

**An acoustic investigation of
English vowels as produced by
English L1 and Setswana L1
foundation phase learners**

by

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Summary and Key Terms

This thesis provides a literature review on various topics related to the aims of the research project. In the process of sketching the rationale of this study, the language-in-education policy (LiEP) of South Africa is examined. The reasons why this policy is not successful, is discussed. Emanating from this discussion, the low literacy scores amongst young learners in South Africa are described and possible reasons for this occurrence are cited (Howie, Van Staden, Tshele, Dowse, & Zimmerman, 2012).

The hypothesis that perceptual and articulation training of the vowels of English would enhance young English second language (Setswana first language-speaking) learners' awareness of English vowels, is posited and defended by referring to previous research (Moats, 2007; Trehearne, 2011; Seeff-Gabriel, 2003). In addition, it is stated that increased knowledge of the vowel system of English will improve English second language (EL2) learners' literacy skills (Moats, 2007). In order to explain and discuss the results of the investigations into the literacy skills of the EL2 learners participating in this study, the notions of literacy acquisition, phonological awareness skills, and language acquisition and language learning are examined.

The main aim of this study is to assess the effects of intervention on the auditory perception and articulatory skills of English second language-speaking (EL2) (Setswana L1-speaking) learners in Grade 3, in the production of the monophthongs and diphthongs of the standard variety of South African English, namely White South African English (WSAfE) (Bekker, 2009). The effects are determined by acoustically comparing the vowel spaces of the participants before and after intervention. Therefore, a discussion of acoustic concepts such as the vowel space and the parameters thereof are provided. In addition, the vowels of WSAfE, those of Black South African English (BSAE), and the vowels of Setswana are discussed and compared according to their acoustic features.

The results of this quasi-experimental, comparative study indicate that the vowel spaces of the EL1 and EL2 participants differ markedly before intervention,

especially when comparing those of the short and long monophthongs of English. After intervention, the vowel spaces of especially the Experimental group are seen to approximate those of the EL1 participants in the Norm group. Interesting findings concerning the central schwa vowels and the diphthongs were made. These indicate that young EL2 (Setswana L1-speaking) learners do not use BSAE, but use a 'new' variety of English that is closer to WSAfE (Mesthrie, 2008).

Pertaining to the measurable sub-aims of this study, the phonological awareness skills and literacy skills of the participants are assessed and compared, before and after intervention. The improvement of the phonological awareness skills and literacy skills of the Experimental group, as well as the changes in the vowel spaces that are noted for this group, prove the hypothesis that intervention in the form of additional input concerning the English vowels will enhance second language learners' perception and articulation. This strengthens the opinion that second language learners need quality teaching of the sound system of the language of learning and teaching.

Key terms: Language-in-education policy (LiEP), language of learning and teaching (LoLT), phonological awareness (PA) skills, literacy skills, literacy acquisition, language acquisition, language learning, White South African (first language) English (WSAfE), Black South African English (BSAE), Setswana, acoustic phonetics, vowel space, formant frequencies, intervention.

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List of Abbreviations and Acronyms

LoLT	Language of Learning and Teaching
ELoLT	English Language of Learning and Teaching
L1	First Language
L2	Second Language
EL1	English first Language
EL2	English second Language
LiEP	Language-in-Education Policy
DoBE	Department of Basic Education
PAM	Perceptual Assimilation Model
NLM	Native Language Magnet
SLM	Speech Learning Model
SAE	South African English
WSAfE	White South African (first language) English
BSAE	Black South African English
NEPI	National Education Policy Investigation
PIRLS	Progress in International Reading Literacy Study
prePIRLS	Progress in International Reading Literacy Study, with younger learners, namely in Grade 4
IEA	International Association for the Evaluation of Educational Achievement
RP	Received Pronunciation
Standard BrE	Standard British English
PanSALB	Pan-South African Language Board
LANGTAG	Language Task Action Group
PED	Provincial Education Department
PA	Phonological Awareness
BICS	Basic Interpersonal Communication Skills
CALP	Cognitive Academic Language Proficiency
SADoE	South Africa Department of Education
OBE	Outcomes Based Education
NCS	National Curriculum Statement

CAPS	Curriculum and Assessment Policy Statement
ELSA Plus test	English Language Skills Assessment for tertiary environment
ANA	Annual National Assessment
NCSNET	National Commission on Special Needs in Education and Training
NCESS	National Committee on Education Support Services
F₀	Fundamental frequency
F₁	Formant one (first formant)
F₂	Formant two (second formant)
Hz	Hertz
V1	Volume 1
V2	Volume 2
TAPS-3	Test of Auditory Processing Skills, Third edition
W-NORM	Wissing/Wikus-Normalisation
PHONAAS	Phonetic Acoustical Analysis System
SLTs	Speech-Language Therapists
SD	Standard Deviation
Fig	Figure

Chapter 1

Introduction

“Language is the vehicle of cognitive growth”, (Brown, 1994, p.3).

1.1 Introduction and background

South Africa has one of the most diverse multilingual populations in the world as can be seen in the figure below, reflecting the various languages spoken in South Africa.

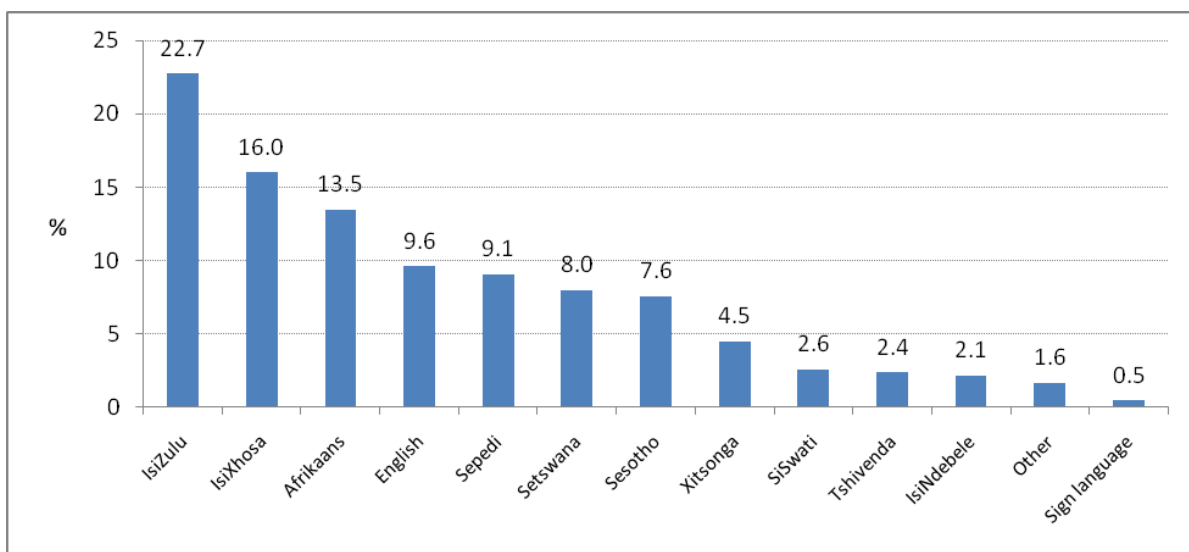


Fig. 1: The various languages spoken in South Africa (Government of South Africa, 2012a)

The language of learning and teaching (LoLT) differs in most cases from the native languages spoken and understood by learners in the schools. Despite the fact that English is the first language (L1) of only 9.6% (Government of South Africa, 2012a) of the South African population, it is the chosen medium of instruction for the majority of South Africans either from Grade R or 1 or after the first three to four years of schooling (National Education Policy Investigation (NEPI), 1992; Webb, 1999). (See Chapter 2 for a discussion on English as medium of instruction in the majority of schools in South Africa).

Focusing on the impact that this may have on the total learning process of learners in such situations, studies in South Africa have shown that English second language

(EL2) learners display poorer phonological awareness skills than their English first language (EL1) peers since they do not always perceive and articulate the vowels of English correctly (Geertsema & Le Roux, 2014; Owens, 2012; Seeff-Gabriel, 2003). The lack of sufficient phonological skills in turn impacts on learners' literacy skills (Venkatagiri & Levis, 2007). (See Chapter 3 for a detailed discussion on phonological awareness skills and literacy acquisition). It has furthermore been established that mother tongue speakers of the African languages, which contain only 5 to 11 vowels, perceive fewer than the 20 vowels known in English. Setswana has a vowel system of seven basic vowels and four raised variants of the mid-vowels. (See Chapter 4 for a discussion of the vowels of Setswana, White South African English (WSAfE)¹ and Black South African English (BSAE). The result is poorer phonological awareness, discrimination and pronunciation of the vowels of English. The fact that diphthongs do not occur in the African languages adds to the problems EL2 learners have with auditory perception and discrimination of the English vowel sounds. The inability to discriminate all the vowels of English – monophthongs and diphthongs – leads to poorer literacy skills (Howie, Van Staden, Tshele, Dowse, & Zimmerman, 2012). (See Chapter 2 for a brief discussion on the results of various literacy assessments done in South Africa).

This study therefore aims to address this problem by investigating the effect of intervention given to EL2 Grade 3 learners, who received tuition through the medium of English from Grade 1, on the perception and production of the vowels of English.

1.2 Rationale

Mother tongue instruction is the best option for schooling (Prinsloo & Heugh, 2013). Butzkamm (2003, p. 30) confirms this when stating “the mother tongue is, for all school subjects, including foreign language lessons, a child's strongest ally and should, therefore, be used systematically.”

¹ WSAfE is seen as Standard South African English according to Bekker (2009, 2012) because of its origin. See Chapter 4 for a more detailed discussion of the origin of English in South Africa.

Quality mother tongue instruction up to Grade 12 would therefore be the best learning opportunity offered to any child. In the South African context the majority of African language-speaking learners do not have this opportunity. Some learners get the opportunity to study via the mother tongue up to Grade 3, but many others do not. Even those learners who do get tuition in the mother tongue are not necessarily advantaged due to the short time they have to acquire the necessary literacy skills before the transition to English in Grade 4. This means that the fledgling literacy skills have to be carried over to the new language of instruction. A study on the reading skills of Grade 4 learners, the Progress in International Reading Literacy Study (prePIRLS) 2011, and conducted by the International Association for the Evaluation of Educational Achievement (IEA), indicates that the majority of African language-speaking learners who received instruction via the medium of the mother tongue from Grade 1 to 3 scored much lower than their English, Afrikaans *and* English L2 peers who received instruction in English from Grade 1 (Howie et al., 2012).

This indicates that mother tongue instruction during the foundation phase is not beneficial if it is not *quality* instruction, focussed on teaching learners sufficient skills to acquire literacy. English L2 learners need even more structured, specialised input on the grammar (and for the purpose of this thesis, the sound system) of the target language to enable literacy acquisition. This is especially necessary when the L1 and L2 differ with regards to grammatical rules (such as morphological rules) and sound inventory. In addition, quality language and literacy instruction in the English as language of learning and teaching (ELoLT) classroom is needed to enable English L2 learners to perform on par with their English L1 peers.

The basic premise of this study is therefore that EL2 learners should receive quality instruction in all the skills necessary to enable them to acquire literacy skills in English. (See Chapter 3 for a discussion on what should be taught to enhance phonological awareness skills). This includes thorough instruction in the sound system of English with special attention to the vowels.

In practice, pronunciation teaching is (or should be) an integral part of second language teaching (Harmer, 2005). Pronunciation teaching, which includes attention to discrimination between L2 sounds, makes L2 speakers aware of the differences between the sounds of the L1 and the L2. Such awareness results in better discrimination and production of the L2 sounds. Through such pronunciation teaching, awareness of the implications of incorrect discrimination and articulation of these sounds, such as meaning loss, is stimulated. Knowledge of the vowel system of English will support phonological awareness skills (*inter alia*), which is crucial to literacy acquisition.

This study will include acoustic phonetic analysis to provide concrete, measurable evidence of differences between the interpretation of the English vowels by EL1 and EL2 learners (Setswana L1-speaking learners). According to Seeff-Gabriel (2003), L2 speakers often discriminate the sounds of a second language with reference to the sounds of their first language. As mentioned earlier, this means that the Setswana L1-speaking learner very often interprets the vowels of English in terms of the Setswana vowel system, which implies that the 20 vowels of English are reduced to the 11 vowels of Setswana. This may impact the meaning of English words (Lanham & Traill, 1965) and literacy acquisition. It is understandable that meaning loss in the classroom is detrimental to the learning process and that any solution to this problem should be investigated (Nsamba, 2009). The acoustic data will allow all stakeholders such as speech-language therapists and educationalists to focus on the differences that exist between the vowel systems of the two languages. Once the differences have been identified, speech-language therapists could design and/or adapt existing intervention materials and methods to present auditory perception and articulation intervention. Educationalists could design foundation phase syllabi to enable African language-speaking learners to contend with English literacy acquisition.

The results of this study could point to the importance of quality input concerning the sound system (and for the purpose of this thesis, the vowel system) of a second language, especially where this second language is the language of learning and teaching. The current English LoLT environment very often has a negative impact on

the learner's cognitive development and therefore on academic performance (Foley, 2010; Probyn, 2009; Seeff-Gabriel, 2003; Uys, Van der Walt, Van den Berg, & Botha, 2007; Weideman & Van Rensburg, 2002). Better proficiency in the LoLT – including knowledge of the more extensive vowel system of English – should lead to better understanding in the classroom which should lead to better academic achievement (Seeff-Gabriel, 2003). Results of this study should raise the awareness of educators concerning the importance of auditory discrimination and articulation training of the vowel system in the ELoLT classroom. The explicit teaching of auditory discrimination and pronunciation is of the utmost importance in the ELoLT environment:

“Concentrating on sounds, showing where they are made in the mouth, making students aware of where words should be stressed – all these things give them extra information about spoken English and help them achieve the goal of improved comprehension and intelligibility”, (Harmer, 2005, p. 183).

Teachers in the ELoLT environment should realise that they present a very important language model to the learners. They themselves should be aware of possible perception-articulation fall-out and that this should be addressed. The curriculum of teacher training institutes should therefore focus on this aspect of language teacher training as well.

1.3 Research question

The research question that this study poses is firstly whether additional input or intervention concerning the vowels of the standard variety of South African English will improve Grade 3 EL2 learners' ability to discriminate and articulate the various vowels. The premise is that intervention will enhance the participants' phonological awareness skills with regards to these English sounds. These improved skills should lead to better auditory discrimination of these sounds as well as articulation that is more in line with that of EL1 speakers. Such an improvement should be noticeable when the vowel spaces occupied by the vowels produced by the EL1 and EL2 participants are compared before and after intervention. Additional questions to be

answered are whether this intervention will improve the participants' phonological awareness skills, and subsequently their reading and spelling skills.

1.4. Brief layout of chapters

Chapter 1: Introduction, background and rationale

In this chapter a brief background to the theme of this thesis is given as an introduction. The rationale, flowing from the background, explains the reason for this specific topic as research project and leads to the research questions.

Chapter 2: The language-in-education policy and practices in the South African education system

This chapter focuses on the tendency in South Africa to choose English as language of learning and teaching (ELoLT). The language-in-education policy (LiEP) is discussed with reference to reasons why this well-intended policy is not successful. Emanating from this discussion, the low literacy scores amongst especially young learners in South Africa are described and various reasons for this occurrence are cited.

Chapter 3: Literacy acquisition, phonological awareness and language acquisition

With the low literacy skills presented in Chapter 2, Chapter 3 follows up with a discussion of the process of literacy acquisition. This process includes the very important skill of phonological awareness which is explained in detail in this chapter. Phonological awareness skills are related to oral language skills and therefore language acquisition – of both first and second language – is discussed.

Chapter 4: Vowel features and the vowels of South African English and Setswana

This chapter provides background information for the presentation of the results of this study in Chapter 6. Therefore the acoustic concept of the vowel space and the parameters thereof are addressed. The vowels of the standard variety of South African English viz. White South African English (WSAfE), those of Black South African English (BSAE), and the vowels of Setswana will be discussed and compared according to their acoustic features.

Chapter 5: Method

The method that was used in order to conduct this study is presented in Chapter 5 along with the aims.

Chapter 6: Results and discussion

The results of this research project are presented and discussed in this chapter. The results will be presented in table-format, supported by figures to visually display the differences and similarities in the data collected from the groups of participants. These results will be discussed below the tables containing the results of various measurements or assessments. A general, conclusive discussion will be provided at the end of the discussion pertaining to the main aim and the sub-aims.

Chapter 7: Conclusion

This chapter will conclude the study; the theoretical background presented in Chapters 1 to 4 will be summarised along with the method explained in Chapter 5. The results presented in Chapter 6 will be summarised, and the final conclusion to these will be offered. Limitations of the research project and recommendations for further studies will be given in this chapter.

