not play a significant role in vowel length acquisition. If age plays a significant role the Setswana-English bilinguals could have attrited in the PSVL.

The findings show that the markedness of a language and age of acquisition are not unanimous in languages. The phonological systems of different languages could be accountable for vowel length acquisition by children.

5.4 Summary of the chapter

This chapter discussed the results of the study in relation to the findings (chapter 4). The first part of the chapter discussed the different patterns of speech rhythm in the speech of Setswana monolinguals and Setswana-English bilinguals. The speech pattern of the bilinguals was found, surprisingly, to have been more syllable-timed than that of monolinguals. The present study concluded that it seems age at which bilingual children acquire the rhythm of the language similar to that of age matched monolinguals may not necessarily play a significant role, rather the phonology of the target language does.

The other main contributions to the field are that the rhythm type of the target language and the language environment of the bilinguals' upbringing may not necessarily have a strong effect in the acquisition of a high variable rhythm. If age, the rhythm type of the language being acquired, and the environment of the larger community had a strong influence in the acquisition of rhythm patterns similar to that of monolinguals, then the bilingual children in the present study would have produced similar statistically significant vocalic measures to that of monolinguals.

In addition, the present study has established that a low durational variability occurs in the first language of bilinguals even when that language is syllable-timed. Even though the present study could not ascertain what could have caused the bilinguals to have more syllable-timed speech than the monolinguals, it concluded that this could be due to either acquisition delay, incomplete acquisition or L1 attrition in the speech of bilinguals. The present study could not attribute the divergence in the speech rhythm of the Setswana-English bilinguals to any one cognitive theory because it seems that there is no literature on when Setswana speech rhythm is acquired. In addition the study did not use young monolingual control group. However the non-significant difference in the rhythm of the STD 1's and STD 2's bilinguals which could indicate there is no development taking place, might suggest either incomplete acquisition or L1 attrition. Since this study is not a longitudinal study and could not ascertain if the Setswana rhythm of the bilinguals was acquired before exposure to English, the study cannot attribute the divergence in the bilinguals rhythm compared to monolinguals to L1 attrition. Indeed, while noted earlier, I do not in this study aim to empirically test for assumptions of attrition or incomplete acquisition, the findings do suggest a possible role for incomplete acquisition as likely to be the cause of the dissimilarity in the Setswana rhythm of the bilinguals and

monolinguals. Further research could explore this more fully (see limitations section in next chapter).

The second part of the chapter discussed differences in the penultimate syllable length in the speech of the Setswana-English bilinguals and Setswana monolinguals. The Setswana monolinguals adhered to the lengthening of the penultimate syllable as per the phonological system of Setswana but the bilinguals' lengthened the final syllable instead. The lengthening of the final syllable by bilinguals could be due to the dominant English in their language environment, as research has shown that final syllable lengthening is widespread in the English language. As with speech rhythm, the present study concluded that the dissimilarities in the PSVL of the Setswana-English bilinguals and Setswana monolinguals could be due to acquisition delay, incomplete acquisition or L1 attrition. However, the present study could not conclude which specific one of these theories of language acquisition could account for the differences for the same reason as stated above. Nonetheless, the finding that the STD 2 bilinguals lengthen the penultimate syllable vowel more than the STD 1 bilinguals show that there is development taking place therefore it is likely that acquisition delay has occurred in the bilinguals' acquisition of PSVL.

Having established that the Setswana-English bilinguals lengthen the final syllable vowel more than the penultimate syllable vowel, and that this could be due to the dominant English, comparisons of the STD (classroom level) and of the home language of the bilinguals was done to determine if increased exposure to English has an effect on the lengthening of these two syllable vowels. The results produced a statistically significant difference in the penultimate syllable vowel length of the STD 1 and STD 2. The difference in the final syllable length and

in the home language use of the Setswana-English bilinguals and Setswana monolinguals were not statistically significant. The statistically significant difference in the penultimate syllable vowel length by STD 1 and STD 2 might mean that the PSVL of the STD 2 is developing in the expected direction due to the exposure to more Setswana as a subject at school, though the final syllable vowel is still the most lengthened. The findings suggest that the phonological systems of the Setswana-English bilinguals have interacted due to acquisition delay based on Kehoe (2002) and Mok's (2011). However, acquisition delay was only found on the stressed-timed languages English (Mok, 2011) and German (Kehoe, 2002) but not syllable-time Cantonese (Mok, 2011) and Spanish (Kehoe, 2002). Therefore, because Setswana is considered syllable-timed like Cantonese and Spanish, the expectation is that the Setswana-English bilinguals should not experience acquisition delay in this prosodic element. This therefore, rules out the theory of acquisition delay in the prosodic feature of PSVL in the speech of Setswana-English bilinguals, leaving L1 attrition or L1 incomplete acquisition as the possible explanations to the divergence. However, as already stated, the present study cannot attribute the effect to either of these language acquisition theories.

The study has therefore demonstrated the effects of high L2 input where L1 input has significantly been reduced in the speech rhythm and PSVL of native Setswana-English bilinguals who are dominant in English their L2. This was measured at different ages (6-7 years old), different levels of exposure to English and levels of proficiency, within the frameworks of bilingual language processing and child L2 acquisition but without necessarily restricting it to the language acquisition theories of incomplete acquisition, acquisition delay or L1 attrition as such.

6. CONCLUSION

6.1 Introduction

This chapter is the final chapter of the thesis; therefore it gives a summary of the main findings of the study, highlights the implications of the study, discusses the limitation of the study, as well as makes recommendations for further study.

6.2 A summary of the main findings of the study

The study investigated the speech rhythm pattern and penultimate syllable vowel length in the Setswana speech of private English-medium educated early sequential Setswana-English bilingual children aged 6-7 years growing up in Botswana, a country with a diglossic setting, where English is the dominant high-status language in educational and public contexts. For this group of children, taught full-time in English from the age of 3 years, the L2 becomes their dominant language through exposure to English-medium education. The prosodic patterns of this group of children were compared to those of monolingual children educated in public schools, for whom English is a learner language, to determine if the prosodic features of speech rhythm and PSVL mirror those of monolinguals, or if English has an effect on the Setswana speech rhythm and penultimate syllable vowel length in comparison with monolingual children.

The data was elicited through the telling of the Frog Story. The children also completed the Raven's Coloured Progressive Metrics task to ensure that the two groups did not differ significantly cognitively. In addition, a language and background questionnaire was completed by the parents and used to offer insights into the findings.

The main findings of the study are summarised according to the research questions, (see page 107)

6.2.1 The pattern of rhythm timing

The most important finding regarding the pattern of speech rhythm of Setswana-English bilingual children compared to that of the Setswana monolingual children was that the speech rhythm pattern of the bilinguals was found, surprisingly, to have been more syllable-timed than that of monolinguals. The nPVI-V and Varco V of the Setswana-English bilinguals produced lower durational variability in the Setswana speech rhythm compared with the Setswana monolinguals. As Setswana is a syllable-timed language (Coetzee & Wissing, 2007), it was hypothesised that the bilingual children's speech rhythm would not be the same as their monolingual peers. Previous studies have shown that the speech rhythm of children develops from a low durational variability because a less vocalic variability in rhythm timing is easier to acquire than one with more variability (Allen & Hawkins, 1980; Grabe et al., 1999; Kehoe et al., 2011; Mok, 2011; Ordin & Polyanskaya, 2014, 2015; Payne et al., 2012). Therefore, the conclusion made was that it is possible that the Setswana-English bilinguals, who are 6-7 years old in the present study, are still at an early stage of Setswana rhythm development; and so could be exhibiting any of the language acquisition theories of L1 incomplete acquisition, delayed acquisition of their L1 (Setswana) or L1 attrition. However, the study could not ascertain any of these language acquisition theories because younger monolingual control

group was not used. In addition, there is nothing in the literature that indicates when the phonology of Setswana is acquired.

6.2.2 The effect of increased levels of exposure to English on the pattern of rhythm timing

This section provides reasons for the differences in the patterns of Setswana rhythm by bilinguals compared to monolinguals. One possibility highlighted by this thesis is that an increased exposure to English in the speech of the Setswana-English bilinguals could be responsible for the low vocalic variability in their Setswana speech rhythm compared to that of Setswana monolinguals. The language background questionnaire information provided by the parents indicated that the Setswana-English bilinguals spoke Setswana as their first language (see section 5.2.1). They were introduced to high input of English at the age of 3 years when they started nursery school. Therefore, the Setswana-English bilinguals who were educated in private English medium schools experienced increased English exposure compared to age matched monolinguals who were educated in public school where English is a learner language (see section 1.3.3). Montrul (2006) argues that, once children start school in one language, they will not reach native speaker attainment in both languages with the minority language being the most affected. The increased English exposure resulted in low exposure to Setswana as reflected by the language background information provided by the parents. Low vocalic variability indicates that the Setswana-English bilinguals' speech rhythm is still developing. This could mean that the bilingual children have experienced, incomplete acquisition, acquisition delay, or L1 attrition in their Setswana. However, it is probable that incomplete acquisition could have been responsible because a comparison of the STD 1's and STD 2's bilinguals' speech rhythm did not yield significant results indicating there is no

development happening. However, as already stated this study could not ascertain any of these cognitive theories.

6.2.3 The pattern of penultimate syllable duration

The main finding of the study is that the monolinguals lengthen the penultimate syllable vowel as per the phonological requirement of the Setswana phonological system, which requires that the most lengthened syllable vowel in the Setswana speech should be the penultimate syllable vowel. The Setswana-English bilinguals do not; they lengthen the final syllable instead, an effect observed in English (Turk & Shattuck-Hufnagel, 2007; Yuen, 2014). It is, therefore, likely that L2 English is having an effect on the production of L1 Setswana.

6.2.4 The effect of increased levels of exposure to English on the pattern of penultimate syllable duration

The major finding is that increased level of exposure to English has probably resulted in the Setswana-English bilinguals lengthening the final vowel length instead of the required penultimate syllable vowel. To further determine the effect of increased exposure to English on the lengthening of these two syllable vowels, a STD and home language comparison of the bilinguals was done. The results produced a statistically significant difference in the penultimate syllable vowel length of the STD 1 bilinguals and STD 2 bilinguals. The STD 2 had greater penultimate syllable vowel length compared to the STD1. The difference in the final syllable length and home language use of the STD 1 and STD 2 Setswana-English bilinguals were not statistically significant.

The statistically significant difference in the penultimate syllable vowel length by STD 1 bilinguals and STD 2 bilinguals might mean that the PSVL of the STD 2 is developing in the expected direction due to more exposure to Setswana as a subject at school, though the final syllable vowel is still the most lengthened. As the STD 2 bilinguals' PSVL was increased, this finding suggests that the phonological systems of the Setswana-English bilinguals have interacted, which could mean acquisition delay (Kehoe, 2002; Mok, 2011).

6.3 Implications of the study

The study has important implications to make regarding the acquisition of speech rhythm and syllable vowel length, with particular reference to the penultimate syllable vowel length, in general processes of phonological development across bilingual child populations whose language differ in prosodic features. The conclusions drawn about these two prosodic features take into consideration the language acquisition theories of acquisition delay, incomplete acquisition, and L1 attrition and suggest that further exploration could usefully provide empirical findings to test these theories more specifically.

6.3.1 Speech rhythm

The finding that the Setswana-English bilinguals Setswana speech exhibited a low vocalic variability than Setswana monolinguals has implications for speech rhythm acquisition in bilingual children. The present study concluded that bilinguals' complete acquisition of a high vocalic variability rhythm, or acquisition that is close to that of age matched monolinguals, is later than the age of 7 years, as demonstrated through this study of Setswana. While the present study did not look at children in a great range of ages, the data collected from the 6-7-year-old

children compared with other studies (Bunta & Ingram 2007; Kehoe et al., 2011; Lleo et al., 2007; Mok 2011) give reason to believe that the acquisition of high durational variability (i.e., stress-timed) rhythm by bilingual children, similar to that of monolinguals, is after the age of 7 years. In displaying less vocalic variability than their Setswana monolingual peers, the rhythmic pattern of the 6-7-year-old Setswana-English bilinguals in the present study is similar to that of 3-year-old bilinguals in studies by Mok (2011) and Kehoe (2011). The participants in Mok (2011) displayed a similar rhythmic pattern in their two languages tending towards less vocalic variability in English. Mok (2011) concluded that there is language interaction between the two languages of the bilinguals that might result in language acquisition delay. Similarly, Kehoe et al.'s (2011) participants showed a less distinct difference between their two languages. The rhythm patterns of Kehoe et al.'s (2011) bilinguals pointed towards a less vocalic variable in German compared to that of monolingual German. The conclusion drawn from this comparison is that, unlike bilinguals in Bunta and Ingram's (2007) study, who were able to keep the rhythm of their two languages separate at the age of around 5 years, acquisition of Setswana rhythm, similar to that of age matched Setswana monolinguals, is later than the age of 7 years. As a result, the research reported here suggests that **it seems that bilingual children's acquisition of the rhythm of the language similar to that of age matched monolinguals does not necessarily depend on the age but rather, on the phonology of the language under investigation.**

The present study also concluded that, similar to that of monolinguals of the same age, the acquisition of speech rhythm by bilinguals might not necessarily depend on the rhythm of the language under investigation (whether syllable-timed or stress-timed). The participants of the present study are acquiring Setswana, a language considered to be syllable-timed. Since the language has low durational variability, the expectation is that the bilinguals' and

monolinguals' speech rhythm patterns would match, similar to the findings of previous studies (Bunta & Ingram 2007; Kehoe, 2011; Mok, 2011) which showed that, when the language that is being acquired by bilinguals is syllabled-timed (Cantonese in the case of Mok, 2011 and Spanish for Bunta & Ingram, 2007 participants), the speech rhythm patterns of the monolinguals and bilinguals are similar. However, when the language being acquired by bilinguals is stress-timed, the speech rhythm patterns of the two groups are dissimilar, with the bilinguals' rhythm tending towards a low vocalic variability. The present study demonstrates that bilinguals display low variability even when the language is syllable-timed. Therefore, in displaying rhythm patterns different from that of monolinguals in a language considered to be syllable-timed, the findings of the present study show that **acquiring a rhythmic pattern similar to that of monolinguals has little to do with the rhythm type of the language being acquired**. In addition, the present study concluded that a low durational variable by bilinguals could occur in the first language of bilinguals even when that language is syllable-timed.

A further conclusion drawn by the present study is that **the language of the larger community does not necessarily contribute to the rhythm pattern of the bilinguals**. The participants of the present study grew up in Botswana where the majority of the people speak Setswana. Moreover, the participants had never lived outside Botswana, according to the questionnaire answers provided by the parents. However, growing up in an environment where the majority of the people speak Setswana does not seem to have contributed towards the Setswana speech rhythm of the bilinguals. If the language of the larger community has an effect on the acquisition of speech rhythm, then there would not be a statistically significant difference in the Setswana rhythm patterns of the bilinguals and that of monolinguals. Even though both the groups' rhythm is syllable-timed, the bilinguals' more syllable-timed rhythm compared to monolinguals implies that the language of the larger community had not contributed towards

the bilinguals' speech rhythm development because, if it had, then the speech rhythm of the bilinguals would be similar to that of monolinguals. The present study has concluded that **language exposure and language dominance play a major role in the acquisition of rhythm even if the language that receives more exposure is the minority language in the community**.

The study further concluded that the divergence in the speech rhythm of the Setswana-English bilingual children could be due to the language acquisition theories of acquisition delay, incomplete acquisition, or L1 attrition however the present study could not ascertain this due to the reasons stated in chapter 2.5 and section 6.1.1. In addition, the present study could not conclude on any of these theories, especially L1 attrition, as this was not a longitudinal study. Nonetheless, what can be observed in the data is more likely a case of L1 incomplete acquisition in the speech of the Setswana-English bilinguals. This is because a comparison of the bilinguals by STD did not produce a significant difference. Therefore, there is no indication that the speech rhythm of the bilingual group is moving in the expected direction. If the speech rhythm scores of the STD 2s produced a high vocalic variability compared to that of STD 1s, it would have shown that the STD 2s rhythm is moving in the expected direction, towards the rhythm of Setswana monolinguals, which has a high vocalic variability, compared to that of the Setswana-English bilinguals. Consequently, indicating that there could be an interaction of the phonological systems of the bilinguals' languages. Interaction of the bilinguals' languages has been attributed to acquisition delay (Kehoe, 2002; Mok, 2011).

6.3.2 The penultimate syllable vowel length

The finding that the Setswana-English bilinguals lengthen the final syllable vowel more than the penultimate syllable vowel led the study to conclude that the lengthening of the final syllable vowel could be due to the influence of English, as final syllable vowel lengthening is prevalent in the English language. Moreover, the study concluded that, just like in marked stress-timed languages, the vowel length of a less marked syllable-timed language like Setswana is susceptible to L2 influence when the L2 input exceeds that of the L1. Previous studies such as that of Kehoe (2002) found that the bilinguals' vowel length matches that of the monolinguals when the language is less marked, such as Spanish (considered syllable-timed), but they do not match that of monolinguals' when the language is marked, like German (considered stress-timed).

A further conclusion drawn by the present study on vowel length is that it seems **age has little influence on when children acquire the vowel length of a language**. Kehoe and Stoel-Gammon (2001) and Salidis and Johnson (1997) found vowel lengthening in early childhood, suggesting vowel length differences are early acquired. The findings of the present study suggest otherwise. This is because, if vowel length was acquired early in life, then the Setswana-English bilinguals in the present study would not display distinctive PSVL patterns different from those of the Setswana monolinguals. This is because the bilinguals had acquired Setswana appropriate for their age before they were introduced to English at the age of 3 years old when they started nursery school (based on the language background information provided by the parents). Therefore, by the time they were introduced to English, their PSVL should have been in place. Because the Setswana-English bilinguals displayed unique PSVL, it could mean that their PSVL is not fully acquired.

Based on these findings, the study concluded that it is not always the case that when a language is not marked (i.e., is syllable-timed) the acquisition of the vowel length will not be a source of difficulty to the bilinguals for them to have similar vowel length patterns to monolinguals. This could mean that **acquiring vowel length patterns similar to monolinguals depends on the phonological system of the language being acquired**.

While this research study could not ascertain for definite which language theory is responsible for the prosodic features uncovered in the examination of PSVL, an observation of the data suggests that it is most likely that acquisition delay has occurred. This is because a comparison of the bilinguals by STD produced significant results in the direction of STD 2s. An increase exposure in Setswana as a subject at school in STD 2 could have resulted in the lengthening of the penultimate syllable length compared to that of STD 1s. Even though the STD 2's penultimate vowel is still not the most lengthened, it being longer than that of the STD 1s shows that it is moving in the expected direction. This suggests that the phonological systems of this group of children have interacted which could mean acquisition delay (Kehoe, 2002; Mok, 2011). What is clear though is that language dominance has played a significant role in the divergence in the PSVL of Setswana-English bilinguals' children and Setswana monolingual children.

6.4 Limitations of the study

Even though this study has yielded comprehensive results, which will contribute to the field of speech rhythm and vowel length particularly the penultimate syllable vowel length, its design was not without flaws. A number of caveats pertaining to the present study are discussed below.

6.4.1 Participants

At 20 (10 Setswana-English bilinguals and 10 Setswana monolinguals), the number of the participants is somewhat small, and so it is not possible to generalise the results to the whole population of children in this age range in Botswana. It would, therefore, be desirable to obtain more data from a larger number of children in both groups, and possibly from a wider age range, to be in a position to generalise.

6.4.2 Data collection

Some issues were encountered regarding data collection, such as the questionnaire, the recording environment, and the narrative task.

While care was taken in the selection of the questionnaires, which met the requirements of the study, the questionnaire to parents is a self-reporting questionnaire, based on parents' opinions only. It therefore lacks validity and there is no way of knowing if the responded was truthful. The selection of the participants for the present study depended on the information provided by the parents on the questionnaire. If the information provided was incorrect this would have an impact on the results of the study.

The recording of the participants was not done in a soundproof room, as none was available. Even though care was taken to make sure that the recording area was without noise, noise was inevitable, as the recordings were done at schools where there are a lot of people involved in different activities.

6.4.3 Durational measurement

The present study only measured the vowels of the syllables rather than the whole syllable including the consonants. It is possible that measuring the whole syllable might produce different measurements, and throw further or different light on the data.

6.4.4 Syllable-timed Setswana

There is no empirical study that gives robust evidence that Setswana is syllable-timed. The assumption of this study – i.e., that Setswana is syllable timed – is based on impressionistic reports (i.e., Coetzee & Wissing, 2007) and analogy with other Bantu languages (Cole, 1955; Gut et. al, 2001). Empirical evidence that adult Setswana is syllable-timed would lend more weight to the findings of this study.

6.4.5 The English the bilingual children are exposed to

The study did not investigate the type(s) or variety/varieties of English the bilingual children are exposed to. For example, there is no information on whether the children's teachers and/or parents' variety of English is similar to native speakers of, e.g., British or American English, or if it is strongly influenced by Setswana (or other local languages), or is anywhere in between.

More information in this respect could shed further light on the children's developing speech patterns.

6.4.6 Younger monolingual control group

The study did not use a younger monolingual control group which could enable it to fully empirically address the question of cognitive theories such as incomplete acquisition, delayed acquisition and L1 attrition in the speech of bilinguals.

6.4.7 Unintelligibility of the bilinguals' Setswana

The study does not have a measure for determining if the bilingual children's different patterns of Setswana speech rhythm affect their intelligibility in Setswana compared to their monolingual peers. Such evidence would strengthen the motivation for carrying out such a study.

6.4.8 Setswana bi-syllabic words

Bi-syllabic words could also be analysed differently as the penultimate syllable is also the first syllable. Therefore, the length of the word could affect the length of the penultimate syllable. This was not followed up in this study.

6.5 Recommendations

This section gives some suggestion for future research.

The study recommends that future research should replicate the study with a larger number of participants. A larger sample size will also enable the results of the study to be more easily generalisable to the whole population. The study also recommends that future research should include children who are in senior primary (STD 3 and above) to find out if their rhythm and PSVL patterns mirror that of the participants who are in lower primary or whether there has been any development.

The study also recommends that future research should take into consideration the measurement of the whole syllable, not just the vowels, as there could be durational differences between the measurements of the vowels and that of the whole syllable, including the consonant/s of the syllable, which could throw additional light on the findings presented here.

A further recommendation is that future research should consider a longitudinal study to determine when children acquire features of the phonological system of Setswana, such as speech rhythm and PSVL. This will help determine which cognitive language theories could be responsible for the divergence of bilinguals' patterns compared to monolinguals' patterns.

In addition, the study recommends that future research should analyse the Setswana-English bilinguals' English narration of the same story that they narrated in Setswana, as this might shed light on their Setswana rhythm and PSVL patterns.

Another recommendation is that future research should collect empirical Setswana data from adult participants and from different areas of Botswana to determine if Setswana speech rhythm is indeed syllable-timed.

Furthermore, it is the recommendation of the present study that it should take into consideration other methods for the selection of the participants for the study rather than the questionnaire only. The questionnaire should be used alongside other methods such as the interview to further ensure validity.

It is also the recommendation of the present study that, where possible, a soundproof room should be used in future when collecting recordings to ensure that they are free from unwanted noise which could interfere with the acoustic analysis of the data.

Moreover, the present study recommends an investigation of the relationship between speech rate and rhythm metrics. This could show if speech rate has an influence on the rhythm type of speakers, i.e., whether their speech sounds and/or is more syllable-timed or stressed-timed due to speech rate.

6.6 Conclusion

The present study examined the patterns of the Setswana speech rhythm and penultimate syllable vowel lengthening in the speech of Setswana-English bilinguals who are 6-7 years old and found that they differ from that of their Setswana monolingual peers. The Setswana speech rhythm of the bilinguals has low vocalic variability than that of their age-matched Setswana monolinguals. In addition, the Setswana-English bilinguals lengthen the final syllable vowel instead of the penultimate syllable vowel required by the phonological system of Setswana. The Setswana-English attend private English medium schools where English is the main medium of instruction. For this reason, English is their dominant language as it is also their home language as shown by the language background information provided by the parents. In the same way, the study has described the Setswana speech rhythm and PSVL patterns of age-matched Setswana monolinguals, as they were the bases of comparison with the bilinguals. The Setswana monolinguals speech rhythm exhibited a high vocalic variability compared to that of the Setswana-English bilinguals. Furthermore, the monolingual group lengthened the penultimate syllable vowel as obligated by the Setswana phonological system.