1.5 Summary

This introductory chapter serves to sketch the background to this research project, namely the language-in-education situation in South Africa. The majority of learners in this country do not receive education via their mother tongue, but through the medium of a second language, viz. English. This is often due to choice, even though research has established that education, during the foundation phase (at least) through the medium of the mother tongue, has greater educational benefits.

Contrary to the statements that mother tongue education offers more advantages, many foundation phase learners in South Africa who *do* get the opportunity to learn via their mother tongue, do not perform well during literacy assessment. The reason for this tendency could be that these learners did not receive quality instruction due to a variety of explanations as mentioned in the prePIRLS 2011. In addition, or alternatively, it could be because the majority of foundation phase learners who do learn via their mother tongue, change to English as medium of instruction in Grade 4. This is a relatively short time for the necessary L1 literacy skills to become fully developed before the transition to English in Grade 4. The immature literacy skills are not always successfully transferred to the new language of instruction.

EL2 learners need structured, focussed input on especially the sound system of the target language to enable learners to discriminate between the vowels of English. Such input should enable literacy acquisition through sound phonological awareness skills. This is even more important when the L1 and L2 differ with regards to sound inventory as is the case with English and Setswana. Educators in the ELoLT environment should realise that they themselves, as important language model to the learners, may experience problems in discriminating the various English vowels. This should be addressed during teacher training.

Many mother tongue speakers of African languages, which contain only 5 to 11 vowels, are unable to discriminate the 20 vowels of standard South African English. The result is that these EL2 learners will have poorer phonological awareness skills, discrimination and pronunciation of the vowels of English, as confirmed by research.

Learners need sufficient phonological awareness skills to develop good literacy skills. The inability to discriminate all the vowels of English, leads to poorer literacy skills.

The research question that this study poses is two-fold: would intervention concerning the vowels of English improve the Grade 3 EL2 participants' ability to discriminate and articulate the various vowels; and would these improved skills result in enhanced phonological awareness skills and corresponding literacy skills.

To present a structure for this thesis, the layout of chapters was presented above. Emanating from the background and rationale sketched in this chapter, the next chapter deals with the LiEP and why it is not successful. Its lack of success can be measured by the poor literacy skills achievement of young South African learners. This issue is also discussed in Chapter 2.

Chapter 2

The language-in-education policy and practices in the South African education system

“Language is not everything in education, but without language everything is nothing in education”, (Wolff, 2006).

2.1 Introduction and objectives

The first objective of this chapter is to discuss the language-in-education policies and practices in the education system in South Africa. English has a long history of being the language of learning and teaching (LoLT) in South Africa; in some instances as preferred language and in others not. Although the African languages became official languages after 1994, they have not fully reached the status of LoLT on all levels of education. English is still the preferred medium of instruction in the majority of schools in South Africa. There are multiple reasons why schools, and thus in effect parents, choose English as the LoLT. This choice is facilitated by the government’s Language-in-Education Policy (LiEP) (1997) which allows parents and schools the freedom to decide on a specific language to be used as LoLT in any particular school. According to research, young learners stand to benefit more from mother tongue instruction (O’Connor & Geiger, 2009; Prinsloo & Heugh, 2013). Despite this, however, parents still decide to enrol their young children in English medium schools.

In contrast to research findings on the benefits of mother tongue instruction on literacy acquisition and over-all academic achievement, recent literacy skills assessments show the opposite. The second objective is therefore to examine the literacy status of learners in South Africa by referring to results of various literacy assessments and to provide probable reasons for the results.

Grade 4 learners who acquired literacy skills via the medium of their mother tongue performed at a lower level than their English second language (L2) peers who were assessed via the medium of English. Although the results of the prePIRLS 2011

research project showed that English L2 learners performed better than the African languages L1 learners, the level of literacy in South Africa is still not very high (Howie et al., 2012). Various reasons for this situation are mentioned in academic circles. One of the main reasons and of most relevance to this study is the little time allocated to the study of English and its sound system during the foundation phase.

2.2 Brief historic overview of English in South Africa

In 1806 Britain took over the Cape Colony, established by the Dutch in 1652, and in 1820 landed approximately 5000 permanent settlers from the south-eastern area of England in the Eastern Cape (De Klerk, 1996; Lanham & Macdonald, 1979; Lass 1995). In 1822 English was declared the only official language of the Cape Colony (De Klerk, Adendorff, De Vos, Hunt, Niesler, Simango, & Todd, 2006; Gough, 1996a; Niesler, Louw, & Roux, 2005).

Between 1840 and 1850, more settlers from the northern counties of England moved to South Africa and settled in Natal (Bekker, 2012; Lanham, 1996). These immigrants, however, were of the middle to higher social classes (compared to the 1820 Settlers according to Bekker, 2012) and supported the British standard variety of speech, named Received Pronunciation (RP) (Gough, 1996a). These two groups of settlers were responsible for establishing the core accents of English in South Africa (Schneider, 2007). Although the variety of English spoken by the settlers in Natal had higher social status as it was much closer to the Standard Southern British English (Lanham, 1996), it is the 1820 Settlers to the Eastern Cape, however, who had the most long-lasting influence on the English spoken in South Africa (De Klerk et al., 2006).

After 1875 even more English-speaking people flocked to South Africa following the discovery of gold and diamonds in Kimberley and the Witwatersrand, swelling the ranks of the English-speaking population (Bekker, 2009; Lanham, 1996). Following the Anglo-Boer war, the Union of South Africa was formed in 1910, with English as official language alongside Dutch (Gough, 1996a). Dutch (and later Afrikaans) was more widely spoken in the rural areas while English was prevalent in urban areas,

except in Bloemfontein and Pretoria (Lanham, 1996). English, however, was definitely the language of commerce and economic progression with the wealth of the country in the hands of the English.

Within the apartheid era, and under Afrikaner nationalism, the Bantu Education Act of 1953 entrenched mother tongue instruction up to the highest possible educational level for black learners. English took on the status of a subject and was no longer the medium of learning and teaching (Posel & Casale, 2011). As a result of this, combined with a second-class education system, Lanham (1996) indicates that the quality of English, as well as the ability to converse on basic topics, declined in the African communities. Despite this decline in English proficiency participants in a study done by Lanham (n.d.) in the mid-sixties to mid-70s, indicated that they would like their children to learn and use Standard British English (Standard BrE). Standard English was therefore seen as the most appropriate and desired variety to use.

The language policy stipulated by the Bantu Education Act of 1953, despite its educational advantage of acquiring literacy via the mother tongue, failed dismally (De Klerk, 1999). As a result, English became all the more desirable. It had the status of international language of business and academia, perceived as spoken by the successful and privileged members of society (Howie et al., 2012; Rasool, Edwards, & Bloch, 2006). English was therefore viewed by many as the key to educational and socio-economic advancement. Due to the limitations of the indigenous languages in the educational and economical spheres, these languages were regarded as worthless by many of their speakers (Alexander, 2005; De Klerk, 1999). This language policy as well as an inferior and limited school curriculum resulted in the political and economic isolation of non-Whites from the rest of the country. The isolation in turn resulted in a devastating limitation of job opportunities, with low-paying manual labour as the only prospect.

After the 1976 uprising in which Black learners protested against language issues such as Afrikaans as medium of instruction in Black schools, the education policy was changed to increase the exposure to English. English then slowly but surely started to claim back its status as language of education in South Africa. After 1994,

despite being only one of the 11 official languages and the mother tongue of only a small percentage of the entire populace even today – 9,6% (Government of South Africa, 2012a) –, English became the lingua franca and the language of choice in education (Branford, 1996; Nel & Müller, 2010; Seeff-Gabriel, 2003). English has thus regained the social status and degree of use it had lost during the years of Afrikaner rule.

2.3 Current status

2.3.1 Post-apartheid: The language-in-education policy (LiEP) of 1997

In the early post-apartheid period multilingualism was strongly promoted and the status of the indigenous languages was raised. Such efforts include the establishment of the Pan-South African Language Board (PanSALB) established in 1995, the Language Task Action Group (LANGTAG) (1996) and the Provincial Language Councils, (De Klerk, 1999; Foley, 2010).

The post-apartheid government adopted one of the most progressive language policies in the world (Probyn, Murray, Botha, Botya, Brooks, & Westphal, 2002), namely the LiEP of 1997 which allows parents the freedom to choose the language of instruction for their children. The underlying principle of the LiEP is to maintain the use of home languages as the LoLT (especially in the early years of learning), while providing access to an additional language(s). The LiEP has the following stipulations:

- All learners shall be offered at least one approved language as a subject in Grades 1 and 2.
- From Grade 3 onwards, all learners shall be offered their LoLT and at least one additional approved language as a subject.
- All language subjects shall receive equitable time and resource allocation.
- Learners must choose their LoLT upon application for admission to a particular school. Where a school uses the LoLT chosen by the learner, and where there is a place available in the relevant grade, the school must admit the learner.

- Where no school in a district offers the desired language as a medium of learning and teaching, the learner may request the provincial education department (PED) to make provision for instruction in his/her chosen language. The PED must make copies of the request and make it available to all schools in the relevant school district.
- The PED must keep a register of requests by learners for teaching in a language or medium that cannot be accommodated by schools.
- It is reasonably practical to provide education in a particular LoLT if at least 40 learners in Grades 1 to 6 or 35 learners in Grades 7 to 12 request it in a particular school.

It should be noted that although English is called an ‘additional’ language, it should actually be described as the second language because of its dominance in all official terrains, especially that of education (Saville-Troike, 2012).

2.3.2 Implementation of the LiEP

2.3.2.1 Disparity between theory and practice

According to Posel and Casale (2011) there is a disparity between approved language policy and practice. They explain that the reason for the mismatch is *choice*; strict state prescription would have resulted in a more structured approach to the language of learning and teaching as well as to the implementation of an additional language.

The choice that is given results in many parents choosing English as medium of instruction, meaning that the learners do not get the opportunity to learn basic skills – cognitive as well as literacy – via the medium of their home languages. According to research, young learners benefit most from instruction via the home language (Alexander, 2005; Foley, 2010; O’Connor & Geiger, 2009; Prinsloo & Heugh, 2013). Despite the fact that mother tongue instruction is therefore advocated by policymakers, educationalists and researchers (Alexander, 2005; Prinsloo & Heugh, 2013; Theron & Nel, 2005), many parents (close to 25%) choose English as LoLT

even from as early as Grade R or Grade 1 (Barnard, 2010; De Klerk, 2002; Government of South Africa, 2010; Nel & Müller, 2010; Posel & Casale, 2011; Seeff-Gabriel, 2003).

In addition, the choice of English as LoLT means that many schools do not offer an African language as LoLT up to Grade 6 or 7 as stipulated by the LiEP. Howie et al. (2012) indicate that according to the prePIRLS and PIRLS 2011 assessment from Grade 4 and onwards about 80% of South African learners are taught via the medium of English. This means that not even in primary school are the African languages being allocated the status of language of learning and teaching.

Another problem arises because of the non-prescriptiveness of the LiEP: not enough time (if at all) is spent on English (as additional language or actually second language) to prepare those learners who learn via the medium of their home languages, to cope with English as LoLT from Grade 4 onwards (Sailors, Hoffman, & Mathee, 2007). Those English L2 learners who have to learn via the medium of English from Grade 1 (or Grade R) are also not exposed to intensive training in English to master the LoLT as well as the syllabus. Carroll (1989) states that the time a learner needs to learn increases when the quality of teaching and ability to comprehend what is taught is not adequate. This holds true in the South African context where the time allocated to language instruction as well as the quality of instruction in many schools can be questioned (Howie et al., 2012; Prinsloo & Heugh, 2013).

The reason for the choice of English as LoLT is that English is still seen as the leading language for learning and teaching by many South African parents. The reason for this perception in turn is the historical and political circumstances very briefly referred to in Section 2.2 as well as the access to higher education it offers (Bosman & Van der Merwe, 2000; Government of South Africa, 1996b; Joubert, 2004; Nkabinde, 1997).

A very important reason for enrolling children in an English medium school (former privileged schools) is that such a school is perceived as having better qualified

teachers and a higher standard of teaching and learning (Howie et al., 2012; Nel, 2004). Research findings, however, indicate that many parents do not necessarily choose to enrol their children in a specific school because of its English medium of instruction policy, but decide on a school for logistic reasons such as proximity to the school or transport arrangements (De Klerk, 2002; Nel, 2004).

According to Howie et al. (2012) the latest figures available from 2007 indicate that the majority of Grade 3 learners have English as LoLT. They state the following:

“The proportion of Grade 3 learners learning via the medium of English was higher than for either Grade 1 or 2 learners”, (Howie et al., 2012, p. 10).

This suggests that many learners switch to English as LoLT after Grade 1 or 2. Concerning the switch to English as LoLT – whether from grades within the foundation phase or in Grade 4 – questions such as the following arise:

- Did these learners who were taught via their home language develop sufficient literacy skills in this language to transfer such skills to English where these skills are now required? According to Howie et al. (2012) the results of the Progress in International Reading Literacy Study (prePIRLS 2011) indicate that the majority of African language learners who received instruction in the foundation phase via the medium of their home language, performed at a much lower level than their English or Afrikaans peers. One can therefore question the effectiveness of the instruction that many L1 speakers of the African languages received. If they did not develop sufficient literacy skills during the foundation phase, one can only assume that they will experience even more problems acquiring these skills in English in Grade 4 where it is expected that they at least have some general literacy skills.
- Were these learners instructed in English as a subject (additional language) in an effective and structured way so that they can make the switch to English as LoLT? (McWilliam, 1998).

- Why is there no corresponding improvement in learning, especially at the end of Grade 3? Learners have had three years of education via the medium of their home language, and one would expect to see literacy skills and learning successes given what is known about mother tongue instruction (Howie et al., 2012).
- Is the stage of the switch to English appropriate? Should the period of mother tongue instruction not be extended up to the end of Grade 7, when Cognitive Academic Language Proficiency (CALP) (Cummins, 2000; Prinsloo & Heugh, 2013) should be developed or better developed?
- Are Grade 1 English L2 learners who have to learn via the medium of English assisted in such a way that they can keep up with their English L1 peers?

The sentiment towards the practice of switching to English as LoLT can be summarised as follows:

“In practice, learners’ home language development is being abandoned too early. At the same time, premature reliance on a new additional language sacrifices its effectiveness as a medium of learning and teaching”, (Prinsloo & Heugh, 2013, p. 1).

2.3.2.2 The LiEP and bilingualism

The LiEP advocates additive bilingualism in that it encourages schools to teach via the home language of the learners, but simultaneously expose the pupils to an additional language. The approach of additive bilingualism, developed in the field of second language acquisition, proposes that the best way for learners to understand concepts in general and second language skills in particular, is through thorough instruction in the home language alongside the learning of the additional language (Cummins, 1980; Heugh, 1999; Probyn et al., 2002). A very important factor in this approach is the emphasis that should be on high quality, intensive, systematic and effective teaching of English as a subject, so that learners who are instructed in their home language during the foundation phase of schooling, are sufficiently proficient in

English when they have to learn through it (Foley, 2010). Even English L2 learners who have English as language of learning and teaching (ELoLT) will benefit from such a teaching approach to English.

In 2012 English as additional language became compulsory in order to prepare learners for the transition to English as medium of instruction from Grade 4 and was introduced as additional language from Grade 1. Questions concerning learners being appropriately capable in English after 3 or 4 years of instruction, arise, however (Foley, 2010; Nel & Müller, 2010). Although a policy of additive bilingualism was employed to encourage multilingualism and in the process promote the indigenous languages, its non-prescriptive nature had the opposite result: Education in South Africa became more monolingual with English being the LoLT of choice in most schools (Heugh, 1999; Probyn, 2009; Probyn et al., 2002). Because of the focus on English as medium of instruction, the indigenous languages have not received the attention they should have and curriculum material for the various subject fields therefore does not readily exist in the various African languages (Foley, 2010). A learner, who wishes to, cannot study a subject like Science, for example, via the medium of their mother tongue and will not be able to write the matriculation examinations in these languages (Barnard, 2010).

Depending on the geographical context, English may be used to a lesser or greater extent in the classroom. In rural areas, the indigenous languages may be used more while less use is made of English as medium of instruction. English and the home language, however, are often used in combination in classrooms in the form of code-mixing (mixing home language and English words in the same sentence) and code-switching (moving from home language to English between sentences) (Brock-Utne & Holmarsdottir, 2004; Foley, 2010; Probyn, 2005). The desired outcomes of this version of additive bilingualism is questionable, however, as learners are not exposed to a good model of either of the languages used in the classroom. Whatever the advantages or disadvantages of this practice, learners from Grade 4 are expected to read and write in English in assessments. (Foley, 2010; Probyn et al., 2002; Probyn, 2005). These students do not necessarily have the language ability to fully comprehend and be conversant with the subject matter at that stage of

their education. One can only imagine the number of problems and amount of stress encountered by learners who were taught via the home language in the foundation phase and who have to switch to English in Grade 4, without the assistance of code-switching and code-mixing, as is the case in classrooms where the teachers do not know the home language of the learners.