The findings of the Setswana-English bilinguals' patterns of these prosodic features were compared to existing studies on the acquisition of these prosodic features by children in other language groups. The present study established that there were some similarities with some studies pertaining to the acquisition of these prosodic features, but they were also some differences. In particular, like with other studies (Allen & Hawkins, 1980; Grabe et al., 1999; Mok, 2011; Ordin & Polyanskaya, 2014, 2015; Payne et al., 2012), the present study established that learning of any language beginnings from a low vocalic variability regardless of whether is stress-timed. Different from previous studies, the present study established that

the low vocalic variability is characteristic of early rhythm development even when the language is considered syllable-timed and it is the first language of the children. This conclusion is based on the Setswana-English bilinguals' low vocalic variability in Setswana rhythm compared to that of the monolinguals.

Different from prior work on vowel length acquisition (Kehoe, 2002; Mok, 2011), the present study has demonstrated that vowel lengthening in a less marked syllable-timed language like Setswana could be a form of difficulty for bilinguals whose L2 input surpasses that of L1. The Setswana-English bilinguals' non-lengthening of the penultimate vowel, as required by the Setswana phonology, led to this conclusion.

Similar to earlier research on bilingual children's language acquisition, the results of the Setswana-English bilinguals' Setswana speech rhythm and PSVL patterns in the present study continue to show that it is likely that high L2 input where L1 input is significantly reduced affects the children's L1. The present study is of the view that high L2 input in early childhood could lead to, either L1 incomplete acquisition, L1 acquisition delay or L1 attrition, but the present study could not ascertain which, if any, was relevant (see chapter 2, 5 and section 6.1.1).

It is hoped that the findings of the present study have contributed to the field of speech rhythm and vowel length, especially penultimate syllable vowel length, in language acquisition by children. It is also hoped that the present study has laid down the foundation for further research in these under-researched prosodic elements in children especially in Setswana and African

languages in general. As a matter of fact, to the best knowledge of the researcher this research is the first of its kind in Setswana.

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8. APPENDICES

APPENDIX 1: QUESTIONNAIRE

Reference Code _____

Language and Social Background Questionnaire (to be completed by parents)

Thank you for taking time to complete this questionnaire. The aim of the questionnaire is to get information on the language use and social background of children in Botswana. It is important that you answer the questions to the best of your ability. However there are no right or wrong answers.

1. Today's date: Day_____ Month _____Year_____

2. Completed by: Mother ____Father ____Other (please specify)_____

Part A – Background

The following information refers to your CHILD:

3. First name: _____ Last name: _____

4. Date of birth: Day_____Month_____Year_____ **5**. Sex: _____ **6.** Grade: _____

7. Country of birth: _____. If not Botswana how long did the child live in that country?_____

The following information refers to the PARENTS:

8. Country of birth of MOTHER: _____

What language(s) did the mother grow up speaking?

_____

__

List the languages known by the mother, in order of fluency (most fluent to least fluent):

_____

__

9. Country of birth of FATHER: _____

What language(s) did the father grow up speaking?

_____

__

List the languages known by the father, in order of fluency (most fluent to least fluent):

_____

__

Please indicate the highest level of education and occupation for each parent.

10. MOTHER

Qualification: _____

Occupation:_____

11. FATHER

Qualification _____

Occupation:_____

Part B – Child's Language Experience

12. Rate your child's speaking of the following languages

Name of language(s)	Below average	Average	Good	Excellent
Setswana				
English				
Other (specify)				

13. Rate your child's understanding of the following languages:

Name of language(s)	Below average	Average	Good	Excellent
Setswana				
English				
Other (specify)				

14. Which language did your child first speak?

_____

Setswana:_____ Other language(s).**List them**:

_____

Both/All at the same time. **List them**:

_____

15. At what age did your child start nursery school?

_____

16. Has your child lived outside Botswana for two (2) years or more?

Yes_____ no _____

17. Is there another person (e.g., maid, grandparent) who lives in the home?

Yes_____ No_____

If yes, what are the languages spoken by the person?

_____

Part C – Language in the home

For each of the following, please indicate with a check mark (√) the use of language in your home for that activity. If a question does not apply to your family, please indicate by writing N/A.

Questions about the CHILD

	1	2	3	4	5	6
Language child speaks to:	**All Setswana**	**More Setswana & little English**	**Half Setswana, half English**	**More English & little Setswana**	**All English**	**Other language**
1. Mother						
2. Father						
3. Siblings						
4. Maid						
5. Maternal grandparents						
6. Paternal grandparents						
7. Other relatives						
8.Friends						
Language child uses for						
9. Reading						
10. Listening to radio						
11. Watching T.V						
12. Searching internet						
Overall language child uses to speak						

13. Home						
14.Within the community						

Questions about the FAMILY

Language spoken to the CHILD by	**All Setswana**	**More Setswana & little English**	**Half Setswana, half English**	**More English & little Setswana**	**All English**	**Other languages**
15. Mother						
16. Father						
17. Siblings						
18. Maid						
19. Maternal grandparents						
20. Paternal grandparents						
21. Other relatives						
22.Friends/ neighbours						

Language spoken at home between

23. parents/spouses						
24. Siblings						
25. Relatives						
26.Friends/ neighbours/maid						

Language used at home for

27. Reading						
28. Listening to radio						
29. Watching T.V						
30. Searching internet						

31. You have come to the end of this questionnaire. Is there anything you would like to add?

This can be anything from language-related comments to remarks about the questionnaire or research itself.

_____

_____

_____

_____

Questionnaire adapted from Dr Ellen Bialystok, Cognition and Development Lab, Department of Psychology York University.

University of Reading

APPENDIX 2: INFORMATION SHEET

Department of English Language and Applied Linguistics

HUMSS Building
The University of Reading
Whiteknights, PO Box 219
Reading RG6 6AW

Phone: 01183788141
+44 (0)118 378 6472
+44 (0)118 975 6506
Email: appling@reading.ac.uk
p.a.thompson@reading.ac.uk

Researcher:
Boikanyego Sebina
Phone: [Number]
Email:b.sebina@pgr.reading.ac.uk

Supervisors:
Prof. Jane Setter
Phone: +44 (0)118 378 6089
Email:j.e.setter@reading.ac.uk
Clare Wright PhD
Phone: +44 (0) 118 378 7044
Email:c.e.m.wright@reading.ac.uk

INFORMATION SHEET

The aim of this study/ project is to investigate the linguistic performance or proficiency in Setswana by Batswana children.

The project requires participants to complete a picture by picking the correct piece from a list of possible pieces. There is also a voice recording of the participants telling a story in Setswana. The participants have been selected on the basis of age and school grade. The participants will be contacted at school where they will be given a Language and Social Background Questionnaire to give to parents to complete. The aim of the questionnaire is to get information on the language use and social background of children in Botswana.

All responses will be anonymized and stored on a password-protected computer or in a locked filing cabinet for the duration of the project. Access will be available only to my project supervisors and me. This is done to ensure that participants' privacy and confidentiality is observed. Upon completion of the project, all information will be deleted and destroyed.

Your participation and that of your child/children in the project is entirely voluntary and you are free to withdraw at any time without having to give a reason.

This project has been subject to ethical review by the School Ethics and Research Committee, and has been allowed to proceed under the exceptions procedure as outlined in paragraph 6 of the University's *Notes for Guidance* on research ethics.

If you have any queries or wish to clarify anything about the study, please feel free to contact my supervisor at the address above or by email at j.e.setter@reading.ac.uk or c.e.m.wright@reading.ac.uk.

Signed

APPENDIX 3: CONSENT FORM

School of Literature and Languages
Department of English Language and Applied Linguistics

University of Reading

Consent Form

Project title: First language attrition in the length and timing of the Setswana penultimate syllable: a case of Setswana-English

I understand the purpose of this research and understand what is required of me; I have read and understood the Information Sheet relating to this project, which has been explained to me by Boikanyego Sebina. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation.

I understand that my and my child's participation is entirely voluntary and that I have and he/she has the right to withdraw from the project at any time.

I have received a copy of this Consent Form and of the accompanying Information Sheet.

Name:

Signed:

Date:

APPENDIX 4 UNIVERSITY OF READING ETHICAL CONSIDERATION

University of Reading

Memo

School of Literature and Languages
Department of English Language and Applied Linguistics

Please reply to: Jon Clenton j.clenton@reading.ac.uk>

To Prof. Jane Setter

From Dr. Jon Clenton

Copy Boikanyego Sebina
Anne Whitbread (file)

Date 23rd June 2014

Your application for Ethical Approval

Your project entitled **'First language attrition in the length and timing of the Setswana penultimate syllable: a case of Setswana-English'** has been considered by the School Ethics Committee, and we are pleased to report that the Committee has raised no ethical objections, and subject to your undertaking to store the consent forms in the Department Office in the normal way, it has accordingly given permission for the project to proceed under the exceptions procedure as outlined in paragraph 6 of the *University's Ethics Guidance to Schools*.

Signed

On behalf of the School Ethics Committee,
Prof. Catherine Leglu, School Director of Research.
Prof. Alison Donnell, Head of School.

APPENDIX 5 CHILD ENGLISH CONSENT FORM

First language attrition in the length and timing of the Setswana penultimate syllable: a case of Setswana-English

Assent Form

My name is Boikanyego Sebina. I am trying to learn about the length of the Setswana syllable because I would like to find out the performance of Batswana children in Setswana. If you would like, you can be in my study.

If you decide you want to be in my study, you will read sentences, re-tell a story and to complete a picture by picking the correct piece from a list of possible pieces.

There are no risks involved in taking part in the study. However at the end of the study we will be able to establish the length of the Setswana syllable as well as the performance of Batswana children in Setswana. This will help in the teaching and learning of Setswana and English.

Other people will not know if you are in my study. I will put things I learn about you together with things I learn about other children, so no one can tell what things came from you. When I tell other people about my research, I will not use your name, so no one can tell who I am talking about.

Your parents or guardian have to say it's OK for you to be in the study. After they decide, you get to choose if you want to do it too. If you don't want to be in the study, no one will be mad at you. If you want to be in the study now and change your mind later, that's OK. You can stop at any time.

My telephone number is 2972584. You can call me if you have questions about the study or if you decide you don't want to be in the study any more.

I will give you a copy of this form in case you want to ask questions later.

Agreement

I have decided to be in the study even though I know that I don't have to do it. Boikanyego Sebina has answered all my questions.

_____	_____
Signature of Study Participant	Date
_____	_____
Signature of Researcher	Date

APPENDIX 6 CHILD SETSWANA CONSENT FORM

Diphetogo tse di diragaletseng noko ya Setswana-boemo jwa Sekgoa le Setswana

MOKWALO WA TUMELANO LE BABOTSOLOTSWA

Bana

Leina lame ke Boikanyego Sebina. Ke leka go ithuta ka diphetogo tse di diragaletseng noko ya puo ya Setswana ka go bo ke batla go oketsa kitso ya rona ka bokgoni jwa bana ba dikole tse di botlana mo temeng ya Sekgoa le Setswana. Fa o rata o ka tsaya karolo mo patlisisong e.

Fa e le gore o eletsa go tsaya karolo mo patlisisong e o tla lopiwa go bala diele, go bolela polelo le go tlhopha ditshwantsho tse di tshwanang.

Ga go na bodiphatsha bope, kgotsa dikgwetlho tse di amanang le patlisiso e. Dipoelo tsa thulaganyo e ke gore maduo a dipatlisiso a tlile go thusa babatlisisi go tlhaloganyo seemo se se teng gompieno ka noko ya puo ya Setswana ka jalo se se tlhabolole kitso ka karole e. Se se tla thusa babatlisisi go loga maano a go somarela puo ya setswana.

Batho ba bangwe ga bana goitse gore o tsaya karolo mo patlisisong e. Ke tla kopanya se ke se tsereng mo go wena le tsa ba bangwe gore go seope yo o tla itseng gore tsa gago ke dife. Fa ke bolelela batho ka patlisiso e ga kena go bua leina la gago gore go seope yo o kaitseng gore ke bua ka mang.

Batsadi ba gago ba tshwanetse go naya teta gore o tsee karolo mo patlisisong. Fa ba sena go dira jalo le wena o tlhopha go tsaya karolo. Ga go ope yo o ka go omayetsang gore ga o bate

go tsaya karolo. Fa o dumalana le go tsaya karolo le gone o gololesegile go ikgogela morago nako nngwe le nngwe.

Mogala wame ke: 2972584 o ka nteletsa fa o na le dipotso ka patlisiso kgotsa o batla go ikgogela morago.

Ke tla go fa moriti wa fomo e go botsa dipotso tse o ka tswang o na le tsone.

Tumalano

Ke dumetse go tsaya karolo mo patlisisong le ntswa ke itse gore ga ke patelesege. Mrs Boikanyego Sebina o a rabile dipotso tsame tsotlhe.

_____ _____

Seatla sa mo tsaya karolo Letsatsi

_____ _____

Seatla sa mo tsaya karolo Letsatsi

APPENDIX 7 INFORMED CONSENT FOR PARENTS

INFORMED CONSENT FORM

PROJECT TITLE*:* **First language attrition in the length and timing of the Setswana penultimate syllable: a case of Setswana-English**

Principal Investigator Boikanyego Sebina

Phone number(s): 2972584

What you should know about this research study:

- We give you this informed consent document so that you may read about the purpose, risks, and benefits of this research study.
- You have the right to refuse to take part, or agree to take part now and change your mind later.
- Please review this consent form carefully. Ask any questions before you make a decision.
- Your participation is voluntary.

PURPOSE

You are being asked to participate in a research study of English Language and Applied Linguistics at the University of Reading in England and English Department at the University of Botswana. The purpose of the study is to contribute to the investigation of linguistic performance in Setswana by Batswana children. You were selected as a possible participant in this study because you are the parent. Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

PROCEDURES AND DURATION

If you decide to participate, you will be invited to answer a language and social background questionnaire.

RISKS AND DISCOMFORTS

There are no risks involved in taking part in the study.

BENEFITS AND/OR COMPENSATION

The research findings will help establish the length of the Setswana syllable as well as the linguistic performance in Setswana by Batswana children. This will assist in the teaching and learning of Setswana and English.

CONFIDENTIALITY

The data from this investigation will be kept confidential. None of these will be used for commercial use.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you decide not to participate in this study, your decision will not affect your future relations with the University of Botswana, its personnel, and associated institutions**.** If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without penalty. Any refusal to observe and meet appointments agreed upon with the central investigator will be considered as implicit withdrawal and therefore will terminate the participant's participation in the investigation without his/her prior request. In this event the participant will be paid what if owed to him/her or forfeit a proportionate amount of relative payment mentioned earlier in this document. In the event of incapacity to fulfill the duties agreed upon the participant's participation to this investigation will be terminate without his/her consent and no compensation will be offered under these circumstances.

AUTHORIZATION

You are making a decision whether or not to participate in this study. Your signature indicates that you have read and understood the information provided above, have had all your questions answered, and have decided to participate.

_____ _____

Name of Research Participant (please print) Date

_____ _____

Signature of Staff Obtaining Consent Date

(Optional)

YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM TO KEEP.

If you have any questions concerning this study or consent form beyond those answered by the investigator, including questions about the research, your rights as a research participant; or if you feel that you have been treated unfairly and would like to talk to someone other than a member of the research team, please feel free to contact the Office of Research and Development, University of Botswana, Phone: Ms Dimpho Njadingwe on 355-2900, E-mail: research@mopipi.ub.bw, Telefax: [0267] 395-7573.

APPENDIX 8 SETSWANA CONSENT FORM FOR PARENTS

MOKWALO WA TUMELANO LE BATSADI BA BA BOTSOLOTSWA

Setlhogo: Diphetogo tse di diragaletseng noko ya Setswana-boemo jwa sekgoa le setswana

Ke tlhaloganya maikaelelo a patlisiso e le se ke kopiwang go sedira. Ke badile ke bo ke tlhaloganya mokwalo o o tlhalosang se patlisiso e e leng ka sone, o tlhaloswa ke Boikanyego Sebina. Ke dumelana le ditsamaiso jaaka ditlhalositse mo pampering e e tlhalosang patlisiso.

Ke tlhaloganya gore go tsaya karolo game kgotsa ga ngwanake ke boithaopo, jalo nna kgotsa ngwanake re gololesegile go gana go tsaya karolo.

Ke nneetswe moruti wa tumalano e, le mokwalo o o tlalosang patlisiso

Leina:

Seatla:

Letsatsi:

APPENDIX 9 LETTER TO SCHOOL MANAGEMENT

The school management

Dear Sir or Madam

Re: Permission to carry out research at your school.

This serves as a request to carryout research at your school. The study investigates linguistic performance in Setswana by Batswana children. The project requires participants to complete a picture by picking the correct piece from a list of possible pieces. There is also a voice recording of the participants telling a story in Setswana. These activities will take place at the school. The participants will be contacted at school where they will be given a Language and Social Background Questionnaire to give to the parents to complete. The completed questionnaire will be returned to school. The participants have been selected on the basis of age and school grade (age 6-7/ STD 1-2).

I am a lecturer at the University of Botswana currently doing Ph.D at the University of Reading, United Kingdom. My thesis is based on this study.

Attached is a research permit from the Ministry of Education and the research information sheet.

Your assistance will be highly appreciated.

Thank you.

Yours faithfully

Boikanyego Sebina

APPENDIX 10: QUESTIONNAIRE CODING SYSTEM

- The public schools (monolinguals) were coded 01.
- The English medium private schools (bilinguals) were coded 02.
- Individual participants were given codes 1 to 10 in private English medium schools and public school respectively.
- For example for a public school participant the code was 011. Where 01 is the school (public school) and 1 is participant number 1.
- While for private English medium school participant the code was 021. Where 02 is the school (private English medium school) and 1 is participant number 1.

As already stated in section 3.4.1 the questionnaire is divided into four sections.

Section (1); questions one to two: the date when the questionnaire was completed and the person who completed it.

- The date was used as the code: for example, 16 October 2015 was coded as 161015.
- The second part about who completed the questionnaire:
    - Father was coded 1,
    - Mother coded 2,
    - Others coded 3.

Section (2); questions three to 11: demographic questions about the child and parents' background.

- Gender:
    - Male was coded 1.
    - Female was coded 2.
- Standard (grade):

    - Standard 1 was coded 1,
    - Standard 2 was coded 2
    - Standard 3 was coded 3.
- Age of the participants.
    - 6 years old was coded 6
    - 7 years old was coded 7.
- Parents' education:
    - High school coded 1,
    - Certificate coded 2,
    - Diploma coded 3,
    - Degree coded 4,
    - Masters coded 5,
    - PhD coded 6,
    - Professor coded 7
    - Without qualification coded 8.
- Botswana was coded 1.
- Other countries were coded 2.
- Languages spoken.
    - Setswana coded 1,
    - English coded 2,
    - Setswana and English coded 3,
    - Setswana and other languages coded 4.
    - Other languages coded 5.
- Languages parents fluent in:
    - Setswana coded 1,

- English coded 2,
- Setswana and English coded 3,
- Setswana and other languages coded 4.
- Other languages coded 5.

Section (3); questions 12 to 17: language experience of the child in both Setswana and English.

- Rating the child's language experience:
  - Below average coded 1,
  - Average coded 2,
  - Good coded 3,
  - Excellent coded 4.
- Yes/no answers
  - Yes coded 1
  - No coded 2

Section (4); Questions one to 30: Language in the home. This is crucial to the analysis of how far amount and type of input has an effect on the speech rhythm and PSVL patterns of the children.

- This section is a Likert scale therefore; the responses were assigned numbers 1-6, which were subsequently used as codes.

Code 99 was used for missing data in all the sections.

APPENDIX 11 PRAAT WINDOW CODING SYSTEM

For example:

V-o-O4

- V stands for vowel.
- o stands for vowel (o).
- O stands for syllable number one of the word.
- Number 4 means the word is a four-syllable word.

V-i-tw4

- V stands for vowel.
- i stands for vowel (i).
- tw stands for syllable number two of the word.
- Number 4 means the word is a four-syllable word.

V-a-p4

- V stands for vowel.
- a stands for vowel (a).
- p stands for penultimate syllable of the word.
- Number 4 means the word is a four-syllable word.

V-e-f4

- V stands for vowel.
- e stands for vowel (e).
- f stands for the final syllable of the word.
- Number 4 means the word is a four-syllable word.

Tier 3 is the different syllables of the word. The word *mosimane* (boy) has four syllables, and these are labelled as s1, s2, s3p, sf4.

For example:

- s1 stands for syllable one of the word which is (mo).
- s2 stands for syllable two of the word which is (si).
- s3p stands for syllable 3, penultimate syllable of the word which is (ma).
- s4f stands for syllable 4, final syllable of the word which is (ne).

APPENDIX 12 INTER-RATER RELIABILITY DATA

MONOLINGUAL 1

Initial measurement	Rater
0.102682206	0.10409128
0.113065942	0.127365291
0.077206198	0.08199408
0.08388825	0.099551253
0.03806041	0.036985679
0.160688698	0.066903246
0.05122947	0.058185473
0.071039458	0.075784939
0.036571567	0.040791574
0.121239964	0.121833623
0.067891942	0.067891825
0.110933923	0.118629334
0.065109356	0.042498111
0.063306363	0.053021863
0.079766017	0.08419548
0.087856996	0.120651791
0.096026271	0.10397967
0.051754075	0.023715356
0.06258768	0.070638858
0.036893297	0.038048118
0.063044662	0.073381171
0.042744772	0.048261132
0.064117158	0.06941831
0.042695491	0.04403193
0.021637673	0.0203796
0.066549506	0.076207489
0.080543039	0.11663459
0.030313364	0.03457178
0.055616501	0.05698412
0.05152481	0.072499282
0.018303751	0.018152985
0.04817749	0.054063225
0.066487879	0.068564072
0.066882226	0.065384588
0.035889183	0.045456615
0.030328504	0.032471097
0.048004487	0.054376991
0.092433538	0.108348248
0.046463404	0.059264103
0.024405039	0.016637591
0.091201779	0.092783944
0.083815594	0.092169589
0.081251901	0.086094156
0.109499225	0.110611031
0.031000294	0.03656297
0.052203756	0.054770067
0.053528485	0.056784107
0.037255127	0.036200323
0.067612948	0.070421803
0.078965476	0.082036792
0.071505804	0.070401549
0.043629605	0.047642891
0.028698094	0.031127861
0.026676591	0.04240215
0.030053526	0.030502895
0.064698937	0.089082533
0.033434051	0.035569766
0.069163411	0.044462672
0.112535431	0.116518017
0.055616501	0.047314322
0.202169522	0.158946441
0.063098172	0.042175596
0.088852528	0.091969118
0.059166726	0.058406539
0.049686849	0.052286426
0.04508671	0.021641577
0.041280427	0.045520687
0.072678438	0.08386111
0.037731671	0.035862879
0.035921767	0.033561704
0.066398259	0.067742561
0.095672657	0.079338167
0.051321271	0.051651595
0.056155253	0.057296829
0.109414328	0.049234587
0.038807056	0.040996852
0.051462573	0.04672259
0.046524854	0.07449319
0.029757657	0.028581082
0.040506919	0.040649624
0.058682986	0.062179641
0.033740415	0.025557197
0.108302062	0.110811812
0.093885655	0.091754819
0.071998883	0.09310429
0.077928203	0.078772573
0.085449537	0.028928152
0.202425626	0.202425626
0.051754236	0.079655993
0.018705391	0.019015099
0.026877274	0.027225558
0.111509457	0.116864515
0.064500569	0.068696386
0.023418523	0.029948285
0.027564309	0.010701954
0.109674892	0.104097721
0.048004988	0.045093266
0.116646767	0.116646875
0.059902062	0.059830297
0.050009864	0.050880094
0.080257132	0.078086644
0.029507445	0.027901739
0.039967357	0.018830955
0.098439661	0.10012796
0.029264129	0.027958671
0.090337124	0.0964467
0.049000846	0.048009883