Another feature of the LiEP is that instead of foundation phase learners mastering the basic reading- and writings skills in their home language (Brock-Utne & Holmarsdottir, 2004; Heugh, 2000b; Probyn, 2005), a model of immersion learning is followed via the medium of English even as early as Grade R or Grade 1. This results in learners not developing the essential language competency in their home language. This has an impact on learners' general academic progress and cognitive development (Foley, 2010; Prinsloo & Heugh, 2013). The impact this has on educational outcomes is reflected in the national statistics: Research indicates that only 27% of school entrants are expected to complete secondary schooling (Foley, 2010; Heugh, 2000b). A number of studies conducted in schools with especially poor classroom performance and low levels of language competency corroborate these statistics: High failure rates at tertiary levels occur as students are unable to deal with advanced subject matter taught via the medium of English (Heugh, 2000b; Probyn, 2009; Probyn et al., 2002; Weideman & Van Rensburg, 2002).

The South African National Curriculum Statement by the South African Department of Education (SADoE) (Government of South Africa, 2002) asserts that as the first additional language may also be used as LoLT, the standard of teaching and learning of this language should be of such quality that the learner becomes proficient enough to learn effectively across the curriculum (Foley, 2010; Uys et al., 2007). This proficiency includes Cognitive Academic Language Proficiency (CALP) which is necessary for thinking and learning. CALP, however, is only sufficiently developed when the learner is about 12 years old (Cummins, 2000).

In general, the implementation of the LiEP does not seem to be successful. This lenient language-in-education policy, although well-intended, has not yet resulted in the African languages obtaining the status of LoLT. In addition, it has not produced

multilingual learners with good literacy skills and corresponding academic achievements.

2.3.3 Current status concerning language-in-education

The 2002 curriculum suggests that English L2 learners, starting from Grade 1, should spend some time on English weekly. However, this has not been compulsory and has not happened in many classrooms, according to the Government of South Africa (2011b). This means that Grade 4 learners need to contend with mastering the curriculum presented in English with little or no skills in this language. Fortunately, this shortfall in the curriculum or in the actual practice of exposing foundation phase learners to English was addressed by the 2009 curriculum review (Government of South Africa, 2011b). The 2009 curriculum review therefore proposes that although the African languages should be used effectively and extensively in the foundation phase, English as first additional language (or in reality *second language*) should be prominent. Unfortunately, English as additional language is not introduced in Grade R, which is the period during which phonological awareness skills peak in preparation for literacy acquisition.

In 2010 the Minister of Basic Education, Angie Motshekga, announced that a new curriculum, *Schooling 2025* (<http://edulibpretoria.wordpress.com/2010/07/07/new-curriculum-for-south-african-schools/>), will replace the criticised outcomes based education (OBE) system that was introduced in 1998. The Action Plan to 2014 (Government of South Africa, 2012b) which sets out goals to achieve the *Schooling 2025* curriculum, supports the idea of home language instruction during the foundation phase in order to establish understanding of important concepts. The Government of South Africa (2012b) mentions that there has been a strong emphasis on the usage of the home language as LoLT during the recent years and advocates that such emphasis should continue. Simultaneously, it was stated that it should be determined whether the use of the home language as medium of instruction results in better learning outcomes.

In 2012, the Department of Education implemented the Revised National Curriculum Statement (NCS) (Government of South Africa, 2011b) which again proposes that the home language should be used as LoLT, particularly during the foundation phase, but that learners should be exposed to an additional language or languages from Grade 1 (Government of South Africa, 2011b). In the Curriculum and Assessment Policy Statement (CAPS) document (Government of South Africa, 2011b), which forms part of the Revised National Curriculum Statement, very little time is allocated to English first additional language during the foundation phase. In the table below the maximum hours suggested by the Government of South Africa, (2011b) is indicated with the minimum in brackets immediately below.

Table 1: Time allocated to First Additional Language during the foundation phase

First Additional Language (Time allocated per week)				
Activity	Grade R	Grade 1	Grade 2	Grade 3
Listening and Speaking		1 hour 30 min.	1 hour	1 hour
Reading and Phonics		1 hour 15 min. (30 min.)	1 hour 30 min. (45 min.)	1 hour 30 min.
Writing		15 min. (0 min.)	30 min.	1 hour (30 min.)
Language use		0 min. (0 min.)	0 min. (0 min.)	30 min
Total:		3 hours (2 hours)	3 hours (2 hours)	4 hours (3 hours)

Note that no time is allocated to English as first additional language in Grade R. This is unfortunate as phonological awareness, which forms a very important part of language acquisition and learning, develops from an early age and peaks during the last pre-school year or Grade 1 (Adams & Gathercole, 1995). The lack of focus on phonological awareness of the phonemes of English may contribute to poor reading and spelling skills.

Although time is allocated to phonics in Grades 1 to 3, one has to keep in mind that phonics and phonological awareness are not identical. While phonics focuses on the relationship between phonemes and graphemes, phonological awareness is a more in-depth knowledge of how sounds work together in a language to form meaningful words. In order for children to benefit from phonics instruction, they need to have sound phonological awareness – and more specifically *phonemic* awareness – skills (Armbruster, Lehr, & Osborn, 2001). (See Chapter 3 for a detailed discussion of phonemic awareness).

In the case of English L2 learners learning via the medium of English, thus being treated as L1 learners, the CAPS allow for eight hours maximum and seven hours minimum teaching time for the L1 in Grade R. The following is a breakdown of the time allocated to the teaching of English. The maximum hours suggested by the Government of South Africa (2011b) is indicated with the minimum in brackets immediately below.

Table 2: Time allocated to Home Language during the foundation phase

Home Language (Time allocated per week)				
Activity	Grade R	Grade 1	Grade 2	Grade 3
Listening and Speaking		1 hour (45 min.)	1 hour (45 min.)	1 hour (45 min.)
Reading and Phonics		5 hours (4 hours 30 min.)	5 hours (4 hours 30 min.)	5 hours (4 hours 30 min.)
Writing		1 hour (45 min.)	1 hour	1 hour
Handwriting		1 hour	1 hour (45 min.)	1 hour (45 min.)
Total:	8 Hours (7 Hours)	8 hours (7 hours)	8 hours (7 hours)	8 hours (7 hours)

Although the time allocated to language learning and teaching in the English L1 classroom may seem adequate, one should remember that not all learners are

English L1 speakers. Many of the L2 learners only have basic communication skills in English which is not sufficient to enable learning. One should keep in mind that listening and speaking skills are oral language skills and precede reading and writing. Good oral skills should assist in the acquisition of literacy skills. One hour a week (maximum) spent on the enhancement and development of these skills therefore seems to be inadequate. Although five hours per week are spent teaching reading and phonics, the argument concerning the difference between phonics and phonological awareness can be offered here once again. Intensive phonological awareness training is necessary for those learners who have to learn to read and write via the medium of a second language, but are treated as if they were L1 speakers of that language.

Although the time spent per *day* on the teaching of English as second language is important, the *years* that learners are taught English are important as well. Prinsloo and Heugh (2013) mention that where a second language is expected to become the LoLT that language must be taught for at least six years before the learners should be expected to use it as language of learning. This statement could just as well apply to English L2 learners who have to contend with ELoLT from Grade 1 or Grade R. Many learners are not ready and able to contend with English as the LoLT.

2.4 Results of literacy assessments in South Africa

A study on language proficiency in South Africa that focuses specifically on literacy and academic proficiency levels is that of the Language Plan Task Group (LANGTAG) of 1996. This study determined functional literacy as corresponding to a Grade 7 level of schooling and accordingly presents the adult illiteracy level in South Africa as 29% (Webb, 2002a).

Weideman and Van Rensburg (2002) examine the results of the English Language Skills Assessment for tertiary environment (ELSA Plus test) conducted by the Unit for the Development of Language Skills at the University of Pretoria in 2002. This test was applied to 1098 first year students in the Faculty of Humanities. Twenty-six percent of these students were identified as having academic proficiency in English

below Grade 10 level. This level is considered to be the minimum level required for successful studies at a tertiary institution (Weideman & Van Rensburg, 2002).

According to Uys et al. (2007), a study undertaken in 2005 by independent consultants Horne and Hough (Horne, 2005), found that only 12% of Grade 11 learners who applied for bursaries at tertiary institutions in 2005 could read and write English at the appropriate level. In 1998, however, 20% of Grade 11's were appropriately proficient in English (Horne, 2005). From such data it is obvious that the teaching and learning of English is not on an adequate level for meeting the required proficiency level – which is a level where the learner has cognitive academic language skills. Nel and Müller (2010) state that it is extremely difficult for a learner to learn a new language, and simultaneously acquire literacy in this language if he/she does not receive support in this process via the home language. Although learners in many schools are assisted in this process (De Klerk, 2002; Probyn, 2005), in just as many other schools, they are not assisted, especially where teachers do not know the home language of the learners in the classroom.

Howie et al. (2012) discuss the results of the Progress in International Reading Literacy Study (PIRLS) of 2011 and state that the levels of reading literacy in South Africa have not improved much since the PIRLS 2006 (Howie, Venter, van Staden, Zimmerman, Long, Scherman, & Archer, 2007) was conducted. The PIRLS 2006 results indicated that South Africa's Grade 4 and 5 learners achieved the lowest scores of all participating countries. In 2011, the International Association for the Evaluation of Educational Achievement (IEA) decided to offer an alternative to the PIRLS assessment to those countries who achieved low scores during the 2006 assessment. The prePIRLS was designed to be shorter and easier. This allowed those countries with poor performances in the previous assessments to be measured more precisely (Howie et al., 2012). One should keep in mind that learners were tested in the language in which they received schooling. The prePIRLS 2011 was conducted at Grade 4 level. The results across languages used in the assessment are presented in Figure 2:

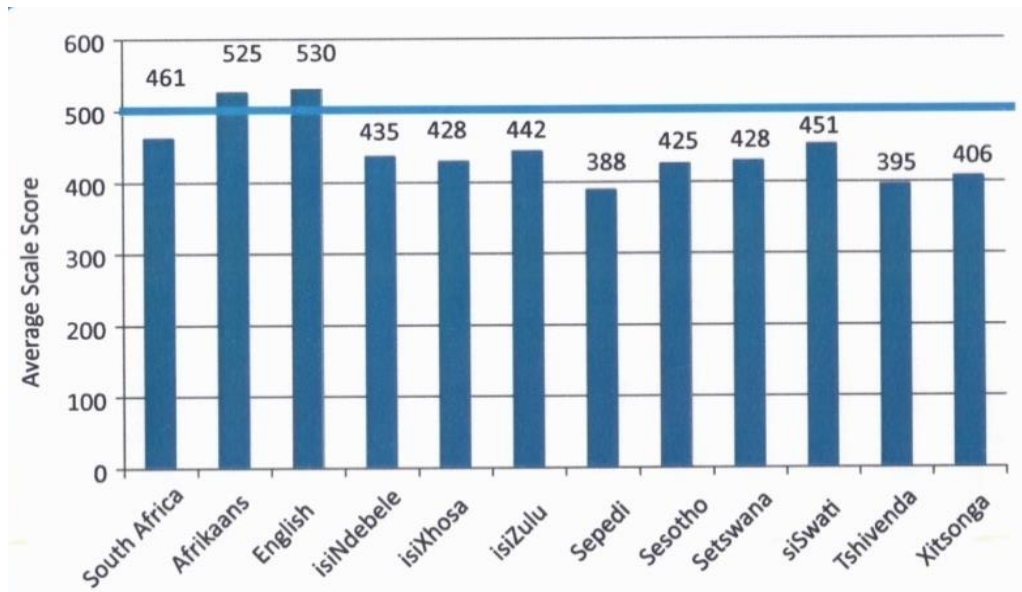


Fig. 2: The results of the prePIRLS 2011 (Howie et al., 2012, p. 38).

Comparing these results, the majority of African L1 learners who received instruction via their home languages during the foundation phase, scored far below the International Centre Point of 500 in reading skills assessment. In addition, they scored well below their English L2 peers who were assessed via the medium of English. Those English L2 learners in turn scored 80 points below the English L1 participants. The difference in scores becomes even more significant when Howie et al., (2012) explain that a difference of 80 points represents a difference of about two years of schooling. These results indicate that many English L2 learners enter Grade 4 with inadequate Grade 2 literacy skills.

In contrast to the statistics of low proficiency, those learners and students with Afrikaans or English as home language perform markedly better (Howie et al., 2012), leading once again to a widening gap in educational outcomes in this country. These two groups of students were able to develop language competency skills in their home language and were taught via the home language. In general, these learners attend schools with better qualified teachers and more resources.

In the light of these research results, the significance of quality home language as well as quality instruction in English as second language cannot be stressed enough.

The Annual National Assessment (ANA) (Government of South Africa, 2013a, b, c; Government of South Africa, 2015) is an assessment tool that measures the literacy and numeracy skills of South African learners in Grades 1 to 9. The results of the 2012, 2013 and 2014 Annual National Assessment (ANA) for literacy in the foundation phase are as follows:

Table 3: National average performance in literacy

Grades	2014	2013	2012
Grade 1	63%	60%	58%
Grade 2	61%	57%	55%
Grade 3	56%	51%	52%

Note: <http://www.education.gov.za/LinkClick.aspx?fileticket=aNmoQzul2/Y%3D> (2013-2015)

Although the results seem to be improving, the 2014 results still indicate that Grade 3 learners are not sufficiently literate when entering the intermediate phase from Grade 4. This surely has a negative impact on their cognitive development as well as their academic achievement. The importance of sufficient language skills on cognitive development is emphasised by Thomas and Collier (2002), stating that language is the tool by means of which an individual learns to structure his experiences and thoughts, and therefore is fundamental to all cognitive functions.

2.5 Reasons for poor literacy results

Poor literacy skills are a barrier to learning. Donald, Lazarus and Lolwana (2002) define a barrier to learning as whichever aspect, either internal or external to the learner that is responsible for a limitation of learning. Low literacy skills create a barrier to the learning and teaching process in the ELoLT classroom specifically where they create linguistic difficulties and contribute to the breakdown of the learning process (Nel, 2004; Seeff-Gabriel, 2003).

Howie (2003) points out a number of general factors that are responsible for low achievement of South African learners. These factors are inadequate subject knowledge of teachers, inadequate communication ability between learners and teachers because of the LoLT, lack of resources such as instructional materials, teachers experiencing difficulties in managing classroom activities, pressure to complete syllabi in time for examinations, heavy teaching loads, too many learners per classroom, poor communication between policy makers and educational practitioners and lack of support to teachers due to shortage of staff in the Ministry of Education. In addition to these factors, Howie et al. (2012) discussing the results of the prePIRLS and PIRLS 2011, mention various factors that contribute to the acquisition of good reading skills. These factors can be divided into learner factors, home factors and school factors which include classroom- and teacher factors. These factors will be discussed below.

2.5.1 Learner factors

Learners who are *engaged* in their reading lessons perform better in literacy assessment (Howie et al., 2012). Another learner factor is *positive attitude* towards reading. A learner who is positive towards reading will be engaged during the reading lesson and benefit all the more from the activities (Howie et al., 2012). Such a reader will read to obtain information as well as for pleasure (Van Staden & Bosker, 2013). A student's reading achievement is related to his/her *motivation* to read; motivated readers are good readers (Howie et al., 2012; Van Staden & Bosker, 2013). *Confidence* in one's reading abilities is a good predictor for reading achievement; learners who are confident in their reading abilities do much better than their less confident peers (Howie et al., 2012; Van Staden & Bosker, 2013). Successful readers have a positive self-perception concerning reading-related activities. Such positive self-perception has a positive influence on learners' determination to complete reading tasks, which in turn feeds into their positive self-perception (Chapman & Tunmer, 2003).

Howie et al. (2012) state that learners need *prerequisite knowledge and skills* to make academic progress, and to achieve the required academic outcomes. They

report that in total, 89% of the Grade 4 teachers taking part in the prePIRLS 2011 indicated that their teaching is negatively affected by the learners' lack of essential knowledge and skills. This means that a large number of learners in Grade 4 did not acquire the required knowledge and skills to read during the foundation phase. These skills include good oral language skills, phonological awareness skills and knowledge of the sound system of the target language.

Another probable reason for the low literacy results in South Africa is *unrealistic self-assessment of communicative competence*. Deumert, Inder and Maitra (2005) report on the results of the Monash Survey of Internal Migration to Cape Town, conducted in 2004 in the Western Cape. This study was based on interviews with 215 household heads and the evaluation of 754 questionnaires. The sample consisted of mainly Xhosa-speaking rural-urban migrants, according to Deumert et al. (2005) with a very low socio-economic status. Participants in this study were inter alia asked to self-assess their proficiency in English based on the six categories *very high; high; average; low; very low; no knowledge*. The self-assessed proficiency of the participants was very high:

- 89.1% of the participants reported that they can speak English.
- More than 60% of participants judged their proficiency in English as *average* or higher.