0.074436202	0.079532795	0.046818165	0.049457228	0.051937801	0.052121561
0.041645017	0.04317258	0.047562623	0.044594535	0.098090798	0.099039783
0.077611168	0.080219282	0.049505259	0.040988505	0.065160497	0.080405136
0.114854845	0.155254528	0.072061905	0.081571614	0.065772239	0.061572798
0.035758074	0.035358092	0.047702951	0.046316499	0.111768173	0.111986182
0.008213784	0.025428853	0.242521467	0.242521378	0.059540055	0.060871923
0.092180302	0.096448283	0.090417179	0.098383044	0.086698676	0.087262874
0.039773962	0.032050817	0.085806936	0.086683811	0.048027104	0.056345722
0.101994252	0.10077772	0.142444297	0.145844465	0.043122295	0.039169578
0.083580874	0.083580874	0.091494126	0.076694071	0.067295437	0.068341533
0.074993094	0.075756776	0.11985077	0.118055075	0.033598448	0.031409591
0.111972742	0.064485221	0.103699006	0.08678316	0.091434368	0.090887116
0.043089359	0.046151622	0.079373224	0.07896708	0.064446776	0.065918997
0.049296801	0.075562257	0.053135384	0.044285592	0.114135593	0.107755026
0.050045047	0.093322097	0.09097221	0.093083654	0.076926475	0.081986308
0.033258644	0.036445216	0.067042513	0.068376416	0.024424184	0.023437266
0.052456393	0.046097849	0.054075913	0.054075913	0.067195025	0.06804231
0.056465212	0.055286873	0.066921184	0.045619282	0.06475716	0.056164083
0.088173243	0.069579533	0.078147291	0.078121263	0.058718551	0.058634903
0.10011337	0.103525367	0.030300163	0.032197053	0.028806153	0.030010579
0.094654492	0.094248753	0.022437453	0.023855512	0.013799134	0.009330755
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0.05261907	0.025843592	0.095897026	0.100797632	0.041312867	0.044292578
0.050205032	0.065419292	0.051805815	0.053453813	0.059572769	0.059572678
0.075614833	0.071959239	0.078794206	0.078794356	0.164293761	0.146865908
0.06133444	0.059627724	0.071634549	0.071634614	0.072613233	0.072613316
0.042742436	0.038469873	0.029531798	0.047880004	0.083703923	0.082452751
0.017796409	0.018516721	0.061800998	0.050084812	0.083105558	0.06949867
0.059661317	0.06168324	0.040925956	0.042453837	0.077222892	0.066710299
0.036276217	0.036276125	0.042321926	0.041191805	0.087013277	0.067231308
0.0693133	0.066410716	0.063346408	0.083298089	0.137031185	0.150945015
0.089020772	0.08546887	0.036518173	0.037675339	0.097401892	0.097097798
0.108938995	0.106629265	0.055027384	0.055027384	0.05325447	0.050635667
0.100984073	0.0904014	0.055642709	0.059686032	0.030378559	0.034329265
0.068552181	0.066030789	0.05929936	0.058820492	0.07526845	0.08510813
0.107859625	0.123300642	0.050884308	0.052220438	0.027650745	0.030743152
0.117701465	0.133285372	0.104496956	0.104049008	0.083816322	0.080723916
0.098496435	0.100196372	0.073370203	0.062203556	0.058292213	0.029739559
0.05874185	0.050894088	0.113322569	0.111544384	0.161777267	0.160447949
0.149881794	0.127188241	0.020698702	0.02069458	0.055537514	0.051978726
0.219574012	0.217780098	0.130192632	0.136299535	0.030514265	0.032015166

0.107453016	0.109680141	0.198214508	0.102444313	0.14490425	0.175876571
0.058857691	0.059790341	0.092261994	0.097313954	0.054442964	0.040978925
0.075408187	0.078396137	0.081996448	0.034086261	0.05673145	0.064657075
0.102326807	0.101827816	0.057474431	0.029926584	0.056267864	0.059381639
0.105470817	0.10524175	0.03952266	0.037932021	0.038093799	0.039291283
0.102008802	0.108221927	0.116326849	0.148130632	0.109782635	0.110751185
0.121727304	0.118849608	0.055277058	0.040156887	0.073474555	0.073474645
0.043298143	0.044498234	0.05556053	0.034519009	0.085349231	0.088103616
0.0573088	0.057486218	0.102049953	0.108311967	0.082818668	0.084479358
0.113347883	0.136810048	0.025175016	0.024142866	0.05747202	0.056151384
0.03983003	0.038418163	0.046322029	0.035043848	0.05967357	0.05967268
0.018910249	0.01090074	0.050927007	0.04888244	0.042807901	0.042807812
0.112886824	0.115952128	0.05101942	0.035585494	0.070154947	0.069415902
0.038784105	0.03811616	0.046350091	0.04710585	0.082767845	0.068665169
0.118350988	0.075383802	0.082400162	0.079516824	0.100578647	0.078121969

MONOLINGUAL 2

Initial measurement	Rater
0.068589537	0.079044484
0.102884306	0.11316264
0.156563074	0.180559284
0.053678768	0.056204782
0.098411075	0.046871002
0.078281537	0.097304396
0.098864167	0.109579222
0.169982766	0.201725692
0.094863652	0.098884522
0.061086443	0.059252406
0.169604712	0.180984641
0.091629664	0.09793181
0.094243341	0.095210575
0.191184855	0.196403204
0.08374603	0.075540027
0.065846115	0.059144738
0.075690181	0.075711787
0.066123757	0.067164796
0.151380362	0.161300147
0.077177697	0.101674322
0.094979062	0.095970979
0.090227113	0.091934083
0.08278671	0.093291944
0.157760859	0.162467698
0.08493178	0.084013997
0.071188136	0.072205647
0.064667085	0.065368462
0.075535503	0.080687116
0.038335262	0.038638963
0.137399542	0.175074422
0.059365275	0.084406599
0.095347022	0.095273076
0.059932414	0.061687603
0.113054326	0.152431976
0.080640085	0.078612239
0.075842139	0.121270751
0.103219228	0.101211752
0.13603222	0.13656778
0.110378246	0.110157914
0.040020183	0.034825705
0.033420916	0.020750168
0.072918363	0.077172064
0.082192894	0.088803986
0.055701527	0.054760514
0.116858784	0.112958927
0.051941371	0.06280762
0.042012382	0.040568407
0.045346698	0.035186856
0.055152378	0.055152480
0.059524212	0.059040304
0.111649935	0.146176851
0.069926134	0.067263641
0.071469631	0.033800113
0.10254719	0.103012399
0.072899024	0.075153869
0.096390485	0.099666998
0.049620275	0.066310301
0.048045028	0.04746426
0.159717285	0.162300488
0.147956985	0.15477108
0.118167196	0.118955824
0.138132177	0.151395959
0.114617805	0.124108002
0.059518341	0.058337276
0.093976328	0.095970208
0.126566364	0.18006382
0.096717304	0.088379897
0.086226378	0.083632935
0.112637674	0.189834266
0.039762641	0.039192799
0.051298245	0.050186515
0.157483985	0.161421254
0.073614436	0.079744506
0.066997408	0.067037628
0.088172421	0.10650993
0.16762325	0.191214878
0.113169663	0.115497506
0.04981809	0.050914397
0.042345377	0.035251883
0.113490684	0.145140982
0.033827156	0.036258593
0.13383793	0.128452991
0.079493527	0.077960365
0.044422854	0.045439755
0.030093291	0.033551611
0.149405636	0.145145114
0.070801259	0.112032357
0.141602518	0.166546047
0.068359836	0.071061492
0.069716516	0.064233688
0.039666294	0.037730483
0.09856473	0.160728209
0.058898436	0.058272101
0.050068537	0.052538126
0.112654209	0.142117175
0.116230533	0.131928319
0.08487144	0.08893567
0.041282262	0.032887683
0.044781935	0.046959357
0.109155967	0.111954838
0.109855685	0.122819823
0.09351797	0.088652524
0.047585852	0.044971499
0.033706347	0.06280762
0.076564551	0.132730564
0.066421332	0.066421234
0.060550912	0.06429819
0.182914214	0.194318975
0.05676648	0.037273724
0.070181492	0.090773039
0.155653635	0.157288602
0.088286449	0.089152337
0.092847303	0.102327021

0.073674398	0.079165866	0.072768192	0.075706852	0.084297851	0.110940847
0.047770341	0.046793819	0.096144284	0.090617401	0.060772806	0.069343834
0.04680638	0.056995355	0.086300562	0.124643933	0.0646001	0.06366923
0.092860212	0.132667258	0.074961802	0.072857061	0.039065825	0.037320687
0.099378687	0.136362355	0.095846642	0.093894556	0.123192502	0.158223373
0.057932342	0.058025604	0.103617991	0.106129813	0.101601327	0.095266669
0.105129258	0.140336525	0.110525857	0.132634604	0.075409553	0.072721419
0.103054338	0.114065464	0.151109571	0.151020568	0.085664587	0.094383583
0.143908363	0.149148807	0.072231231	0.054032082	0.042008978	0.044043693
0.091712092	0.088731896	0.071861745	0.080768647	0.073126739	0.1080716
0.036589481	0.029142064	0.080027852	0.087259827	0.07221304	0.073851323
0.187480615	0.190394821	0.045185794	0.046959773	0.146253477	0.146746917
0.108571022	0.151854358	0.072950559	0.07094597	0.127582821	0.125832238
0.04712606	0.073991278	0.071861745	0.07013702	0.059165801	0.059453662
0.11059672	0.108099869	0.101839069	0.106485893	0.08471467	0.082772052
0.060156226	0.053307687	0.079583673	0.079177318	0.080112905	0.086944202
0.079618534	0.100111205	0.264392537	0.294507265	0.033616933	0.040828046
0.030962763	0.026865709	0.062915125	0.116082802	0.123710312	0.122499759
0.04688647	0.046707319	0.141118038	0.162311826	0.072612574	0.075127237
0.06266256	0.158761248	0.099664615	0.098605607	0.021457089	0.097906541
0.047339996	0.046105952	0.09447007	0.095528308	0.060486412	0.064143108
0.076154017	0.073750261	0.099718407	0.105064896	0.067117389	0.068137882
0.079262948	0.102327021	0.122461201	0.126173104	0.068061169	0.062842524
0.035697195	0.039046092	0.152201779	0.211041896	0.060693776	0.061515346
0.049102918	0.050701602	0.0622374	0.063105277	0.146464967	0.146142272
0.098205837	0.108332208	0.185441248	0.205195094	0.08156231	0.079842771
0.047284292	0.046178229	0.072350987	0.071958622	0.123870334	0.123776418
0.08347905	0.098661477	0.071059005	0.070856785	0.068406005	0.068406124
0.054954861	0.061463842	0.071672379	0.071715668	0.063829542	0.062622771
0.098395369	0.097880819	0.053310034	0.056073087	0.083380532	0.085291556
0.063107114	0.065785946	0.090034724	0.098959437	0.047912694	0.047912694
0.038359226	0.040450054	0.039775796	0.03937238	0.075131702	0.073870262
0.122502045	0.157190995	0.058874631	0.054060156	0.187080932	0.18797892
0.065970349	0.064513521	0.145448964	0.15033157	0.062051597	0.051890626
0.188083948	0.188473285	0.093266743	0.095527193	0.076300719	0.079000092
0.037389444	0.038905221	0.072198391	0.093067832	0.07087752	0.072171566
0.070505188	0.069636538	0.032605725	0.036153063	0.082614939	0.124892178
0.053413491	0.051535811	0.119342923	0.117589473	0.031348831	0.023807764
0.039254212	0.028614707	0.030393408	0.029933956	0.146548882	0.197553718
0.079266552	0.10496251	0.141650011	0.141650011	0.077243716	0.112845579
0.036983381	0.054162315	0.069072248	0.071367556	0.135761683	0.135761575

0.087197646	0.098520125
0.067321712	0.069072179
0.067079449	0.048913955
0.035552108	0.04011741
0.130134131	0.136200793
0.091563448	0.089170623
0.078884295	0.078997656
0.137411353	0.149453291
0.12751868	0.12713987
0.041307352	0.043837741
0.085986733	0.088934052
0.057324489	0.056041696
0.114458198	0.112083392
0.058083265	0.055054824
0.136825839	0.136364656
0.076843028	0.121102662
0.068875734	0.074357756
0.070932026	0.067510251
0.07962976	0.075057578
0.116600721	0.161694099
0.075937299	0.076830024

0.046961239	0.045540066
0.148499053	0.143882643
0.049499684	0.052234622
0.10322812	0.10322733
0.084838593	0.096480745
0.024992168	0.034010671
0.13233341	0.13589076
0.078617429	0.078617532
0.160792208	0.203512216
0.037815333	0.037103863
0.106143847	0.110223498
0.063686308	0.068479033
0.156482625	0.173203961
0.083282095	0.083971058
0.069339084	0.06635222
0.1471113	0.169430393
0.084313746	0.09587341
0.066404539	0.073285252
0.058010003	0.058010133
0.084195944	0.081651295
0.069160954	0.072208726

0.035289716	0.035289716
0.080662209	0.082674724
0.117212272	0.122022707
0.059016374	0.05744094
0.053337819	0.051809514
0.102293626	0.100070743
0.044016647	0.042917186
0.068687317	0.068817321
0.061409191	0.060503743
0.102003077	0.10434773
0.05863169	0.059789976
0.163445875	0.164940186
0.082087515	0.081117199
0.040519278	0.040291349
0.146950988	0.144876444
0.129489994	0.133239995
0.068725121	0.069405568
0.101386565	0.115271108
0.100706119	0.119642102
0.077673671	0.072863827

BILINGUAL 1

Initial measurement	Rater
0.069891404	0.207986343
0.159385656	0.168910121
0.179294594	0.18781797
0.265162056	0.263639696
0.325803726	0.322772982
0.099807211	0.101343132
0.042611075	0.045857702
0.074860732	0.13056541
0.134024859	0.136786114
0.230755482	0.261550145
0.07455962	0.075406291
0.154261283	0.115421191
0.117983214	0.116677997
0.168726824	0.166876452
0.117951382	0.132008848
0.067013252	0.067722328
0.124237192	0.126937735
0.281944328	0.326184335
0.234953319	0.235047114
0.065978137	0.091482
0.114449484	0.152244811
0.143272637	0.192033835
0.146905308	0.163956694
0.07984802	0.095569697
0.111538535	0.163557486
0.10508802	0.103284023
0.139741387	0.160253136
0.132070858	0.110360389
0.124538299	0.080673491
0.248732518	0.264799917
0.064135563	0.107356933
0.072152509	0.092697087
0.117581866	0.120508161
0.23079717	0.228917491
0.212081972	0.258555198
0.096831575	0.09433212
0.102610852	0.124831095
0.103700245	0.105897491
0.199151596	0.2026681
0.081767349	0.082148156
0.115929581	0.158371916
0.102553091	0.108822813
0.143992382	0.159732123
0.10107567	0.100527205
0.072472987	0.136613131
0.140441983	0.151669217
0.198997566	0.200755193
0.222712301	0.257513792
0.295826434	0.353859549
0.111564182	0.109259425
0.0608354	0.059040506
0.115152721	0.123937602
0.339905725	0.387012364
0.254192038	0.297331067
0.115879609	0.125014553
0.255467934	0.070892938
0.112831671	0.068068258
0.138430314	0.14066929
0.139490799	0.137199122
0.244898071	0.244898071
0.12556144	0.18236857
0.430842146	0.428540974
0.097238381	0.034518693
0.07705683	0.076055616
0.154415823	0.193006032
0.059773014	0.074765533
0.070417524	0.091257513
0.144929089	0.143622188
0.194466998	0.192179006
0.301670154	0.386857715
0.441749133	0.444138497
0.107057491	0.108008807
0.128723888	0.1479985
0.170782188	0.169118131
0.077925355	0.07970921
0.111321935	0.159947635
0.118743398	0.092676502
0.131319116	0.090959892
0.10097401	0.102861603
0.091090118	0.092048961
0.155332622	0.155332745
0.172257158	0.186357606
0.173669804	0.199360665
0.098843984	0.105218122
0.163126713	0.162423328
0.09438001	0.09438121
0.12980228	0.043378587
0.193178888	0.186165547
0.067198682	0.068070756
0.05274161	0.050406593
0.061538775	0.065039082
0.080220159	0.102680096
0.070696498	0.070696576
0.070913233	0.070913356
0.061638836	0.062941566
0.15258729	0.101969473
0.073566937	0.073780759
0.079002985	0.101454244
0.116009401	0.102349227
0.099018461	0.099018528
0.15248831	0.050807719
0.193858278	0.142360762
0.067782119	0.068935871
0.074560331	0.073336033
0.070794658	0.071142574
0.141965884	0.172194743
0.109948264	0.15557105
0.140012243	0.158988808
0.060874021	0.095092941
0.124741845	0.124536111
0.077462343	0.077961469
0.064814206	0.063926936
0.0840706	0.083145216

0.154051155	0.15113604
0.08246648	0.082477469
0.11426728	0.113672731
0.028486655	0.031114423
0.123350466	0.122984275
0.133932086	0.134867181
0.145651144	0.158983427
0.07616153	0.077681495
0.096204038	0.098858241
0.088568797	0.111719659
0.149650726	0.173141999
0.12130905	0.120770188
0.135501865	0.137334717
0.079164046	0.081127189

0.112561377	0.113151081
0.116272192	0.119759899
0.13276823	0.132165868
0.077856154	0.077059696
0.028282821	0.028277217
0.091711205	0.092606477
0.163042143	0.171814981
0.080142449	0.080142350
0.085244789	0.085942736
0.113659719	0.113659697
0.122477023	0.120163983
0.124518307	0.120965491
0.065256035	0.109385015
0.14288986	0.139272082

0.071177381	0.074426796
0.073334271	0.081281324
0.16931589	0.170622979
0.204904581	0.21357845
0.10634503	0.10700292
0.062600911	0.061624195
0.088892026	0.086227583
0.087728286	0.117100325
0.137280728	0.124717917
0.10757991	0.10757887
0.10074944	0.095211321
0.128071322	0.136196188

BILINGUAL 2

Initial measurement	Rater
0.128438054	0.133025127
0.16513464	0.168091819
0.042330968	0.052292636
0.104301239	0.047267271
0.086917699	0.096144207
0.171517592	0.177785733
0.232359981	0.272694737
0.217987485	0.11168679
0.209376276	0.212983745
0.145647346	0.15197172
0.174342767	0.187289353
0.065766732	0.066119687
0.094464942	0.108254931
0.176374418	0.176227448
0.178946485	0.176972297
0.17737816	0.089819675
0.108653837	0.108263445
0.132722725	0.103355374
0.162740109	0.160739206
0.093721377	0.089233614
0.056760839	0.045996963
0.123389858	0.127065946
0.124739902	0.133106674
0.102922554	0.103864158
0.072570808	0.076403722
0.045466048	0.050584285
0.106517767	0.103948028
0.101564045	0.104865476
0.058160883	0.060539706
0.113616608	0.116524811
0.120379502	0.13308382
0.062539736	0.062403606
0.094376166	0.095613886
0.128657476	0.139213577
0.129848574	0.131979274
0.294911985	0.295212083
0.097394788	0.099552968
0.127277279	0.129176259
0.096288029	0.100483304
0.141649804	0.140395148
0.105595312	0.105723107
0.093991432	0.092515045
0.166515684	0.170315803
0.187402669	0.192717516
0.283134683	0.273760953
0.097245136	0.097245955
0.160080454	0.156593994
0.179529481	0.170639126
0.072990192	0.070716178
0.093371414	0.095751522
0.15214857	0.153064835
0.04251578	0.043613248
0.125522778	0.128107545
0.110813726	0.110813878
0.134951369	0.190312319
0.226243887	0.225684008
0.095396467	0.093558431
0.120165131	0.119773908
0.127552373	0.125354896
0.130534207	0.127523347
0.096195654	0.095048916
0.128835222	0.142220286
0.045663116	0.044199268
0.092630893	0.097314809
0.109924848	0.110242029
0.046172548	0.045373503
0.184261025	0.133981281
0.160588896	0.159525378
0.091307402	0.092325563
0.181503716	0.189937109
0.077428542	0.076369879
0.083284483	0.085880418
0.135337284	0.1401076
0.153555765	0.158793165
0.158761045	0.162637065
0.069533902	0.13606908
0.24223777	0.241415207
0.130309717	0.127646718
0.103441734	0.101676167
0.169268292	0.174578207
0.222535401	0.22581654
0.295547812	0.07926446
0.110012693	0.11428906
0.169063624	0.16930792
0.173917126	0.180878279
0.17310684	0.136709326
0.172473268	0.18292919
0.115806187	0.11954686
0.100805386	0.099570617
0.179500185	0.178394621
0.190247358	0.189578512
0.139880427	0.137612199
0.168975555	0.166776214
0.171799131	0.170501067
0.217938103	0.220341695
0.177031378	0.120940296
0.214084457	0.212635313
0.14677641	0.056410695
0.167574687	0.168804297
0.206794294	0.204314074
0.105289147	0.104608001
0.146489248	0.145833892
0.199687943	0.196783008
0.118270545	0.116511662
0.211150615	0.243748387
0.211510469	0.210975213
0.163816932	0.18411647
0.176777132	0.181332523
0.127560386	0.128541969
0.082222345	0.086884467
0.119080638	0.121185541
0.137509784	0.145574036
0.115207251	0.09993787
0.060624652	0.064592392
0.219585352	0.221809766
0.219585352	0.221096935

0.273451715	0.274463578
0.106440632	0.112070365
0.107664088	0.104742242
0.17006032	0.176990867
0.130966823	0.135865531
0.17840559	0.1816074
0.056914951	0.058872179
0.040318676	0.042658879
0.121673431	0.123967891

0.156945807	0.156736445
0.201075341	0.184083534
0.144141807	0.087699866
0.148576939	0.146192252
0.135869632	0.137081297
0.218170591	0.2192694
0.102984419	0.109456259
0.178708257	0.177061029
0.110030141	0.112914175

0.148817745	0.148185082
0.156322972	0.15536923
0.15521689	0.158273693
0.213245027	0.21111979
0.097464047	0.09768314
0.094141409	0.096466274
0.105216869	0.116485399
0.119924725	0.116511662