Deumert et al. (2005), however, found during conversations and interviews with the participants that these self-assessed, high levels of proficiency were overestimated and that the language skills of these participants were often less than basic.

According to a study by Nel and Müller (2010), even student-teachers who were already teaching at the time of the study, over-estimated their proficiency in English. Eighty-seven percent of these respondents stated that they were proficient in English, while the results of this study in fact indicated evidence of poor English proficiency. These participants, enrolled for an advanced certificate in education at a distance teaching university in South Africa, over-estimated their English proficiency to such an extent that 66% of them indicated that they did not need training in English usage.

To understand why these university students and adults have low proficiency in English but overestimate their English language proficiency, one should look at the two types of language proficiency as distinguished by Cummins (2000), viz. Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP). BICS are used in context-embedded situations where contextual clues assist in the allocation of meaning of an utterance. BICS are aided by para-linguistic aspects such as stress and intonation, duration and tone of voice, as well as non-linguistic aspects such as facial expressions, body language and gestures. Communication using BICS is thus assisted and enabled by the complete communicative context in which the speaker and hearer find themselves.

CALP, on the other hand, is necessary within context-reduced academic situations such as classrooms and can therefore be defined as an academic language register. This kind of proficiency requires higher order thinking skills such as analysis, deductions, synthesis and the ability to express oneself clearly and logically (Cummins, 2000; Nel & Müller, 2010). Second language learners of English in the ELoLT environment thus have to perform various kinds of academic tasks by relying on CALP.

Although many parents, teachers and learners alike may feel that they are proficient in English, there is a difference between being able to converse socially, perhaps using high frequency phrases in a second language, and to study academic content and perform academically using this language (De Klerk, 2002; Posel & Casale, 2011; Probyn, 2005). As English will be encountered on various levels in society and especially on tertiary level, these diverse levels of competency should be acknowledged and tools to address this problem should be made available from foundation phase.

Related to the low proficiency rate, is the fact that English as *LoLT* has *not been mastered* by the time the young learner has to learn via that medium. Nel and Müller (2010) as well as Seeff-Gabriel (2003) state that many learners in South Africa are confronted with the setback of learning through the medium of a second or additional language from a very early age, before they have mastered English as LoLT. These

learners are thus expected to deal with the learning of English as a second or additional language, the differences between their L1 and English, as well as the proficiency required to manage academic content offered in English. According to Nel (2004), it appears that English L2 learners in the ELoLT milieu are not cognitively on par with their English L1 peers. Nel (2004), Seeff-Gabriel (2003), the National Commission on Special Needs in Education and Training (NCSNET) and National Committee on Education Support Services (NCESS) (Government of South Africa, 1997c) correctly believe that the lack of academic achievement of many English L2 learners could be assigned to inadequate proficiency of English and not to a lack of cognitive ability.

Highlighting the importance of the degree of language proficiency second language learners need, McWilliam (1998) suggests that to ensure academic achievement, second language (L2) learners' command of English needs to match that of L1 speakers. Literacy acquisition in the L2 is possible and results in higher levels of reading skills when learners receive adequate, high quality reading instruction (Howie et al., 2012).

When formal learning and teaching do not take place in the learners' L1 and the LoLT may not be successfully mastered, sufficient language skills do not exist to support comprehension and inference. These skills are necessary for cognitive development and academic achievement (Nel, 2007; Owens, 2012; Rees, 2000).

As the mastery of the LoLT affects literacy, cognitive development and academic achievement, it is understandable that many learners in the ELoLT environment do not perform as well as their English and Afrikaans peers that attend schools where the LoLT is their L1. The necessary level of mastery of the LoLT is specified by McWilliam (1998) who suggests that to ensure academic achievement, second language (L2) learners' command of English needs to *match* that of L1 speakers.

Madrid (1995) mentions additional factors which are intrinsic to the learner him/herself. These are: gender, social context, personality, age, aptitude and

cognitive styles. Although important in a holistic process of learning, these factors will not be discussed as part of this study.

2.5.2 Home factors

Learner factors are influenced by the home environment. The home environment includes the availability of *resources*. There is a direct relationship between the learners' performance on literacy assessment and the amount of resources in their home environment: In general, learners with more resources available performed better than those with few resources (Howie et al., 2012).

Parents' attitude towards reading is an important home factor that influences the reading skills of learners. Parents model reading behaviour, and when they promote reading as an important activity, their children can be *motivated* to read. According to Howie et al. (2012), the learners whose parents indicated that they like reading tended to achieve higher scores.

A positive relationship exists between *parents' educational expectations* for their children and the children's reading achievement. The higher the parents' education aspirations for their children, the better the children scored. Howie et al. (2012) mention that compared to their international counterparts, South African parents have exceptionally high educational aspirations for their children.

Another factor that could be responsible for low literacy achievement in South Africa is the fact that the learner's *mother tongue or home language*² *does not reach maturation*. The term 'mother tongue' refers to the primary language that a person has acquired in his/her early years and which has normally become his/her natural instrument of thought and communication.

²Although the terms 'home language', 'mother tongue' and 'first language' are not synonymous in reality, they are used interchangeable in the literature and will therefore be treated as synonyms in this study (Saville-Troike, 2012).

According to Chomsky's (1965b) notion of linguistic competence, one should therefore be expected to be completely competent in one's mother tongue. The term 'home language' or 'first language' refers to the language that is spoken most frequently at home by a person, according to the Department of Basic Education (Government of South Africa, 2010).

In the South African context the mother tongue of a learner as defined above, is not necessarily his/her home language, due to a variety of reasons. Some of the reasons for the different languages spoken in a home could be the following: the parents may have different first languages; it may be a reconstructed household with various members speaking different languages; and logistic factors such as learners boarding with relatives, friends or acquaintances to be closer to school while these people speak different languages than that spoken by the learner.

Another important reason could be that the language of the caregiver that spends the greatest portion of the day with the child during his/her early years differs from that spoken by the family. The young learner is thus exposed to a multilingual environment as well as to English as the LoLT, which may further inhibit the maturation of the mother tongue or home language.

According to various researchers the mother tongue is the most appropriate medium of instruction when imparting skills in general, but more importantly the skills of reading and writing, especially in the early years of schooling (De Witt, Lessing, & Dicker, 1998; Kotzé, 2000; Nel, 2007; Posel & Casale, 2011; Posel & Zeller, 2010; Smuts, 2000; Vermeulen, 2000; Von Gruenenwaldt, 1998; Weideman & Van Rensburg, 2002). As the mother tongue is that language to which the learner is exposed from even before birth (Owens, 2012), this should be the language in which the most successful learning and cognitive development takes place. Butzkamm (2003) corroborates this when stating that mother tongue instruction provides the best opportunity for learning; in all school subjects as well as in additional language studies.

Posel and Casale (2011) conducted research into the correlation between home language proficiency and English second language proficiency, using data gathered in 2008 for a new household survey – the National Income Dynamics Study (NIDS). They conclude that home language expertise is a pivotal factor in determining the success of acquiring literacy skills in English. This is second only to the impact of levels of higher education.

2.5.3 School factors

Howie et al. (2012) state that almost all schools that took part in the prePIRLS 2011 were affected by *shortages of reading resources*. Additional learning materials, sources of information and even textbooks are not always available (Howie et al., 2012; Probyn, 2005). These limited classroom resources also limit the teachers' teaching practices and limit successful learning (Howie et al., 2012).

These authors report that schools that were not affected by resource shortages scored more than 100 points more than those that indicated that they were substantially affected. As one hundred points fewer translate to about two years of less schooling in educational terms, the enormous influence of insufficient reading resources can be appreciated.

Learners in schools where teachers indicated that they experienced problems with the *working conditions* did not perform as well as those in schools where teachers indicated that they had very few problems.

Within the school environment *libraries and library books* provide significant resources to learners and teachers. Learners who attended schools where well-sourced libraries were available performed better than those where no libraries or books were available. According to Howie et al. (2012) 59% of South African Grade 4 learners attended schools where no library facilities were available.

2.5.4 Classroom and teachers factors

Educators themselves and their teaching practices form the core obstruction to learning in the ELoLT classroom (Howie et al., 2012; Nel, 2004; Nel, 2007; Nel & Müller, 2010; Probyn, 2005; Uys et al., 2007; Viljoen & Molefe, 2001). When teachers and learners feel restricted and intimidated by the LoLT, learning and teaching can become a passive and ineffective process (Nel, 2004).

On average, teachers of the participants who completed the prePIRLS 2011 had 17 years *teaching experience*. This is similar to international findings (Howie et al., 2012). It seems that, compared to international literacy assessment results teacher experience does not play that much of a role in the quality of teaching in South African classrooms. These authors report that learners who were taught by teachers younger than 29 and older than 60 performed best.

Teachers' formal education and training play a role in the quality of teaching that learners receive. Howie et al. (2012) found that Grade 4 learners who were taught by teachers who have a university degree performed best. Probyn (2005) suggests that teachers need training and assistance to deal with the current limitations presented by the linguistic situation in schools as well as the lack of sufficient teaching resources. All teachers across the curriculum should be made aware of the importance of language in the learning process and should realise that every opportunity should be made use of to expand on and consolidate learners' understanding of subject material (Probyn, 2005). This includes information on how to develop learners' proficiency in the language of learning and teaching and the importance of sufficient phonological awareness skills.

Teachers' career satisfaction was measured by the prePIRLS and PIRLS 2011. According to Howie et al. (2012) the results of the prePIRLS and PIRLS 2011 indicate that the majority of the learners who participated were taught by teachers who indicated that they were happy in their profession. Almost all teachers of the participating Grade 4's (97%) indicated that they regard teaching as being very important. However, it seems as if their enthusiasm diminished with time – 50% of

the Grade 4 learners had teachers that indicated that they had more enthusiasm at the beginning of their teaching career than at the time of the prePIRLS 2011 survey (Howie et al., 2012). In addition, about 54% of Grade 4 learners were taught by teachers who indicated that they experienced feelings of frustration being a teacher. *Ineffective teaching practices* in the ELoLT classroom play a crucial role in the lack of learning that takes place. Teachers provide the information as contained in textbooks or worked-out syllabi and learners learn by rote and reproduce the information in tests, exams and assignments. This method is linguistically undemanding to both teachers and learners (Donald et al., 2002; Sweetnam Evans, 2001). It is obvious that such learning and teaching practices do not lend themselves to cognitive development, an increase of knowledge, interest in the subject material or long term memory retention. The main reason for this teaching practice may be that teachers have not received training in how to teach via the medium of English as a second language and therefore feel unable to exhibit good teaching practices in English (Probyn, 2005).

In a study conducted by Probyn in 2005 in the Eastern Cape Province, it was determined that teachers who apply a more teacher-directed method of teaching, as opposed to a more learner-centred approach (the last approach is encouraged by the Outcomes Based Education model (OBE); Harmer, 2005) had more success in language teaching and learning. This is because students get more English input and English language practice when there are more teacher-directed activities in the classroom. According to Krashen (1985), the essential component in L2 learning is comprehensible input via teacher-talk. Teacher-talk and teacher-centred teaching practices are therefore important in the classroom where learners are in desperate need of a language model.

In classes where teachers made use of extended group discussions which normally take place in the learners' L1 (Probyn, 2005), in order to move away from the 'traditional' teacher-centred approach (Probyn, 2005), it was noted that the discussions were in the mother tongue of the learners, and not in English, which did not contribute to the acquisition or learning of English. As much of the group discussions take place in the L1 of the learners, it may stimulate understanding of a

specific topic and enables learning in the learners. They will, however, struggle to translate their understanding and knowledge of the discussed topics into English during assessment when reading and writing skills in English are required. The implications are a lack of academic achievement and academic skills.

A crucial factor for successful language and literacy acquisition is *adequate language modelling* by the teachers. In the South African context, especially in rural areas, many African and Afrikaans-speaking teachers responsible for teaching via the medium of English do not have adequate English proficiency to do so competently (Nel, 2004). According to Vinjevolt, as quoted by Chall and Jacobs (2003), the majority of educators cannot speak, read and write English well enough to understand the textbooks of the learners. This statement is in direct contrast to what Krashen (1985) as quoted in Harmer (2005, p. 66) suggests language modelling should be:

“... the best kind of language that students could be exposed to as ‘comprehensible input’, that is language which students understand the meaning of, but which is nevertheless slightly above their own production level.”

According to Nel (2004), Cele (2001) states that as English is not the ultimate medium of instruction in South Africa – in theory, in any case – teachers are not expected to have English linguistic competence in schools where learners and teachers speak an African language as first language. When these teachers then experience difficulties in handling the linguistic demands of teaching in English across the curriculum, they employ code-switching as a survival technique, (Lemmer, 1995). Although this technique may enhance learners’ understanding and finally aid the learning process, Lemmer (1995) states that the negative side-effect of code-switching is that black learners do not get adequate occasion to acquire sufficient English proficiency. Probyn (2005) confirms this when reporting that teachers who teach mainly via the first language, believe that learners should understand the content better, but were at a loss as to how to bridge the gap between the first language teaching in class and the need to read and write in English during assessment. One can thus conclude that when English is not used in

the classroom, the language model that students are provided with is not sufficient to ensure English proficiency and literacy. Proficiency and literacy in English are needed for assessment of knowledge and understanding of subject content. On the other hand, should teachers not code-switch, many learners would not understand the subject matter, which will lead to very little learning taking place.

Nel and Müller (2010) undertook a study to determine the impact of teachers' limited English proficiency on English second language learners in South African schools. The participants were student-teachers who were involved in rural primary school teaching, with learners between the ages of 6 and 11. Although these participants felt that they were sufficiently proficient in English, the researchers found that they were not and that language errors were transferred from teacher to student.

Because of teachers' inadequate proficiency in English, learners do not have a proper language model. Krashen (1985) states that intelligible teacher-talk is indispensable for L2 acquisition. Therefore, teachers should be proficient enough in English to serve as proper language models to their students.

Although one assumes that interaction with an English-speaking person plays the most important role in language modelling, the media plays a role in language modelling as well. When access to newspapers, magazines, television and radio is limited, access of English L2 learners to language modelling is limited. As was stated earlier, the only access learners really have to English media is through television, popular music, and radio. The quality of the English used in these media is questionable, however.

Marinova-Todd (2003) concludes that good language role models and high quality teaching generate the best results in L2 acquisition and will also guarantee native-like proficiency. In addition, she states that the teacher should model tactics to deduce meaning when reading. Students will then learn or copy these strategies which they will then apply themselves eventually. Education students should therefore be made aware of the barriers to meaning deduction in L2 learning and

should be taught strategies to assist English second language learners in the process of learning across the curriculum.

According to Nel (2004), various researchers believe that the education department, training institutes and schools should improve their training programmes in such a way to improve teachers' linguistic knowledge and skills of English as this will improve their proficiency in the language they utilize to teach. Although this will improve the learning and teaching process in the South African classroom, institutions should realise that teachers also need specific skills to teach L2 learners via a second language, across the whole curriculum.

Adhering to curriculum structure, reading instruction is generally embedded in language instruction. Therefore, *time spent on reading* is less than time allocated to language learning. Howie et al. (2012) report that on average across all 11 languages language instruction has priority over reading instruction and more time is therefore spent on language instruction. However, language instruction averaged not more than five hours per week while time allocated to reading instruction is even less.

2.5.5 Poor development of skills central to good literacy skills

Howie et al. (2012) state that reading comprehension and strategy development is vital for effective literacy development. They continue by saying that despite the importance of the development of such skills, it has not been emphasised in the South African school curriculum. The result is that many learners do not develop the necessary higher order cognitive abilities which they need for learning.

These skills and strategies should be taught even earlier than Grade 4. Those learners, whose principals reported that such skills were emphasised already before or in Grade 2, performed better. Howie et al. (2012) therefore suggest that teachers in Grade 4 are probably dealing with an accumulation of deficits in reading and comprehension skills.

In relation to this, Owens (2012, p. 360) states that:

“Literacy is the use of visual modes of communication, specifically reading and writing. Literacy encompasses language – academic and cognitive processes, including thinking, memory, problem solving, planning, execution – and is related to other forms of communication.”

This definition indicates that literacy is dependent on language skills as well as cognitive skills which a child should acquire at a young age in and via his mother tongue (Alberts, 2012; Nel, 2004; Roodt, 2002; Vermeulen, 2001).