APPENDIX 13 INTRA-RATER RELIABILITY DATA

MONOLINGUAL 1

Initial measurement	Rater
0.102682206	0.09966887
0.113065942	0.111406896
0.077206198	0.080358625
0.08388825	0.082248743
0.03806041	0.035342262
0.160688698	0.05704145
0.05122947	0.052341669
0.071039458	0.07330796
0.036571567	0.039421762
0.121239964	0.188272899
0.067891942	0.067891854
0.110933923	0.107732353
0.065109356	0.062748421
0.063306363	0.064924831
0.079766017	0.083985332
0.087856996	0.085176613
0.096026271	0.100632331
0.051754075	0.054366414
0.06258768	0.065450828
0.036893297	0.038354872
0.063044662	0.063044765
0.042744772	0.041338994
0.064117158	0.066688376
0.042695491	0.041982865
0.021637673	0.020975967
0.066549506	0.069024002
0.080543039	0.080932766
0.030313364	0.029631742
0.055616501	0.058579675
0.05152481	0.050373962
0.018303751	0.01967137
0.04817749	0.047866528
0.066487879	0.065217259
0.066882226	0.064626138
0.035889183	0.038029182
0.030328504	0.062429884
0.048004487	0.048640586
0.092433538	0.093644825
0.046463404	0.048133468
0.024405039	0.024200502
0.091201779	0.090300367
0.083815594	0.0836612
0.081251901	0.08289116
0.109499225	0.109422321
0.031000294	0.034911606
0.052203756	0.054712219
0.053528485	0.052627944
0.037255127	0.03655349
0.067612948	0.068489626
0.078965476	0.079434471
0.071505804	0.069552547
0.043629605	0.044221142
0.028698094	0.028298055
0.026676591	0.033108724
0.030053526	0.032542763
0.064698937	0.06532858
0.033434051	0.034260728
0.069163411	0.04568097
0.112535431	0.113044087
0.055616501	0.05095037
0.202169522	0.202169653
0.063098172	0.063845586
0.088852528	0.090022276
0.059166726	0.059264982
0.049686849	0.050662664
0.04508671	0.047584532
0.041280427	0.045822142
0.072678438	0.074020383
0.037731671	0.037311588
0.035921767	0.035590248
0.066398259	0.068566328
0.095672657	0.098383087
0.051321271	0.053869385
0.056155253	0.058200279
0.109414328	0.108047883
0.038807056	0.038540591
0.051462573	0.051009605
0.046524854	0.048742512
0.029757657	0.030407955
0.040506919	0.040320824
0.058682986	0.057258084
0.033740415	0.035203637
0.108302062	0.105327935
0.093885655	0.091624821
0.071998883	0.071998769
0.077928203	0.077677846
0.085449537	0.088954655
0.202425626	0.202961709
0.051754236	0.056914169
0.018705391	0.01854097
0.026877274	0.027574504
0.111509457	0.114604919
0.064500569	0.056187466
0.023418523	0.024757801
0.027564309	0.007764594
0.109674892	0.139762695
0.048004988	0.056546042
0.116646767	0.116646885
0.059902062	0.060352824
0.050009864	0.052808163
0.080257132	0.083979842
0.029507445	0.029786992
0.039967357	0.036196851
0.098439661	0.10236922
0.029264129	0.027770146
0.090337124	0.090160944
0.049000846	0.049353912

0.074436202	0.077128042	0.046818165	0.044425683	0.051937801	0.051164896
0.041645017	0.043287051	0.047562623	0.05074289	0.098090798	0.096905403
0.077611168	0.076008037	0.049505259	0.04876268	0.065160497	0.065961755
0.114854845	0.112245639	0.072061905	0.073762835	0.065772239	0.06342842
0.035758074	0.037146341	0.047702951	0.049332481	0.111768173	0.114078434
0.008213784	0.007004378	0.242521467	0.242521546	0.059540055	0.057346202
0.092180302	0.090971091	0.090417179	0.093585237	0.086698676	0.07887701
0.039773962	0.037108533	0.085806936	0.083675551	0.048027104	0.050186022
0.101994252	0.101994368	0.142444297	0.142444300	0.043122295	0.041617677
0.083580874	0.083580874	0.091494126	0.089740667	0.067295437	0.066588283
0.074993094	0.073419004	0.11985077	0.118388827	0.033598448	0.029940732
0.111972742	0.113681039	0.103699006	0.103699116	0.091434368	0.089406169
0.043089359	0.043337847	0.079373224	0.078803062	0.064446776	0.06415561
0.049296801	0.049838524	0.053135384	0.049002178	0.114135593	0.110506384
0.050045047	0.049567662	0.09097221	0.093378226	0.076926475	0.093027748
0.033258644	0.034752073	0.067042513	0.065708609	0.024424184	0.024925512
0.052456393	0.049418896	0.054075913	0.054075913	0.067195025	0.067408731
0.056465212	0.056605629	0.066921184	0.068783477	0.06475716	0.066090728
0.088173243	0.090670947	0.078147291	0.076604401	0.058718551	0.060101256
0.10011337	0.116339696	0.030300163	0.0284357	0.028806153	0.029282441
0.094654492	0.095521014	0.022437453	0.024846608	0.013799134	0.013218146
0.102032276	0.101845355	0.023717262	0.02103358	0.107888556	0.11070197
0.05261907	0.05261899	0.095897026	0.096404436	0.041312867	0.043817086
0.050205032	0.052029617	0.051805815	0.051427663	0.059572769	0.059572810
0.075614833	0.072267582	0.078794206	0.078794345	0.164293761	0.165250253
0.06133444	0.06133398	0.071634549	0.071634456	0.072613233	0.073676103
0.042742436	0.043592382	0.029531798	0.024308013	0.083703923	0.084894889
0.017796409	0.019180496	0.061800998	0.060756241	0.083105558	0.082941997
0.059661317	0.060873958	0.040925956	0.042290253	0.077222892	0.078551052
0.036276217	0.035545873	0.042321926	0.039414559	0.087013277	0.086058585
0.0693133	0.067895571	0.063346408	0.062284111	0.137031185	0.140795494
0.089020772	0.088862475	0.036518173	0.037979389	0.097401892	0.091928201
0.108938995	0.105936104	0.055027384	0.055027421	0.05325447	0.053520533
0.100984073	0.100984073	0.055642709	0.05386874	0.030378559	0.028766202
0.068552181	0.065465308	0.05929936	0.059316199	0.07526845	0.075764231
0.107859625	0.110218377	0.050884308	0.048989995	0.027650745	0.027650678
0.117701465	0.117452465	0.104496956	0.105760644	0.083816322	0.083816435
0.098496435	0.099139466	0.073370203	0.07235736	0.058292213	0.057262933
0.05874185	0.060395389	0.113322569	0.11065728	0.161777267	0.159744213
0.149881794	0.150587773	0.020698702	0.020870515	0.055537514	0.054807183
0.219574012	0.211402948	0.130192632	0.134010672	0.030514265	0.05849809

0.107453016	0.029391723
0.058857691	0.108150128
0.075408187	0.061437829
0.102326807	0.077646411
0.105470817	0.101046863
0.102008802	0.099959581
0.121727304	0.113151239
0.043298143	0.04451562
0.0573088	0.058116131
0.113347883	0.114877368
0.03983003	0.037153906
0.018910249	0.021343424
0.112886824	0.113653734
0.038784105	0.036097595
0.118350988	0.118350890
0.198214508	0.198214612
0.092261994	0.094534166
0.081996448	0.081996532
0.057474431	0.059269907
0.03952266	0.038071784
0.116326849	0.113378644
0.055277058	0.054791839
0.05556053	0.054587396
0.102049953	0.103758336
0.025175016	0.027680738
0.046322029	0.046322123
0.050927007	0.05087957
0.05101942	0.050054705
0.046350091	0.048405768
0.082400162	0.079303067
0.14490425	0.146711095
0.054442964	0.05095222
0.05673145	0.057023514
0.056267864	0.059734778
0.038093799	0.040554648
0.109782635	0.109424851
0.073474555	0.073474555
0.085349231	0.086686136
0.082818668	0.083119661
0.05747202	0.058323627
0.05967357	0.057605819

0.042807901	0.042807898
0.070154947	0.070497802
0.082767845	0.082526768
0.100578647	0.099327974

MONOLINGUAL 2

Initial measurement	Rater
0.068796976	0.068589537
0.105218905	0.102884306
0.165112743	0.156563074
0.054965573	0.053678768
0.148809685	0.098411075
0.078586871	0.078281537
0.100922086	0.098864167
0.167100504	0.169982766
0.092752148	0.094863652
0.062473554	0.061086443
0.167107176	0.169604712
0.090568251	0.091629664
0.09475405	0.094243341
0.190337429	0.191184855
0.081952583	0.08374603
0.06715096	0.065846115
0.075478019	0.075690181
0.066272889	0.066123757
0.151086101	0.151380362
0.07839576	0.077177697
0.094277373	0.094979062
0.087968973	0.090227113
0.082921886	0.08278671
0.165922119	0.157760859
0.085569641	0.08493178
0.072391785	0.071188136
0.065917723	0.064667085
0.077046835	0.075535503
0.039298406	0.038335262
0.172414429	0.137399542
0.061786021	0.059365275
0.094845538	0.095347022
0.064086565	0.059932414
0.116521028	0.113054326
0.076870287	0.080640085
0.075395959	0.075842139
0.104345349	0.103219228
0.137362503	0.13603222
0.109831235	0.110378246
0.029848497	0.040020183
0.034386766	0.033420916
0.078446869	0.072918363
0.086562062	0.082192894
0.057429055	0.055701527
0.115235745	0.116858784
0.050297211	0.051941371
0.041213243	0.042012382
0.043111132	0.045346698
0.056161263	0.055152378
0.057170148	0.059524212
0.114340295	0.111649935
0.068288724	0.069926134
0.072382413	0.071469631
0.100500685	0.10254719
0.075354237	0.072899024
0.097430888	0.096390485
0.064924014	0.049620275
0.041239439	0.048045028
0.16028914	0.159717285
0.127312405	0.147956985
0.117079186	0.118167196
0.135644627	0.138132177
0.116812702	0.114617805
0.059892936	0.059518341
0.095673132	0.093976328
0.135165824	0.126566364
0.097346239	0.096717304
0.083042259	0.086226378
0.19082491	0.112637674
0.035373689	0.039762641
0.054310118	0.051298245
0.157113024	0.157483985
0.07216341	0.073614436
0.067671815	0.066997408
0.090082692	0.088172421
0.167477682	0.16762325
0.113967923	0.113169663
0.050925439	0.04981809
0.040336982	0.042345377
0.148971062	0.113490684
0.033858218	0.033827156
0.133849089	0.13383793
0.079070623	0.079493527
0.043129431	0.044422854
0.028850442	0.030093291
0.147112922	0.149405636
0.069511305	0.070801259
0.153899595	0.141602518
0.067431729	0.068359836
0.067445641	0.069716516
0.039724339	0.039666294
0.101168461	0.09856473
0.058100985	0.058898436
0.051625877	0.050068537
0.113589657	0.112654209
0.115359287	0.116230533
0.110989448	0.08487144
0.036600809	0.041282262
0.046980808	0.044781935
0.107508442	0.109155967
0.112654556	0.109855685
0.087761471	0.09351797
0.068791905	0.047585852
0.030629237	0.033706347
0.117579927	0.076564551
0.066421332	0.066421332
0.059926209	0.060550912
0.184060232	0.182914214
0.053148841	0.05676648
0.073715652	0.070181492
0.15545058	0.155653635
0.089847346	0.088286449
0.092628814	0.092847303
0.07311487	0.073674398
0.045323826	0.047770341
0.046017717	0.04680638
0.13222368	0.092860212
0.099378687	0.099378956
0.057716489	0.057932342
0.127895623	0.105129258

0.104913958	0.103054338	0.151109571	0.1511095821	0.088215364	0.085664587
0.142216585	0.143908363	0.074389939	0.072231231	0.045898698	0.042008978
0.086589273	0.091712092	0.072322674	0.071861745	0.072902674	0.073126739
0.03173247	0.036589481	0.080785966	0.080027852	0.071435096	0.07221304
0.18521401	0.187480615	0.046932799	0.045185794	0.147743663	0.146253477
0.148574082	0.108571022	0.072585833	0.072950559	0.127582821	0.127582901
0.049056031	0.04712606	0.070575533	0.071861745	0.058791625	0.059165801
0.112474127	0.11059672	0.104514079	0.101839069	0.082255548	0.08471467
0.060857698	0.060156226	0.081223882	0.079583673	0.08067371	0.080112905
0.078534922	0.079618534	0.264615429	0.264392537	0.034649819	0.033616933
0.024658034	0.030962763	0.11415506	0.062915125	0.121505366	0.123710312
0.045829639	0.04688647	0.141442688	0.141118038	0.070605011	0.072612574
0.137940898	0.06266256	0.097466917	0.099664615	0.080425159	0.021457089
0.04829937	0.047339996	0.095713152	0.09447007	0.061415618	0.060486412
0.077251065	0.076154017	0.099350047	0.099718407	0.068189994	0.067117389
0.079351547	0.079262948	0.123335924	0.122461201	0.067730222	0.068061169
0.035545288	0.035697195	0.203094015	0.152201779	0.060721239	0.060693776
0.049102918	0.049102867	0.0622374	0.0622350	0.145926853	0.146464967
0.099654873	0.098205837	0.187210579	0.185441248	0.079794285	0.08156231
0.045304063	0.047284292	0.073426748	0.072350987	0.12006233	0.123870334
0.077127608	0.08347905	0.071151181	0.071059005	0.070490167	0.068406005
0.053815784	0.054954861	0.07008688	0.071672379	0.064227653	0.063829542
0.098286871	0.098395369	0.051637807	0.053310034	0.075697439	0.083380532
0.061386441	0.063107114	0.093925595	0.090034724	0.049799818	0.047912694
0.034935012	0.038359226	0.04036813	0.039775796	0.077825668	0.075131702
0.149255549	0.122502045	0.060118609	0.058874631	0.185883614	0.187080932
0.063907723	0.065970349	0.147271055	0.145448964	0.05268199	0.062051597
0.188083948	0.188083890	0.092623332	0.093266743	0.0766055	0.076300719
0.038174675	0.037389444	0.071952113	0.072198391	0.069676285	0.07087752
0.071736577	0.070505188	0.034754228	0.032605725	0.081138915	0.082614939
0.052061029	0.053413491	0.117024003	0.119342923	0.033114077	0.031348831
0.030389337	0.039254212	0.033478635	0.030393408	0.192004976	0.146548882
0.078809684	0.079266552	0.141650011	0.141650056	0.115737633	0.077243716
0.04045102	0.036983381	0.068706407	0.069072248	0.135761683	0.135761720
0.069300552	0.072768192	0.083171589	0.084297851	0.082631899	0.087197646
0.090492693	0.096144284	0.058805068	0.060772806	0.067158384	0.067321712
0.147844085	0.086300562	0.062150176	0.0646001	0.070432295	0.067079449
0.075579153	0.074961802	0.041270646	0.039065825	0.044305617	0.035552108
0.098868833	0.095846642	0.121340819	0.123192502	0.131917475	0.130134131
0.1005958	0.103617991	0.104856812	0.101601327	0.090710581	0.091563448
0.11187451	0.110525857	0.061007543	0.075409553	0.078077609	0.078884295