Owens (2012) continues to explain that reading is the combination of an intricate system of perceptual and cognitive performances that range from word recognition and decoding skills to understanding and assimilation. Following on the process of decoding, is the very important practice of drawing of conclusions, thus comprehension, and inferences that a reader in the academic environment needs to be able to do. Comprehension cannot be separated from language development as it is the result of the interaction of letters, sounds, word meaning, grammatical processes as well as the reader’s prior knowledge (Hulit, Howard, & Fahey, 2011; Owens, 2012).

Writing, which is the other component of literacy, also depends on language skills and cognitive abilities such as planning, execution, revision and monitoring based on self-feedback (Kintsch, 1998; Owens, 2012; Scott, 1999). Literacy is therefore an intricate process, dependent on language and cognitive development and skills. The development of these skills starts from an early age, and continues through-out the school years (Hodgkiss, 2007; Hulit et al., 2011). As language and cognitive skills develop from an early age, one can expect the development of the mother tongue to play an important role in the effective development of these skills.

Nel (2004) explains that to contend with information in the classroom, learners need to be academically literate. This means that learners have to master English for academic purposes (CALP has to be developed) over and above English as a L2 (Seeff-Gabriel, 2003). As formal language courses in schools in South Africa often

lack quality and the necessary depth to further develop CALP, learners who have to learn through English as L2, often have a shortage of the necessary literacy skills to contend with cognitively challenging study materials (Wessels, 1996).

Learners who are exposed to a print-rich environment from an early age generally acquire literacy skills more easily as foundations for literacy have been laid (Hodgkiss, 2007; Howie et al., 2012; Hulit et al., 2011; Owens, 2012). Those learners, whose exposure to written materials is limited, tend to acquire literacy skills less easily.

In South Africa not much literature in all the African languages is available. In addition to the lack of easily obtainable literature in the African languages, the socio-economic and/or logistic situation of many learners is such that any such available literature cannot be accessed (Howie et al., 2012). Many parents and/or caregivers are furthermore not aware that early exposure to printed materials is the most important factor in early reading success (Hodgkiss, 2007; Howie et al., 2012; Hulit et al., 2011).

Exposure to English materials that could improve English literacy skills in English L2 learners is also very limited. Probyn (2005) states that over 80% of African learners in townships and rural schools in the Eastern Cape Province have little exposure to English outside the classroom, apart from popular music and television. According to Probyn (2005), not many African learners have direct contact with English L1 speakers due to demographics. In addition, he states that it appears that the majority of learners have limited access to reading materials: a national survey (the Monitoring Learning Achievement Survey, (Strauss, 1999) determined that only 10% of parents bought magazines and newspapers, 83% of schools have no libraries, and more than 50% of learners indicate that they have access to fewer than 10 books. In such print-deprived circumstances, one can expect learners to have low literacy skills (Howie et al., 2012). It was found by Howie et al. (2012) that learners who do not have access to libraries or books scored 33 points lower in the prePIRLS 2011.

Although literacy skills focus on reading and writing, one should remember that these skills are language-based, which means that oral and auditory perception skills are part of becoming literate as well. Hodgkiss (2007, p. 15) stresses the interrelatedness of reading and oral skills (and therefore auditory perception skills as well). She stresses the fact that being able to speak a language equips the learner to learn alphabetic principles, grammar, and to comprehend what is being read.

Special attention should therefore be given to learners who do not have good oral skills in English. Good oral skills go hand in hand with good perceptual skills, so these skills need to be developed and enhanced, with special emphasis on phonological awareness concerning the sound structure of English, which differs from that of the African languages. Non-English-speaking learners need to be adequately prepared before they are taught to read English, according to Burns, Griffin and Snow (1999).

This preparation should prioritise enhancement of oral language skills, especially in the situation of the second language being the language of learning and teaching. This supports the importance of phonological awareness, pronunciation teaching, and auditory perception training during the early years of primary school. Phonological awareness skills are central to successful reading acquisition. A lack of these skills translates into poor reading skills.

Additional reasons for low literacy achievement exist. According to the Department of Education (Government of South Africa, 2001a) and Howie et al. (2012), factors in addition to those mentioned and discussed on the previous pages that contribute to the low literacy level are:

- physical, mental, sensory, neurological and developmental impairments
- differences in cognitive ability
- bullying
- socio-economic deficits
- the number of learners per class

Although these factors all play a role in the learning process, they will not be discussed.

2.6 Summary

English has been the preferred LoLT for many people in South Africa since the early 1800's. During the apartheid era, English became even more desirable and was seen as the language of advancement and success. In a post-apartheid South Africa, multilingualism and freedom of choice was the ideal and this resulted in the progressive language-in-education policy, namely the LiEP of 1997. Although the fundamental principle of the LiEP is to retain the use of the home language as LoLT during the early school years while giving access to an additional language, this has not necessarily been happening in all schools. Parents very often choose English as language of instruction from Grade 1 (or Grade R) despite the fact that research shows that young learners benefit most from instruction in the home language. Various reasons exist for this choice. Parents believe that English medium schools are better resourced and have better qualified teachers. They also see English as the language of opportunity and tertiary advancement.

Another fall-out of the implementation of the LiEP is that it does not specify the amount of time that should be spent on the additional language, English in the majority of cases, and does not enforce the implementation of the teaching of the additional language. This results in those young English L2 learners who switch to English as LoLT in Grade 4 (and sometimes as early as after Grade 1) not being proficient enough in English to learn successfully. Another result of the leniency concerning the choice of language of instruction is that the African languages have not yet acquired the status of LoLT. The policy of additive bilingualism is seen as unsuccessful because it is not strictly implemented.

In 2012 the Department of Education implemented the Revised National Curriculum Statement (NCS) (Government of South Africa, 2011b). This document again advocates the use of the home language as LoLT during the foundation phase while being exposed to an additional language/s. In the CAPS however, very little time is

allocated to English as additional language during the foundation phase. No time is allocated to English as additional language in Grade R. Even in the syllabus of English L1 learners little time is allocated to language learning and very little to the teaching of phonics. A distinction is furthermore not made between phonics and phonological awareness, with no indication of how much time, if at all, is spent on teaching phonological awareness skills. This surely has an impact on the acquisition of English phonology of English L2 learners and in turn affects the development of skills such as phonological awareness necessary for successful literacy acquisition.

Results of various literacy skills assessments in South Africa indicate that especially English L2 learners and tertiary students have low literacy proficiency. Assessments such as the prePIRLS 2011 and the ANAs indicate that many Grade 3 learners are not sufficiently literate when starting the intermediate phase in Grade 4. This has a negative effect on the cognitive development and academic progress.

A number of reasons are cited for the low levels of literacy in South Africa. Researchers mention factors intrinsic to the learner and his/her environment such as learner factors, home factors and classroom and school factors as impacting on literacy acquisition of learners.

In the next chapter, literacy acquisition, phonological awareness and language acquisition will be explored in detail.

Chapter 3

Literacy acquisition, phonological awareness and language acquisition

“Although the capacity for language is genetic, the details of a language, including vocabulary and structural rules, are learned”, (Hulit, Howard, & Fahey, 2011, p. 16).

3.1 Introduction and objectives

This chapter contains a detailed theoretical discussion of three main topics, namely literacy acquisition, phonological awareness and language acquisition. This will support the analysis of the results of this study. It will also provide a background against which the insufficient English language abilities and the resultant low literacy skills of many young English L2 learners, as discussed in Chapter 2, can be understood. In addition second language learners’ knowledge of the sound system of English forms part of their oral language abilities, which is relevant to the main aim of this study.

In the previous chapter the issues of language-in-education and low literacy skills in South Africa were discussed. Expanding on these topics, this chapter focuses on the concepts of literacy acquisition, language acquisition and the importance of phonological awareness (PA) skills to facilitate these two acquisition processes. As many young (and older) learners do not perform well in literacy assessment, the importance of high quality instruction pertaining to the requisite skills will be discussed as well.

The intricate process of literacy acquisition is discussed in Section 3.2. Literacy acquisition depends partly on oral language abilities (Proctor, August, Carlo, & Snow, 2006). Oral language acquisition, both of the first and second (or additional language), is discussed in Section 3.3. The acquisition of oral language, when it is the first language (L1), is a natural process (Sugiura, Ojima, Matsuba-Kurita, Dan, Tsuzuki, Katura, & Hagiwara, 2011). Very often, however, children from households of lower socio-economic status do not reach a level of oral proficiency that will

support or enable literacy acquisition (Moats, 2007). These children display a lack of semantic knowledge especially, which will affect their reading acquisition because a lack of vocabulary skills greatly affects reading comprehension (Moats, 2007).

The situation is much more problematic when young learners have to acquire literacy skills in a second language in which they are not sufficiently proficient (Nel & Müller, 2010). In South Africa, young English L2 learners very often struggle to acquire sufficient literacy skills because they have neither adequate decoding skills that are based on phonological awareness, nor sound oral language ability.

Phonological awareness skills are discussed in Section 3.2.2.2. Although one of the main topics of this chapter, it is treated as a requirement for literacy acquisition and is therefore discussed as a subsection of literacy acquisition. Phonological awareness skills influence literacy acquisition, especially during the beginning phase of reading when the young reader reads by decoding words (Trehearne, 2011). Decoding abilities are determined by the level of phonological awareness skills a child has. Phonological awareness develops chronologically from the less sophisticated to the very sophisticated, reaching this level during the pre-school years. A child with sufficient PA skills will therefore be able to decode words when starting to read. As many L2 learners do not have sufficient decoding skills at that stage, sound teaching practice is necessary to rectify this fall-out.

Many researchers posit that literacy acquisition can be enhanced if high quality, structured teaching of phonological awareness and oral language skills takes place (Lessing & De Witt, 2005; Moats, 2007). Instruction in these skills should therefore start no later than pre-school or Grade R (Wasik, Bond, & Hindman, 2006). As many young (and older) learners do not perform well in literacy assessment, the importance of high quality instruction pertaining to the requisite skills will be discussed in Section 3.4.

3.2 Literacy acquisition

Literacy can be defined as the use of graphic means of communication, specifically reading and writing (Owens, 2012; Ravid & Tolchinsky, 2002; Verhoeven, 1999). Although decoding is of great importance in the reading process, literacy acquisition is not only about the ability to decode the link between sounds and letters (phoneme-grapheme coupling), but includes cognitive and academic processes such as problem solving, memory, making deductions, planning and execution (Owens, 2012).

In order for children to develop skills to enable these processes, they need to develop prerequisite language skills. These language skills include the understanding and use of the sounds, vocabulary and sentence structure of the target language (Verhoeven, 1999). Cunningham, Zibulsky and Callahan (2009, p. 477) state the following concerning literacy acquisition:

“The road to literacy begins long before a child enters school, long before pencils, paper, and textbooks come into play. It begins at birth when the sounds of language are first perceived, and this journey continues throughout the preschool years, enriched by stories heard, rhymes rehearsed, and songs sung.”

While the development of oral language skills progresses, written language in the form of books, signs and print in general is introduced to the child, familiarising him/her with the idea of print. The pre-school years form the basis for literacy acquisition since it is during these years that language develops (Trehearne, Healy, Cantalini-Williams, & Moore, 2004). A stimulating environment during these years will ensure good oral language skills and will serve as an introduction to written language (Cunningham et al., 2009; Howie et al., 2012; Hulit et al., 2011).

3.2.1 Learning to read

Hulit et al. (2011) mention that while speech is an innate ability of human beings, language abilities such as reading and writing are skills that are driven by

environmental needs. Perhaps more important than fulfilling environmental needs reading is described as one of the most incredible of man's accomplishments (Stuart, 2006). She continues to state that learning to read is one of the most important aspects of learning.

Reading can be defined as a meta-linguistic skill grounded in language. In more detail, it can be explained as "the synthesis of a complex network of perceptual and cognitive acts from word recognition and decoding skills to comprehension and integration" (Owens, 2012, p. 360).

When addressing the process of learning to read, the issue of the Whole Language Approach ('top-down') versus the Phonics Approach ('bottom-up') surfaces (Adams, 1990). While very little attention will be given to these approaches here, they need to be briefly addressed because the specific approach adhered to by policy makers and educators will influence the success of literacy teaching during the foundation phase. The Whole Language Approach focuses on teaching children to read by recognizing words as whole components of language (Goodman, 1993; Wren, 2002). This approach to reading advocates that reading is a natural process, that children learn to read largely through so-called 'literacy experiences', and exposure to books and printed material, and should be fun (Moats, 2007). Words are not decoded and precision is not important. According to Wren (2002) the child can insert and substitute words in the text as long as the story still makes sense. The focus is therefore on comprehension and appreciation of the text (Wren, 2002) that was 'read'. One cannot but wonder *what* exactly the child will comprehend from text if the text was not accurately read. On the other hand, however, one can imagine that young readers might enjoy this more informal, less structured approach and could be more motivated to read than in a more structured context.

Moats (2007) indicates that this approach is not successful: children do not learn to read by chance, and without thorough instruction. Advocates of the Phonics Approach determine that children need to master a progression of skills in order to become literate; starting at using phonological awareness skills to ultimately decode words into constituent sounds and moving through to reading comprehension

(Moats, 2007). These skills are taught and/or expanded in a structured way in the classroom.

Many educators tend to follow a more 'balanced' or eclectic approach to reading but there is controversy as to what such a balanced approach entails (Wren, 2002). In a personal interview with an experienced head of the foundation phase, holding a Master's degree, J. Du Plessis, this statement by Wren (2002) was confirmed. She indicated that the Whole Language Approach was only followed regarding high frequency words that occur in texts. Learners in Grade 1 were taught to recognise Afrikaans words such as *ek* (I), *is* (is), *die* (the), *ons* (we), *mamma* (mother), *pappa* (father), *en* (and), *dit* (this/it), etc. in texts. This practice, according to her, enhances early fluency in reading and creates a sense of achievement in the learners, both of which act as motivation to read. Simultaneously, high quality input is given on phonemic awareness, phonics, fluency, expansion of vocabulary, and reading comprehension. Oral language skills are developed as well.

The final word about the Whole Language Approach, Phonics Approach and more 'balanced' approaches has not yet been spoken and many advantages and disadvantages of each can be listed (Wren, 2002). It is not within the scope of this study to do a thorough exploration of all approaches to reading. It is, however, relevant to this study to recognise the advantages of the Phonics Approach since it has been determined that having good decoding skills, which rely on good phonological awareness skills, are of the utmost importance to young readers (Moats, 2007).

Abadzi (2008) states that the brain is genetically programmed for language acquisition, but not for reading. Reading acquisition is therefore a process whereby the brain must become programmed to perform various tasks. These tasks are the following, according to Abadzi (2008):

- Recognising letters as objects according to the brain's rules of visual recognition;
- Perceiving words, syllables and individual sounds through adequate knowledge of the phonology of the target language (phonological awareness);

- Linking sounds to letters to words and then to word meaning via functional neural circuits;
- Retaining a message long enough to decode it by means of sufficient working memory; and
- Understanding and interpreting the message through adequate vocabulary knowledge.

These tasks relate to the components of reading acquisition as discussed by various researchers, such as Koda (2007), Trehearne (2011), Lervåg and Aukrust (2010), Geva (2006b) and Cunningham et al. (2009).

The various skills needed for literacy acquisition can broadly be categorised as decoding skills and oral language skills. The ability to decode words depends on the reader's phonics skills, which in turn depends on his/her level of phonological awareness skills. In the early stages of reading acquisition, decoding plays a crucial role in word-level reading skills and thus affects reading comprehension and fluency (Geva, 2006b; Hoover & Gough, 1990; Lervåg & Aukrust, 2010).

Although the influence of decoding diminishes during the later stages of reading acquisition, decoding skills do not become obsolete. Chall (1996) indicates that children still use decoding skills when confronted with unknown words. This once again indicates the importance of decoding abilities based on good phonological awareness skills.

Oral language skills contribute more to the literacy acquisition process during the later stages of reading after decoding has become automatised (Proctor et al., 2006). Oral language proficiency refers to grammatical skills and vocabulary knowledge. The influence of oral language skills will be discussed in more detail in Section 3.2.4, while vocabulary as a component of reading acquisition will be addressed in Section 3.2.2.5.

Concerning the various components of reading and their contribution to reading acquisition, Koda (2007) states that although each component is distinct and

separable, together they enable awareness, understanding, and recall of language coded into print. The components of reading will be discussed in more detail below.

3.2.2 Components of reading

3.2.2.1 The recognition of letters as visual objects

Abadzi (2008, p. 586) declares that “Reading starts with tracking and interpreting individual letters in a morass of print.” In order for the brain to do this, it has to know enough about the individual letters to isolate and recognise them in print. This means that the child will be able to decode print if he/she can recognise letters and the patterns they form. In order for the child to have sufficient knowledge of the letters and their corresponding sounds, their phonological awareness (phonemic awareness) must be developed to such a level that they can identify and interpret the individual letters in print.

3.2.2.2 Phonological and phonemic awareness

According to various sources such as Owens (2012), Stuart (2006), Trehearne (2011), Cunningham et al. (2009), Abadzi (2008), Phillips, Clancy-Menchetti and Lonigan (2008) as well as Hulit et al. (2011), a thorough knowledge of the sounds, sound structure and syllabic structure of the target language is needed by the young reader. These are termed ‘phonological awareness skills’ and include phonemic awareness, which is the specific ability to segment words into constituting sounds and blend these sounds to form new words. Because phonological awareness plays such an important role in literacy acquisition and falls within the scope of this study, it will be discussed in detail below.

3.2.2.2.1 Phonological awareness in detail

Phonological awareness can be defined as a person’s consciousness of the sound pattern of spoken words (Bernthal, Bankson & Flipsen, 2013). In more detail, it can be defined as that part of oral language that is associated with the ability to reflect on

the sounds and sound patterns of a word, rather than on the semantic content of the word (Trehearne et al., 2004). Furthermore, it can be explained as a meta-linguistic skill and can therefore be described as the ability to reflect on, recognise, identify, abstract and manipulate sound units in spoken language (Chen, Anderson, & Li, 2004; Chiang, 2003; Laurent & Martinot, 2010; Liberman, Shankweiler, Liberman, Fowler, & Fischer, 1977; Verhoeven, 2007; Yeong & Rickard Liow, 2012). Phonological awareness therefore includes various cognitive and behavioural skills such as memorising and manipulating sound units (cognitive skills) and producing these sound units (behavioural skills) (Cockcroft, Broom, Greenop, & Fridjohn, 2001). The phonological skills of the child learning a language are also linked to his/her working memory and play an integral role in the ability to learn to read and spell (Baddeley, 1990). The importance of well-established phonological awareness abilities in the multilingual classroom in South Africa is therefore obvious and the teaching of these skills should be encouraged from a very early age.

When studying phonological awareness, a brief explanation of the interchangeably used terms 'phonological awareness' and 'phonemic awareness' is necessary. Although these terms are regularly used as synonyms, there are differences between them (<http://www.k12reader.com/phonemic-awareness-vs-phonological-awareness/>). Phonological awareness can be seen as the 'umbrella term' and is explained as the insight that spoken words are constructed by smaller units of sound, thus that words can be divided into syllables and phonemes, the recognition of rhyme, alliteration, and the omission, addition or replacement of phonemes in words (Bernthal et al., 2013; Best, 1994; Bialystok, Majumder, & Martin, 2003; Cockcroft & Alloway, 2012; Cockcroft et al., 2001; Stewart, 2004; Verhoeven, 2007; Yeong & Rickard Liow, 2012). A child with good phonological awareness will thus be able to: use and recognise rhyme, divide words into syllables, blend various phonemes into syllables and words, identify the onset and rime³ sounds in a syllable, segment and blend phonemes to form (new) words and see smaller words in larger words, e.g. 'mat' in 'material'.

³ *Rime* is that part of the syllable that is not the onset, for example, in the syllable 'cat', 'c-' is the onset and '-at' the rime.

Phonemic awareness is seen as only one aspect of phonological awareness (<http://www.k12reader.com/phonemic-awareness-vs-phonological-awareness/>). It is a more “sophisticated skill” according to Stewart (2004, p. 32), and deals with only one aspect of phonological awareness, namely the phoneme as the smallest unit of language that can bring about a difference in meaning (Owens, 2012). Words are constructed by blending phonemes together, e.g. ‘cat’ is formed by blending the phonemes /k/, /æ/ and /t/ together. Should one of these phonemes within the word ‘cat’ be replaced with another, the meaning of the word will change, e.g. if /k/ is replaced with /m/, the word changes to ‘mat’, which has a totally different meaning than ‘cat’. When a child becomes aware of the fact that a single unit of sound in a language (a phoneme) contributes to distinguishing meaning in words, his/her phonemic awareness is triggered. The child with phonemic awareness skills should thus be able to manipulate phonemes by blending, segmenting or replacing individual phonemes in words to generate new words. Owens (2012) states that the skills of segmentation and blending are the most important sub-skills of phonological awareness when a child starts to read.

Although phonemic awareness is clearly of essential importance when a child acquires or learns a language and becomes literate in that language, the ‘umbrella’ term *phonological awareness* will henceforth be used to refer to this process of language learning or acquisition, referring to the more inclusive or holistic process of becoming acquainted with the phonological system of a language.

3.2.2.2.2 The development of phonological awareness

According to researchers such as Cockcroft, Broom, Greenop and Fridjohn (1999), Treiman and Zukowski (1991), Yeong and Rickard Liow (2012), Bernthal et al. (2013) and Trehearne et al. (2004) children develop awareness of smaller parts of a word as they grow older. Phonological awareness thus develops from the larger phonological units to the smallest (thus from ‘shallow’ to ‘deep’) in the following sequence:

Rhyme awareness

- Perceive and create patterns of rhyme



Skills at the level of the syllable

(Usually developed by 3 or 4 years of age)

- Recognise that words contain syllables, e.g. 'doorbell' = 2 syllables



Skills at the level of onset and rime

(Usually developed by 4 or 5 years of age)

- Realise that words can be divided into two components, its onset and rime, e.g.
'cat': c- = onset; at = rime
- Realise that words such as 'cat' and 'mat' contain phonological similarities - i.e. they rhyme and are rhythmically alike
 - Likely to be able to blend words, e.g. 'door' + 'bell' = doorbell
 - Likely to be able to segment multisyllabic words, e.g. 'doorbell' = 'door' + 'bell'
- Likely to be able to identify when words share the same singleton onsets, e.g. 'door' and 'dog'



Skills at the level of the phoneme

(Often delayed until child learns to read and write)

- Can compare, contrast and manipulate phonological segments within and across syllables and words
 - Can delete phonemes in words to create new words, e.g. 'crack' - delete /k/ to form 'rack'
 - Can count number of sounds in individual words
- PA fully realised when a child can recognise the syllables in a word; that each syllable consists of individual phonemes and can identify and manipulate (blend and segment) these phonemes

This means that a pre-schooler aged 3 - 4 years would generally be able to divide words into syllables, but will not be able to perform onset-rime and phoneme segmentation tasks. A year later, however, the child will be able to perform onset-rime tasks, but will probably still experience problems with segmenting words into the various individual phonemes. When the child starts learning to read and write he/she will become able to function at the deepest level of phonological awareness as explained above (Adams, 1990; Lundberg, Frost, & Peterson, 1988; Stanovich, 1993b).

According to Trehearne et al. (2004) and Adams, Foorman, Lundberg and Beesler (1998) children, at the end of their pre-school years, should be able to complete tasks requiring the skills mentioned on the previous page if they have received adequate teaching, exercise, and exposure to various literacy activities. The child with all these skills in place should now be ready to read.

3.2.2.2.3 Phonological awareness and working memory

Working memory plays a role in phonological awareness. Sometimes termed 'short-term memory' (Gathercole, 1998; McDougall, Hulme, Ellis, & Monk, 1994; Unsworth & Engle, 2007), it can be described as the ability to store information for short periods and manipulate or process this information (Abadzi, 2008; Cockcroft & Alloway, 2012). Focussing on language usage, it can be defined in more detail as follows:

“Working memory refers to the transitory storage capacity and operations that manipulate verbal or written input while processing incoming information and retrieving relevant phonological information from the long-term lexicon”, (Pae & Sevcik, 2011, p. 47).

According to Baddeley's (2003) Working Memory Model, working memory is a restricted system consisting of four components. These components are:

- The *central executive* which is an attention control system directing the functions of the phonological loop and the visuo-spatial sketchpad, thus mediating the storage of information (Baddeley, Gathercole, & Papagno, 1998);
- The *phonological loop* which holds a restricted short-term phonological store which is necessary for speech perception and speech production;
- The *visuo-spatial sketchpad* which consists of the visual cache (storing static visual/spatial data) and the inner scribe (involved during rehearsal) (Cockcroft & Alloway, 2012). The visuo-spatial sketchpad positions and controls visual images and is responsible for the manipulation and generation of mental images (Baddeley, 2000); and

- The *episodic buffer* which allows for the integration of information and the feeding of the information stored in the phonological loop and visuo-spatial sketchpad to long-term memory.

The phonological loop is dedicated to processing verbal input and comprises two sub-systems which are a passive phonological input store (concerned with speech perception) and an articulatory rehearsal process (concerned with speech production) (Milwidsky, 2008). According to Milwidsky (2008) these two sub-systems have a restricted capacity and loss of information from these systems occurs within a few seconds. The loss of information, however, can be counterbalanced and restored by a sub-vocal rehearsal process which feeds articulatory information back into the phonological store. The articulatory control process is also responsible for converting written or visual information into phonological code which is added to the phonological store. Baddeley (1986) states that it is the phonological loop that maintains the phonological data necessary for reading and spelling because it preserves the sounds, words, phrases or sentences while they are being processed.

3.2.2.2.4 Phonological awareness and literacy development

Regarding the relationship between literacy acquisition and phonological awareness, sufficiently developed phonological awareness skills are seen as the best predictor for reading ability during early school years (Adams, 1990; Armbruster, Lehr & Osborn, 2001; Bernthal et al., 2013; Cockcroft et al., 2012; Deacon, Wade-Woolley & Kirby, 2009; Lervåg & Aukrust, 2010; Moats, 2007; Snow, Burns, & Griffin, 1998; Verhoeven, 2007). After that, reading itself plays the biggest role in further reading development (Hogan, Catts, & Little, 2005).

Owens (2012) mentions that socioeconomic status (SES), speech sound accuracy, age and vocabulary each contributes to phonological awareness of the young pre-schooler and therefore to the literacy skills of the learner. Owens's (2012) statement that speech sound accuracy is imperative to phonological awareness is of pronounced importance to this study: it has been found that English L2 learners in South African schools do not always perceive and articulate the vowels of English

correctly (Seeff-Gabriel, 2003). This has an impact on the learners' phonological awareness of the English vowels, which in turn affects their reading and spelling ability. In addition to Owens's (2012) observation, Moats (2007) makes an important statement concerning the importance of the learners' phonemic awareness skills: she states that excellent phonemic awareness skills do not only have short-term benefits for the learner, but provide life-long facilitation to his/her other language abilities. In more detail, Moats (2007) explains that the learner's capability to process phonemes affects his/her aptitude to remember oral language and to recall and produce the spoken form of a word. Therefore, students lacking these skills, have trouble to memorise facts and lists of items. They also tend to confuse minimal pairs, or words sounding alike, and often elide word endings when writing. The lack of phonemic awareness skills affects the rate at which learners learn phonics, which is detrimental for the success of literacy acquisition. Moats (2007) also mentions that learners without the necessary phonemic awareness skills struggle to listen in noisy backgrounds. In the less-than-ideal circumstances in many of the South African schools, this aspect plays an important role.

Moats (2007) states that reading programmes that sufficiently emphasise phonemic awareness skills are the most successful. In agreement with this statement, Adams et al. (1998) believe that the child with good phonological awareness skills when he/she starts school has a better chance to understand how phoneme-grapheme coupling works – i.e. how sounds and letters are converted to print (Adams et al., 1998). Good PA skills therefore enable the child to decode words (Koda, 2007). She continues to explain that the ability to decode efficiently is critical in the reading acquisition process, especially in the initial stages of becoming literate. The ability to decode also enables the child to access existent linguistic knowledge that was accrued through oral language use prior to literacy acquisition.

3.2.2.3 Phonic skills

Phonics can be defined as the ability to link sounds to letters, thus to understand phoneme-grapheme coupling (Hulit et al., 2011; Lervåg & Aukrust, 2010). Moats (2007) cautions that phonics and phonemic awareness should not be confused and

stipulates that phonemic awareness is an auditory skill that precedes phonic skills – good phonemic awareness skills are thus necessary to make correct phoneme-grapheme couplings when the child starts to read and write. In this way phonic skills are dependent on phonemic awareness skills (Lervåg & Aukrust, 2010). Phonic skills assist young readers to not only decode regularly spelled words, but also to decipher irregularly spelled ones. These decoding skills also enable young readers to read text accurately when reading aloud as well as to comprehend what they read (Hulit et al., 2011).

Decoding skills predict reading comprehension, accuracy and fluency in the beginning stages of reading in the L2 (Geva & Clifton, 1994; Geva, Wade-Woolley, & Shany, 1997; Geva & Siegel, 2000). Insufficient decoding skills will limit comprehension on word-level reading (Geva, 2006b; Hoover & Gough, 1990; Lervåg & Aukrust, 2010). Geva (2006a) mentions that phonological awareness, rapid automatised naming (RAN), as well as working memory skills influence decoding skills and therefore will influence the L2 learner's ability to read on a word-based level.

Although decoding is seen as the best predictor of reading acquisition during the early stages of reading, its influence does not stop altogether during the later stages of reading. Droop and Verhoeven (2003) found that especially L2 learners in Grade 3 or 4 still have to decode unfamiliar words in order to grasp their meaning. This stresses the importance of proper decoding skills in the L2 reading process.

Researchers like Lervåg and Aukrust (2010) found that L1 and L2 learners' skills are very often equal at word-level reading, where decoding is the most important factor predicting reading ability (Geva & Zadeh, 2006; Lesaux & Siegel, 2003). This, however, depends on the decoding skills of the L2 learners, which in turn depends on their phonological awareness skills.

Given that phonic skills focus on phoneme-grapheme coupling, a thorough knowledge of how phonemes and graphemes relate to one another will also assist

the learner in spelling words correctly. The degree of difficulty of phoneme-grapheme coupling depends on the orthography of the target language.

Orthographies are described as being ‘transparent’, ‘shallow’ or ‘consistent’ on the one hand, or ‘opaque’, ‘deep’ or inconsistent’ on the other, depending on the simplicity of the phoneme-grapheme coupling; thus the ease with which a word’s pronunciation can be foretold from its spelling (Besner & Smith, 1992; Chen et al., 2004). A language with a transparent orthography has regular phoneme-grapheme coupling which will enable decoding and therefore reading acquisition. Setswana, as most of the African languages, has a transparent orthography, meaning that words are generally spelled the way they sound, for example *‘loleme’* (tongue). English, however, has an opaque orthography and the phoneme-grapheme coupling is therefore less direct, making decoding more difficult. This means that there are many words such as *‘tongue’* and *‘break’* where the phonemes cannot be predicted by looking at the graphemes and vice versa, making the reading acquisition process more difficult (Cockcroft et al., 2001; Ziegler & Goswami, 2005).

Geva (2006b) states, however, that it is not only phoneme-grapheme coupling that plays a role in L2 reading acquisition: the contents of the phonemic and syllabic repertoire as well as the grammatical complexity of the language determines the ease with which the L2 learner will acquire literacy skills. Focussing on the more intricate syllabic structure of English compared to the regular, open syllabic structure of Setswana, for example, it is clear why many L2 learners struggle to acquire literacy skills.

Lervåg and Aukrust (2010) mention that decoding plays a greater role in reading comprehension for longer in inconsistent or opaque orthographies like that of English. They state that it takes more time to learn to decode in such orthographies. Good phonic skills are therefore crucial when learning to read in a language with an opaque orthography.

Another aspect of English’s opaque orthography is that different phonemes are represented by the same grapheme or symbol, for example the vowel in the words

'*bath*', '*man*', and '*was*' is orthographically represented by the grapheme 'a'. Different phonemes, however, are represented by this grapheme, namely /ɑ:/, /æ/, and /ɒ/ respectively. Cockcroft et al., (1999) and Ziegler, Bertrand, Toth, Csepe, Reis, Faisca, Saine, Lyytinen, Vaessen and Blomert (2010) mention that it seems that a different set of phonological processing skills is required when learning to read in an opaque orthography than when one learns to read in a more transparent language. Cockcroft and Alloway (2012) explain that when reading in a transparent orthography, children rely heavily on the phoneme level, while relying more on larger units of words such as syllables and rimes when learning to read in an opaque orthography. These phonological awareness skills concerning syllabification and onset-rime detection develop earlier than Grade R, before many L2 learners attend school. This may mean that English L2 learners have not developed these skills which they need for reading in a language with an opaque orthography. Learners who change to English as medium of instruction in Grade 4, will be used to relying on knowledge of the phonemes of their first language. When there is a significant difference between the phonemes of the L1 and the L2, as is the case with the vowel systems of Setswana and English, these L2 learners may struggle to correlate phonemes and graphemes in the LoLT.

Ziegler and Goswami (2005) state that the more opaque an orthography, the slower the child will learn to read in that language. The L2 learner in the ELoLT classroom therefore needs excellent phonic skills which are based on phonological awareness skills to contend with the opaque orthography of English.

3.2.2.4 Reading comprehension

The critical objective of reading is to infer meaning from text by first converting print into language and then deducing the intended message (Koda, 2007). Requiring a higher degree of reading comprehension, Owens (2012) indicates that the young reader must also be able to deduce the answers to questions concerning inferred meaning.