0.135771753	0.137411353
0.130155207	0.12751868
0.044263555	0.041307352
0.082194488	0.085986733
0.054440505	0.057324489
0.11307782	0.114458198
0.058524072	0.058083265
0.138499578	0.136825839
0.111370114	0.076843028
0.070476631	0.068875734
0.078829391	0.070932026
0.078784559	0.07962976
0.118176839	0.116600721
0.075337136	0.075937299
0.047412852	0.046961239
0.14764002	0.148499053
0.052304773	0.049499684
0.10322812	0.10322798
0.105157591	0.084838593
0.031239716	0.024992168
0.133900295	0.13233341
0.077762252	0.078617429
0.161906734	0.160792208
0.039702245	0.037815333
0.104928171	0.106143847
0.064024658	0.063686308
0.157960935	0.156482625
0.081852331	0.083282095
0.066006115	0.069339084
0.147333326	0.1471113
0.085950615	0.084313746
0.069849852	0.066404539
0.058635426	0.058010003
0.082213678	0.084195944
0.069160954	0.069160954
0.037693564	0.035289716
0.08132966	0.080662209
0.121721702	0.117212272
0.061852155	0.059016374
0.051233573	0.053337819
0.102818208	0.102293626

0.042924239	0.044016647
0.069987278	0.068687317
0.060472217	0.061409191
0.09887204	0.102003077
0.056487352	0.05863169
0.163666176	0.163445875
0.084883979	0.082087515
0.039559229	0.040519278
0.145695148	0.146950988
0.13096066	0.129489994
0.069024718	0.068725121
0.103427906	0.101386565
0.102450954	0.100706119
0.078591599	0.077673671

BILINGUAL 1

Initial measurement	Rater
0.069891404	0.129833899
0.159385656	0.160074043
0.179294594	0.180100393
0.265162056	0.263639696
0.325803726	0.322772982
0.099807211	0.101343132
0.042611075	0.045857702
0.074860732	0.109267137
0.134024859	0.136786114
0.230755482	0.261550145
0.07455962	0.075406291
0.154261283	0.115421191
0.117983214	0.116677997
0.168726824	0.166876452
0.117951382	0.120203567
0.067013252	0.067722328
0.124237192	0.126937735
0.281944328	0.326184335
0.234953319	0.235047114
0.065978137	0.091482
0.114449484	0.152244811
0.143272637	0.184269306
0.146905308	0.163956694
0.07984802	0.095569697
0.111538535	0.163557486
0.10508802	0.103284023
0.139741387	0.160253136
0.132070858	0.110360389
0.124538299	0.080673491
0.248732518	0.264799917
0.064135563	0.092795604
0.072152509	0.092697087
0.117581866	0.120508161
0.23079717	0.228917491
0.212081972	0.258555198
0.096831575	0.09433212
0.102610852	0.124831095
0.103700245	0.105897491
0.199151596	0.2026681
0.081767349	0.082148156
0.115929581	0.158371916
0.102553091	0.108822813
0.143992382	0.159732123
0.10107567	0.100527205
0.072472987	0.094837498
0.140441983	0.139757333
0.198997566	0.200755193
0.222712301	0.257513792
0.295826434	0.353859549
0.111564182	0.109259425
0.0608354	0.059040506
0.115152721	0.123937602
0.339905725	0.387012364
0.254192038	0.297331067
0.115879609	0.125014553
0.255467934	0.282112222
0.112831671	0.115855805
0.138430314	0.201566308
0.139490799	0.137199122
0.244898071	0.244898101
0.12556144	0.18236857
0.430842146	0.428540974
0.097238381	0.097822495
0.07705683	0.076055616
0.154415823	0.193006032
0.059773014	0.062859943
0.070417524	0.070248368
0.144929089	0.143622188
0.194466998	0.192179006
0.301670154	0.345818843
0.441749133	0.444138497
0.107057491	0.108008807
0.128723888	0.130661074
0.170782188	0.170074702
0.077925355	0.07970921
0.111321935	0.112856721
0.118743398	0.119624398
0.131319116	0.18081493
0.10097401	0.108349298
0.091090118	0.092048961
0.155332622	0.155332598
0.172257158	0.186357606
0.173669804	0.199360665
0.098843984	0.132014394
0.163126713	0.162423328
0.09438001	0.09438121
0.12980228	0.131100303
0.193178888	0.193367281
0.067198682	0.068070756
0.05274161	0.050406593
0.061538775	0.065039082
0.080220159	0.102680096
0.070696498	0.070696501
0.070913233	0.070913312
0.061638836	0.062941566
0.15258729	0.152256916
0.073566937	0.073780759
0.079002985	0.101454244
0.116009401	0.121963631
0.099018461	0.099018461
0.15248831	0.153128164
0.193858278	0.201684265
0.067782119	0.068935871
0.074560331	0.073336033
0.070794658	0.071142574
0.141965884	0.172194743
0.109948264	0.15557105
0.140012243	0.158988808
0.060874021	0.095092941
0.124741845	0.124536111
0.077462343	0.077961469
0.064814206	0.063926936
0.0840706	0.083145216
0.154051155	0.15113604
0.08246648	0.082477469
0.11426728	0.113672731
0.028486655	0.031114423
0.123350466	0.122984275
0.133932086	0.134867181
0.145651144	0.158983427

0.07616153	0.077681495
0.096204038	0.098858241
0.088568797	0.111719659
0.149650726	0.173141999
0.12130905	0.120770188
0.135501865	0.137334717
0.079164046	0.081127189
0.112561377	0.113151081
0.116272192	0.119759899
0.13276823	0.132165868
0.077856154	0.077059696
0.028282821	0.028277217
0.091711205	0.092606477
0.163042143	0.171814981
0.080142449	0.080142399
0.085244789	0.085942736
0.113659719	0.113659812
0.122477023	0.120163983
0.124518307	0.120965491
0.065256035	0.109385015
0.14288986	0.139272082
0.071177381	0.074426796
0.073334271	0.081281324
0.16931589	0.170622979
0.204904581	0.21357845
0.10634503	0.10700292
0.062600911	0.061624195
0.088892026	0.086227583
0.087728286	0.117100325
0.137280728	0.124717917
0.10757991	0.10757899
0.10074944	0.095211321
0.128071322	0.136196188

BILINGUAL 2

Initial measurement	Rater
0.128438054	0.127591209
0.16513464	0.164531474
0.042330968	0.087450882
0.104301239	0.073789061
0.086917699	0.097233496
0.171517592	0.181124458
0.232359981	0.233693004
0.217987485	0.148309996
0.209376276	0.212882749
0.145647346	0.145233443
0.174342767	0.176612302
0.065766732	0.066962491
0.094464942	0.098052219
0.176374418	0.194416819
0.178946485	0.179544364
0.17737816	0.178699079
0.108653837	0.105215425
0.132722725	0.134680634
0.162740109	0.168929892
0.093721377	0.091310998
0.056760839	0.055883947
0.123389858	0.142244792
0.124739902	0.199041957
0.102922554	0.114043622
0.072570808	0.072411425
0.045466048	0.046518855
0.106517767	0.106708544
0.101564045	0.128460578
0.058160883	0.06244871
0.113616608	0.110591994
0.120379502	0.162028372
0.062539736	0.062238343
0.094376166	0.120515054
0.128657476	0.144021028
0.129848574	0.158359886
0.294911985	0.312391456
0.097394788	0.097592192
0.127277279	0.128803298
0.096288029	0.095361307
0.141649804	0.167766773
0.105595312	0.104418589
0.093991432	0.09642074
0.166515684	0.167982484
0.187402669	0.215217842
0.283134683	0.283134707
0.097245136	0.095376211
0.160080454	0.169707307
0.179529481	0.191205646
0.072990192	0.076070492
0.093371414	0.124333529
0.15214857	0.164938196
0.04251578	0.042998071
0.125522778	0.127136397
0.110813726	0.11443236
0.134951369	0.159114452
0.226243887	0.226243912
0.095396467	0.095165581
0.120165131	0.117557482
0.127552373	0.19568618
0.130534207	0.130534198
0.096195654	0.095882606
0.128835222	0.145443585
0.045663116	0.047566197
0.092630893	0.114190428
0.109924848	0.107006675
0.046172548	0.046221467
0.184261025	0.131339961
0.160588896	0.186349831
0.091307402	0.09094936
0.181503716	0.182065147
0.077428542	0.076058757
0.083284483	0.08324622
0.135337284	0.138568216
0.153555765	0.154486812
0.158761045	0.157774496
0.069533902	0.067010373
0.24223777	0.171367114
0.130309717	0.142819396
0.103441734	0.102893577
0.169268292	0.173631264
0.222535401	0.241636806
0.295547812	0.295547908
0.110012693	0.109770999
0.169063624	0.174250487
0.173917126	0.179154618
0.17310684	0.171128128
0.172473268	0.250422006
0.115806187	0.117089066
0.100805386	0.099923156
0.179500185	0.18802657
0.190247358	0.190247298
0.139880427	0.17600553
0.168975555	0.178216899
0.171799131	0.174174591
0.217938103	0.220362374
0.177031378	0.176826942
0.214084457	0.214084457
0.14677641	0.14794989
0.167574687	0.178354821
0.206794294	0.205126384
0.105289147	0.106109178
0.146489248	0.147750606
0.199687943	0.20420396
0.118270545	0.149991005
0.211150615	0.212241118
0.211510469	0.215557611
0.163816932	0.167819856
0.176777132	0.177045682
0.127560386	0.125760925
0.082222345	0.082222297
0.119080638	0.116210035
0.137509784	0.135879744
0.115207251	0.118356156
0.060624652	0.05807664
0.219585352	0.222605576
0.219585352	0.218439296
0.273451715	0.291582022
0.106440632	0.105027929
0.107664088	0.108608427
0.17006032	0.169268616

0.130966823	0.129878471
0.17840559	0.179182945
0.056914951	0.056914899
0.040318676	0.041572119
0.121673431	0.122003241
0.156945807	0.158762721
0.201075341	0.201075341
0.144141807	0.146210649
0.148576939	0.15047413
0.135869632	0.135869632
0.218170591	0.215988967
0.102984419	0.099897762
0.178708257	0.178041883
0.110030141	0.110291166
0.148817745	0.147528411
0.156322972	0.15648526
0.15521689	0.156002338
0.213245027	0.217644279
0.097464047	0.100242189
0.094141409	0.097801515
0.105216869	0.117177777
0.119924725	0.121613345