Reading comprehension depends on knowledge of vocabulary: it can therefore be defined as understanding and interpreting what was read (Koda, 2007). Stressing the importance of semantic skills, Abadzi (2008) states that although reading speed (or fluency) is necessary for comprehension it is knowledge of vocabulary that is of cardinal importance for reading comprehension.

In order to understand the text the young learner is reading accurately, he/she must understand the relationships between the words in a sentence as well (Hulit et al., 2011). Reading comprehension also depends on pronunciation, which in turn depends on decoding (Gilbert, 2012). If the young reader does not pronounce a word correctly, he/she cannot relate the meaning of the word to a known word in his/her vocabulary.

Geva (2006b) declares that a relationship exists between decoding skills and reading comprehension at the early stage of reading acquisition – the young reader with good decoding skills will be able to comprehend what he/she has read. It is therefore crucial that the L2 learner in the ELoLT classroom can decode accurately in order to understand what he/she has read.

The idea of prior or existing knowledge contributing to reading comprehension is related to the importance of a rich oral vocabulary in the literacy acquisition process. Owens (2012) states that new information gathered while reading interfaces with the reader's existing knowledge and thus creates the meaning of what is read.

Reading comprehension is a very important aspect of academic activities (Lervåg & Aukrust, 2010). Educators should be aware that the L2 learner is very often not on par with his/her L1 peer concerning skills and tools that aid reading comprehension. No stone should be left unturned to develop this component of reading in especially the L2 learner.

3.2.2.5 Vocabulary

Although accurate and rapid decoding skills are necessary in the literacy acquisition process, it is not the only essential component needed to make a skilful reader (Moats, 2007). Knowledge of vocabulary is crucial to fluency and reading comprehension. The larger the vocabulary and the more precise the pronunciation of the reader, the more understandable a text will be. Once again, the L2 learner is at a disadvantage because his/her vocabulary in the L2 is seldom on par with that of his/her L1 class mates (Verhoeven, 2000).

Moats (2007) mentions that pre-school children with low SES very often enter school with insufficient knowledge of vocabulary. This deficit will impede the development of their oral language abilities as well as their acquisition of literacy and reading comprehension. She also states that such learners learn new items of vocabulary at a slower rate. This will have a negative effect in the ELoLT classrooms in South Africa and will surely contribute to the low scores in literacy skills.

Limited vocabulary in the LoLT results in severe comprehension problems, both on word-level and text-level reading (Carlisle & Beeman, 2000). If too many words are unknown, the L2 learner will not be able to infer word meaning from the text (Carver, 1994). This is detrimental to the learner's success in completing various academic activities (Lervåg & Aukrust, 2010). Nakamoto, Lindsey and Manis (2007) found that many L2 learners start to fall behind their L1 peers on reading comprehension from Grade 3. This could be attributed to L2 learners having poorer vocabulary skills (Lervåg & Aukrust, 2010). A rich vocabulary at the outset of the reading acquisition process facilitates reading comprehension and better academic achievement (Lervåg & Aukrust, 2010).

Expansion in academic vocabulary is related to cognitive and linguistic growth in the educational environment (Owens, 2012). In the classroom, the young learner must be able to comprehend the meaning of words such as 'remember', 'conclude', 'although', etc. in order to answer questions correctly. A sufficient vocabulary that includes words (and their meaning) that are used in the classroom will aid the development of the young reader's academic language and his/her academic progress.

3.2.2.6 Reading fluency

Reading fluency is defined as the ability to read text accurately, fast and with expression, which depends on comprehension (Hulit et al, 2011). Moats (2007) states that oral reading rate, accuracy, fluency and silent-reading comprehension are all related. She continues to explain that learners will understand a longer section of text only if they read the text fluently enough with the correct stress and intonation patterns.

Geva (2006b) believes that reading fluency is dependent on the reader's ability to decode words and simple text accurately and automatically during the early stages of reading acquisition. The importance of decoding skills is stressed by researchers who declare that PA skills predict the speed with which children acquire reading fluency in the early grades (Geva, Wade-Woolley & Shany, 1997; Geva, 2006b; Geva & Siegel, 2000; Stanovich, Cunningham & Cramer, 1984). L2 learners who struggle to decode words because of insufficient phonological awareness skills and phonic skills will not be as fluent as L1 learners. This may impede their reading comprehension and impact negatively on their academic performance.

Fluency develops when the other components of reading are in place (LaBerge & Samuels, 1974). Wolf and Katzir-Cohen (2001) posit that the early stage of reading fluency requires the measured development of precise and automatic performance of orthographic, phonological, morphological, lexical and syntactic skills. They continue to explain that to be efficient and fluent readers, young readers need to expand their vocabulary (words or phrases) that can easily be accessed from memory. Fluent readers therefore no longer decode each and every word in a sentence, but make use of word recognition based on experience and memory of that word/phrase.

All the components of reading addressed in the afore-going sections contribute to create a skilful reader. Prinsloo and Heugh (2013, p. 3) summarise this cohesion as follows:

“Many studies on how language is learnt and processed by the brain confirm the connection between reading speed, fluency and comprehension. These elements crucially rely on vocabulary and word and language structure for automated reading to contribute to learners’ conceptual development.”

3.2.3 Spelling

Spelling skills take time to develop (Owens, 2012; Schickedanz & Casbergue, 2009). Children, during the preliterate phase, attempt to spell or write by making scribbles and adding an occasional letter to their writing (Henderson, 1990 in Owens, 2012; Knight-McKenna, 2009).

As the child accumulates knowledge about the alphabet, he/she invents a system, *invented spelling*, where the letter names and what phoneme-grapheme knowledge he/she has are used to spell a word (Bear, Invernizzi, Templeton & Johnston, 2008; Knight-McKenna, 2009; Owens, 2012). An example of invented spelling is *LFT* for “elephant” (Henderson, 1990 in Owens, 2012, p. 375). Consonants are thus used first, while vowels are only added later (Knight-McKenna, 2009). During a later phase of invented spelling the system also includes other creative spelling methods such as *phonemic spelling* where the word is spelled the way it is heard, for example *BEDR* for “better” (Pflaum, 1986 in Owens, 2012, p. 375). Ouellette and Sénéchal (2008) as well as Caravolas, Hulme and Snowling (2001) note that invented spelling reveals the result of a combination of phonological awareness and orthographic knowledge and mention that it enables reading acquisition. Caravolas et al. (2001) indicate that it is specifically phoneme segmentation skills coupled with phoneme-grapheme knowledge that enhance phonemic spelling. They found that phonemic spelling in turn, in combination with reading, promote conventional spelling ability.

Phonological awareness skills clearly influence spelling ability. Various studies done on the influence of phonological awareness and its influence on spelling in English have shown that good PA skills correlate with good spelling ability (Arab-Moghaddam & Sénéchal, 2001; Caravolas et al., 2001; Furnes & Samuelsson, 2011;

Geva, 2006a; Koda, 2007; Landerl & Wimmer, 2008). Alphabetic knowledge, phoneme-grapheme coupling and RAN also play a role in spelling skills (Aarnoutse, Van Leeuwe & Verhoeven, 2005; Caravolas et al., 2001). Except for vocabulary skills, oral language skills do not play such an important role in the acquisition of spelling skills (Arab-Moghaddam & Sénéchal, 2001; Everatt, Smythe, Adams & Ocampo, 2000; Geva, 2006a, Wade-Woolley & Siegel, 1997).

Owens (2012) states that a child develops a more conventional spelling system when he/she receives spelling instruction in school. He continues to explain that with increased memory capacity for the regularities of spelling patterns a child notices the spelling process is facilitated. A child learning a language with a 'deep' orthography like English may take longer to notice regularities of spelling because of the many inconsistencies in the phoneme-grapheme coupling system. This is especially true concerning the vowels of English as referred to in Section 3.3.3.

Although Lennox and Siegel (1996) believe that the majority of learners move from a purely phonological spelling method to a mixed strategy between Grades 2 and 5, PA and phonics play an important role as basis for the acquisition of spelling skills in the early foundation phase. These skills should therefore be enhanced with special attention given to the L2 learner.

3.2.4 Oral language and its influence on literacy acquisition

It has been established that oral language abilities influence the acquisition of literacy skills (Crawford-Brooke, 2013; Geva & Zadeh, 2006; Koda, 2007; Lervåg & Aukrust, 2010; Owens, 2012; Prinsloo & Heugh, 2013; Proctor, Carlo, August & Snow, 2005).

Although decoding skills, grounded in phonological awareness skills, are considered the strongest predictor for literacy acquisition, these skills, on their own, will not make a competent reader as mentioned earlier (Adbadzi, 2008; Adams, 1990; Bernthal et al., 2013; Cockcroft & Alloway, 2012; Cucchiaroni, Neri, & Strik, 2009; Moats, 2007; Verhoeven, 2007).

Oral language skills have to be developed as well. Oral language ability, and especially semantic or vocabulary knowledge, is seen as an important predictor of reading skills specifically during the later stages of reading acquisition when decoding has become automatised and the child starts reading more on text-level (Geva & Zadeh, 2006; Lervåg & Aukrust, 2010; Miller, Heilmann, Nockerts, Iglesias, Fabiano, & Francis, 2006; Proctor et al., 2005; Roskos, Tabors, & Lenhart, 2009).

Components of oral language such as vocabulary – semantic knowledge – and other grammatical skills are related to text-based aspects of literacy such as reading fluency, reading comprehension as well as the ability to write (Geva, 2006a). The importance of good oral language skills is therefore clear.

While the decoding skills of L2 learners might be equal to those of L1 learners during the early stages of reading acquisition, L2 learners generally have poorer oral language skills and this will influence their text-based reading ability (August & Shanahan, 2006; Geva & Zadeh, 2006; Proctor et al., 2005; Snow et al., 1998; Verhoeven, 2000). L2 learners take a long time to develop L2 oral proficiency (Geva, 2006a). She continues to point out that research determined that even after five to six years of attending L2 medium of instruction schools, various aspects of L2 oral proficiency, especially those required for academic language-use, continued to be insufficient.

During the years it takes for oral language proficiency to develop, the L2 learner may struggle to keep up with the academic requirements. Reading difficulties are therefore to be expected. Geva (2006b), however, states that although L2 learners are still developing oral language skills at this stage of reading, they *can* learn to read and spell and achieve similar results to L1 learners.

In order to understand the influence of oral language on the acquisition of literacy skills, oral language has to be defined and its components briefly discussed. The acquisition of oral language, both L1 and L2, is therefore also important to this study and will be discussed in Section 3.3.

3.2.4.1 Oral language defined

Crystal (2008) defines oral language as language in its spoken form as opposed to its written form. Oral language can further be defined as the verbal system through which we communicate our knowledge, ideas, experiences and feelings (Hulit et al., 2011; Lesaux & Harris, 2014). It therefore encompasses listening and speaking skills. These skills depend on the knowledge of the linguistic rules of the target language and start to develop from a very young age (Fielding, Kerr, & Rosier, 2007).

Children enter school with differences in background knowledge and oral language ability. According to research, these differences can be attributed to the children's experiences in the home environment as well as SES (Cain & Oakhill, 2007; Hart & Risley, 1995). Children with a low SES often have limited background knowledge and limited oral language proficiency which will have a negative impact on their literacy acquisition (Cain & Oakhill, 2007; Howie et al., 2012; Moats, 2007; Snipes, Horwitz, Soga, & Casserly, 2008).

In the South African context, many learners in the foundation phase are from low SES households with accompanying disadvantages such as limited or insufficient exposure to language, especially English; limited exposure to print; limited exposure to English beyond basic interpersonal conversation skills; limited background experiences; parents with limited education; and disruptions and transitions in the learners' home life (Howie et al., 2012). The effect of these disadvantages surely multiplies when the young learner has to learn through the medium of a L2. Their oral language abilities cannot be on par with their English L1 peers and this is reflected in the results of the prePIRLS 2011 (Howie et al., 2012).

The components of oral language can be defined as the intricate system that communicates meaning via sounds. This system consists of three modules namely phonological awareness, semantics, and syntax according to Snow et al. (1998). Lesaux and Harris (2014) explain that to develop the oral language of a child, one needs to develop the skills and knowledge regarding the linguistics of the target

language that will provide the basis for the child's listening and speaking skills. The linguistic components of language that children need to master are the following (Crystal, 2008; Hulit et al., 2011; Owens, 2012):

3.2.4.2 Components of oral language

3.2.4.2.1 Pragmatics

Crystal (2008) defines pragmatics as the study of language from the point of view of the language user: the language choices he/she makes, what constraints he/she employs in language use in social interaction and what the effects of the language he/she uses are on the other participants in the communication situation. Owens (2012) therefore describes pragmatics as the interaction of language and socialisation.

As pragmatics is concerned with the *way* language is used to communicate rather than with the *structure* of that language, an understanding of the social environment in which language is used is important. In the more formal environment of the classroom, children need good pragmatic skills to negotiate their way. The learner has to understand that he/she is expected to behave or perform linguistically in a specific way. For example, the learner must be aware of turn-taking rules, i.e. when could he/she speak and when not and he/she must adhere to the various maxims of conversation such as responding with enough, correct and relevant information to a question asked by the teacher (Grice, 1975).

Within the classroom, academic language and how the speaker uses it therefore become more important than social or interpersonal language. Owens (2012) states that pragmatics is the area of linguistics that grows most during the school years and adulthood.

3.2.4.2.2 Semantics

Semantics is defined as the study of meaning in a language (Crystal, 2008). This definition refers to the meaning of words in a language. Owens (2012) stresses that the words in a language do not reflect reality itself but rather represent the users' perceptions of reality. He therefore links word knowledge to world knowledge. Word knowledge is defined by Owens (2012) as containing word definitions and constitutes each language user's vocabulary. World knowledge refers to each individual language user's first-hand experience, understanding and memory of the world. It therefore makes sense that a child who is exposed to a variety of experiences in the real world and discussions about events will have a more expanded vocabulary – thus a rich 'meaning-library' to consult during language-use – than the child from a milieu-poor environment.

If the meaning of words depends on the language user's perceptions of reality, cultural experiences should have an influence on meaning. In Setswana, for example, only one word, '*tala*', is used to indicate both blue and green. The English L2 learner must therefore adapt his world knowledge to accommodate the difference between these two colour terms in English.

Lesaux and Harris (2014) refer to vocabulary, and thus semantics, as a central aspect of spoken language. Crawford-Brooke (2013) mentions that semantic development focuses on both receptive and expressive vocabulary. Receptive vocabulary refers to the words the learner understands. The understanding is based on the background knowledge and experiences of the child. Expressive vocabulary refers to the words the child uses when talking and writing. The importance of vocabulary enhancement can therefore not be stressed enough: the more extensive the vocabulary of the learner, the better language user he/she should be.

Vocabulary growth, however, is not the only part of semantics that develops as the language user matures. Real semantic growth takes place when the child can understand semantically interrelated concepts, figurative language and sense relations such as synonyms, antonyms and homonyms since these will enhance the

child's understanding of a word (Crawford-Brooke, 2013; Owens, 2012). Such growth should be fostered in the classroom.

The development of the ability to provide definitions of the meaning of words is an important part of vocabulary growth. According to Owens (2012) these skills develop during school age and are part of the meta-linguistic skills language users develop. He explains that children between the ages of seven and eleven years learn and come to understand many terms concerning spatial, temporal, familial, disjunctive and logic relationships. An understanding of these terms and the ability to use them correctly will enhance the learner's oral academic language use. As an example of the use of familial or kinship terms, the Setswana L1 speaker within the ELoLT classroom will have to remember that in English the word '*grandmother*' refers to both your mother's or father's mother. In Setswana the word '*mmemogolo*' can refer to the grandmother on the mother's side or the mother's older sister, but not to those family members on the father's side.

In Setswana, gender is not grammatically distinguished (Cole, 1955). This means that the sentence '*Énê o a tsamaya*' may mean '*He is walking*' or '*She is walking*'. It is generally experienced in South Africa that many African languages speakers do not always correctly distinguish between '*he*' and '*she*' in English or Afrikaans. Although one tends to accept that the young L2 learner will be able to distinguish the gender of the subject or object of the sentence during receptive language exercises, comprehension may suffer. Mistakes concerning the use of the correct pronoun or possessive pronoun will surely occur in productive language exercises such as speaking and writing.

3.2.4.2.3 Syntax

Syntax is defined as the study of the rules determining the manner in which words are combined to form sentences in a language (Crystal, 2008). These rules therefore determine word order, phrase order and clause order in a sentence. They also determine the relationships between words, word classes and other sentence elements.

The syntactic differences between the L1 and L2 may pose a problem for young L2 learners. In English a verb in the present tense will have the suffix -s if the subject is singular. In Setswana the correspondence between subject and verb is created by means of the subjectival concord which is derived from the subject, for example:

'Ngwana o ithuta mo sekolong' versus *'The **child** learns at school'*

'Bana ba ithuta mo sekolong' versus *'**Children** learnø at school'*

According to Nippold (2009) language production and syntactic complexity are influenced by the specific type of speaking task and the knowledge of the topic. Very importantly, Owens (2012) mentions that greater syntactic complexity is noticed when children talk about a topic that is familiar to them. Once again, this means that children with a wide exposure to different experiences and good general knowledge and vocabulary will be able to use sentences that are more complex.

3.2.4.2.4 Morphology

Morphology can be defined as the study of the structure of words (Crystal, 2008). The focus is therefore on the morpheme as the smallest meaningful unit of a word and how morphemes combine to form words. Children learning the morphological rules of English will have to learn to use the correct way of forming the past tense of verbs, plural forms, and use various inflexional prefixes such as *un-*, *dis-*, *non-* and *ir-*, for example. Crawford-Brooke (2013) mentions that knowledge of the morphology of a language will enable a child to increase his vocabulary because he/she will realise that the addition of affixes may allow one to form 'new' words, e.g. *happy* + the prefix *un-* results in a 'new' word *unhappy*, allowing one to express the opposite of *happy*.

During the data collection process of this study it was noted that many of the English L2 participants added the -s plural suffix to all words to form the plural, even to words such as *'teeth'*, *'feet'* and *'men'* that were already in the plural form. The words they used to indicate the plural of these nouns were thus *'teeths*'*, *'feets*'* and *'mens*'*. The regular rule of plural formation in English was therefore applied consistently, even though incorrectly in some instances. Setswana has a regular and systematic

way of indicating the plural form of nouns (Cole, 1955). All nouns are divided into classes according to their class prefixes. When the noun is used in the plural form, the singular class prefix is replaced with the plural class prefix, e.g. 'monna' (man) > 'banna' (men). One could thus assume that the young L2 learners wanted to apply the same type of *regular* morphological rule to English as well, even though Setswana makes use of prefixation while English applies suffixation to obtain the plural form of a noun.

3.2.4.2.5 Phonology

Phonology is defined by Owens (2012) as that part of linguistics that studies the rules governing the structure, distribution and sequencing of speech sounds, including the syllabic structure of a language. These rules therefore determine how a language user will use the sounds of the target language to produce organised oral language or speech.

Distributional rules determine which sounds can be used in which positions in a word. For example, the /ŋ/ phoneme in English can be used in the terminal position in a word, but not in the initial position, e.g. ring /rɪŋ/.

Sequencing rules determine which sounds may appear in combination. For example, in English the sound combination /st/ is allowed while in Setswana it is not permissible. Sequencing rules also determine the phonetic value of phonemes which appear next to one another across syllable boundaries, for example:

When the past tense morpheme -ed is suffixed to a verb, the morpheme will be realised as a:

- voiced plosive /d/ if the final sound of the verb stem is voiced, e.g.
hum + -ed = /hʌmd/
- voiceless plosive /t/ if the final sound of the verb stem is voiceless, e.g.
fish + -ed = /fɪʃt/

Another aspect of phonology that children need to master, as mentioned by Owens (2012), is the syllabic structure of a language. Setswana has an open syllabic structure, meaning the syllable always ends on a vowel, or a syllabic consonant, for example 'mo- n- na' (man), while English has open and closed syllables.

In order to be competent language users, children need to master rules like these. Owens (2012) states that speech sound knowledge in a child's memory, forms the foundation for phonological awareness. According to him the child fully develops the phonetic inventory of his first language during the early school-years, including these morphophonemic rules. Young second language users in the ELoLT classroom have not necessarily mastered all these skills yet. This may result in a deficit in English oral language skills that will affect the quality of the learners' oral work, reading, spelling and writing as it affects their phonological awareness skills.

The following table is a brief summary of the phonological rules acquired by children in the early school age period:

Table 4: Phonological rules acquired during the early school-years

Age	Phonological rule
5 years	Can identify syllables
6 years	Pluralisation rule: when /s/; when /z/; and some /əz/ cases
7 years	Recognises unacceptable sound sequences
8 years	Is able to produce all English sounds and blends of sounds
12 years	Complete adult stress and accent system developed

Note: Adapted from Owens (2012, pp. 339 - 350)

Phonological knowledge also includes phonological awareness skills (Snow et al., 1998). Crawford-Brooke (2013) states that once the phonological rules have been acquired for basic listening and speaking early-on in the language acquisition process, young children start to develop phonological awareness skills. Anthony and Francis (2005) mention that linguistic characteristics of oral language such as phoneme position and articulatory aspects seem to influence phonological

awareness development of the child. The child, who is to become literate, should therefore have a thorough knowledge of the linguistic system of the language in which he/she is going to become literate.

When keeping all the components of language in mind that have been discussed in this section, it should be obvious that the English L2 learner in the foundation phase needs extensive teaching of English language structures to ensure that his/her language skills are on par with L1 learners. It should therefore not be assumed that the young L2 learner will acquire sufficient English language skills simply by being taught through the medium of English.

The aspect of being a competent language user leads to the question as to how oral language – first language and additional languages – are acquired. These processes will be discussed below.

3.3 The acquisition of language

The study of language acquisition has interested persons from various spheres of life for thousands of years. Owens (2012) mentions a child-language study conducted in the seventh century BC by an Egyptian pharaoh Psammetichus I. Both St. Augustine and Charles Darwin studied and published reports on language development; albeit from different perspectives (Owens, 2012).

First languages (L1s) are assumed to be languages of which the acquisition starts before the age of three years (Berman, 2009; Saviile-Troike, 2012). Although this acquisition process is seen as natural and normal, Owens (2012) posits that children do not learn language miraculously; they need certain cognitive, perceptual, social and communicative skills to engender language. The ability to acquire language must therefore be present. Cunningham et al. (2009) mention that the physical and emotional well-being of families as well as their ability to provide a stimulation-rich environment have an influence on the quality and rate of language-developing interactions taking place. Learners in less-than-favourable socioeconomic and less supportive environments may therefore very likely not develop the level of oral

language skills necessary for good literacy acquisition. This statement is in alignment with the findings of Howie et al. (2012) concerning the reading skills of many young South African learners.

3.3.1 First language acquisition and second language learning

First language acquisition is described as a natural subconscious process in which children develop the linguistic knowledge of the specific environment they form part of by using their innate language ability (Oxford, 1990; Sugiura et al., 2011). The L1 is therefore acquired during early childhood, through interaction with speakers of the language as part of the process of growing-up, and is inextricably part of the process of making sense of our world (Owens, 2012; Saville-Troike, 2012).

Theories as to how children acquire their L1 have probably been competing for acceptance since they came into being. Three major groups of theoretical approaches to language acquisition can be distinguished according to Ambridge and Lieven (2011) and Lane and Molyneaux (1992):

- **The Nativist/Innatist/Generativist/Universal Grammar approach**
This approach stresses the role of inherent capacities of humans to develop language as most important. (cf. Chomsky's (1965) LAD [Language Acquisition Device])
- **The Behaviourist approach**
It stresses the role of the environment and the reinforcement of positive language behaviour by caregivers. (cf. Ingram, 1989; Skinner, 1957)
- **The Constructivist/Emergenist/Socio-linguistic/Socio-pragmatic/Functionalist/Interactionist approach**
This approach acknowledges that the child has the organismic abilities to develop language *and* that the environment plays an important role in this development because it provides input concerning the language model, stimulation and motivation. (cf. Piaget, 1953; Vygotsky, 1978; Yule, 2010)

The debate between the Nativist and Behaviourist approach is part of the ‘nature-versus-nurture’ debate (Ambridge & Lieven, 2011; Hulit et al., 2011; Owens, 2012). The essence of the ‘nature-nurture’ argument is that scientists have been debating the influence of genetics – i.e. does development occur because of human beings being inherently predisposed to such development (Chomsky, 1965a) or does development occur because of learning from the environment (Christiansen & Charter, 1999; Goldberg, 2006; Hulit et al., 2011; Owens, 2012; Saville-Troike, 2012).

Hulit et al. (2011) observe that whenever human behaviour is discussed, the ‘nature-versus-nurture’ argument will surface. Linguists and other language experts do not necessarily adhere to one of the two theories exclusively, but may prefer to position themselves on a continuum between the two opposing views of the Nativist and Behavioural approaches (Lane & Molyneaux, 1992) and therefore follow the Interactionist or Constructionist theories.

This reluctance to adhere to one specific theory exclusively reveals the complex nature of language and language acquisition. Yule (2010, p. 170) summarises the reason for an eclectic approach as follows:

“First language acquisition is remarkable for the speed with which it takes place. Long before a child starts school, he or she has become an extremely sophisticated language-user, operating a system for self-expression and communication that no other creature, or computer, comes close to matching. In addition to the speed of acquisition, the fact that it generally occurs, without overt instruction, for all children, regardless of great differences in their circumstances, provides strong support for the idea that there is an innate predisposition in the human infant to acquire language. We think of this as a special capacity for language with which each newborn child is endowed. By itself, however, this inborn language capacity is not enough.”

Studying the various theories of and proposals to language acquisition and development, the position taken in this study is in agreement with Yule’s (2010) and

Pinker's (1994) view that humans must have an inborn predisposition to acquire language, but that this ability is enhanced and developed through input from language-users in the child's environment

While L1 acquisition is described as a natural process, second language (L2) learning is more of a conscious, cognitive effort and therefore the distinction is often made between the terms 'acquisition' and 'learning' (Krashen, 1985). Brown (1994), however, states that both acquisition and learning are necessary for communicative competence in a L1 and a L2, especially when higher level language skills are required.

Approaches to second language learning do not differ that much from those used to describe L1 acquisition (Butler & Hakuta, 2006; McLaughlin, 1978; Paradis, 2009). Some prominent theories explaining second language acquisition are the following:

- **The Contrastive Analysis Hypothesis (CAH)** (Lado, 1957)

In this approach, what need to be learned are the differences between the L1 and the L2. The major source of error production is seen as the influence of the L1. The concept of 'inter-language' flows from this approach. Although criticism has been lodged against the CAH, Gass and Selinker (2008) state that this theory cannot be abandoned completely because the influence of the L1 on L2 phonology cannot be ignored.

- **The Markedness Differential Hypothesis (MDH)** (Eckman, 1977)

This theory is based on the phonological theory of markedness. A marked feature is a salient, less usual feature in the phonology of a specific language, while an unmarked feature is a more common feature. Davidson (2011) states that when some aspect of the L2 phonology is more marked than in the L1, L2 speakers will have more difficulty learning it. The syllabic structure of English differs from that of Setswana, for example. Setswana has a consistently open syllabic structure while English has closed syllables as well. This feature of English phonology may be difficult for the L2 learner to grasp. Another feature of English phonology that

does not occur in Setswana is that of diphthongs and long vowels that do not necessarily occur in the penultimate syllable of the word.

- **The Optimality Theory (OT)** (Prince & Smolensky, 1997)

As with the other L2 acquisition theories, OT has its roots in phonology (Davidson, 2011). OT relies on universal constraints and the ranking of these constraints. The constraints distinguished are faithfulness and markedness constraints (Davidson, 2011; Gass & Selinker, 2008). Faithfulness constraints match the language input with the language output while markedness constraints determine how well the output is formed (Gass & Selinker, 2008). According to these authors constraints are universal or innate and apply to all languages. Variations across languages are the results of the distinctive ordering of the constraints. Second language learning therefore involves the reordering of the L1 constraints.

- **Ontogeny-Phylogeny (OP)** (Major, 2001)

This model of L2 acquisition encompasses the phonological relationship between the L1 and the L2 as well as phonological universals present across languages. Major (2001) states that the L2 learner only has L1 knowledge and latent universals (which are not already part of the L1 or L2) at the outset of L2 learning.

The development of language learning does not only refer to speech production, but to the perception of speech as well. A complex relationship exists between speech perception and speech production (Bilbao, 2002). Bilbao (2002) went as far as to state that until a L2 speaker can perceive the various speech sounds of the L2, he/she will not be able to produce these speech sounds correctly. When studying second language learning, one has to be aware of theories explaining speech perception, especially those dealing with L2 perception, such as these briefly discussed below.

- **Perceptual Assimilation Model (PAM)** (Best, 1994)

This perceptual model predicts the perceptual difficulties in distinguishing L2 phonetic contrasts due to articulatory gestures (Best & Tyler, 2007; Bilbao, 2002). For example, when listening to a non-native sound, the listener may perceptually assimilate the sound to the L1 sound closest in articulatory movement (Bilbao, 2002). It therefore seems that listeners do not perceive acoustic signals, but rather the phonetic or articulatory movements of the articulators responsible for the production of the sound.

Bilbao (2002) explains that L2 speakers struggle to discriminate between two contrastive sounds if both of these sounds are assimilated as good exemplars of a single L1 sound. In such a case, the L2 speaker/listener will not be able to discriminate between the sounds. If these sounds vary in goodness of fit to a single L1 category, however, perceptual discrimination will be easier as the sounds will be associated with two different L1 categories. When the L2 sounds are extensively different from the L1 sound, they may not be classified as belonging to a specific category.

- **Speech Learning Model (SLM)** (Flege, 1986)

Flege's SLM focuses on the interaction between L1 and L2 sounds. If great differences exist between the L2 sound and the nearest L1 sound, a new category for the L2 sound will be formed over time. The properties of the new L2 categories are said to be based on the properties of the L2 sounds alone, and are foreseen to be identical to the L2 norms. However, where L1 and L2 sounds do not differ that much, a single category containing both sounds is formed. The L2 sound which is thus perceived as 'similar' or 'identical' to the L1 sound will be assimilated to the native L1 category. If this happens, the accentedness of L2 speech is clearly discernable (Best & Tyler, 2007).

- **Native Language Magnet (NLM)** (Kuhl & Iverson, 1995)

According to this theory, the L1 prototypical sounds act as perceptual magnets that 'warp' auditory experience (Højen & Flege, 2006). The NLM states that as a child develops his perceptual inventory of the L1 sounds, it becomes dominant so

that he/she may find it difficult to perceive new L2 sounds. The L1 sounds would thus attract L2 sounds.

Advancing one of these theories or models, however, does not fall within the scope of this study and neither is the selection of one to explain the results of the acoustic analysis and the subsequent positioning of the vowels within the vowel space. However, the idea of phonetic similarity and dissimilarity between the phonetic systems of two languages features in all of these perceptual models and theories. It is also widely accepted that these perceived similarities and dissimilarities are responsible for L2 productions that differ from native productions (Anh, 2009; Baker, Trofimovich, Flege, Mack, & Halter, 2008; Best, 1994; Flege, 1986; Flege, Schirru, & MacKay, 2003; Flege, Birdsong, Bialystok, Mack, Sung, & Tsukada, 2006; Kuhl, Williams, Lacerda, Stevens, & Lindblom, 1992; Strange, Ahakane-Yamada, Kubo, Trent, Nishi, & Jenkins, 1998).

The characteristics of L1 sounds result in the categorisation of L2 speech sounds as acoustically *similar* or *new* (Flege, 1987). According to Flege (1987), *new* L2 sounds are those that do not have counterparts in the L1 and are deemed more difficult to produce (Oh, Guion-Anderson, Aoyama, Flege, Akahane-Yamada, & Yamada, 2011). This could be, for example, the case with the central vowel [ə] which does not occur in Setswana. L2 speakers could therefore assimilate the L2 sound to an existing L1 sound or form a new category for the L2 sound (Best, 1994; Flege, 1986; Flege, 1987; Strange et al., 1998). Interestingly, James (1986) makes the observation that since L2 learners make production mistakes with both new and similar sounds, it would seem that they continue to discriminate these L2 sounds in terms of the L1 categories.

In addition to the degree of cross-linguistic similarities (Baker & Trofimovich, 2005) between the L1 and L2 phonetic inventories, the age of acquisition of the L2, and the duration of exposure to the L2 influences the acquisition of L1 and L2 sound contrasts as well (Baker & Trofimovich, 2005; Bosch, Costa, & Sebastián-Gallés, 2000). It is said that young L2 learners have a better chance of creating L2 phonetic categories distinct from the existing L1 categories (Flege, 1995; Guion, 2003; Oh et

al., 2011). This implies that young EL2 learners can better establish new phonetic categories for English sounds (Bosch et al., 2000) so that less overlap between Setswana and English categories occur. If this happens, EL2 learners will be able to distinguish all (or more of) the vowels of English and therefore produce more native-like vowels. This will also assist phonologic awareness skills and subsequent literacy acquisition (Seeff-Gabriel, 2003).

Although it is generally accepted that early bilinguals (learning a L2 before puberty) can establish phonetic categories for the L2 sounds because the L1 does not influence the L2 that much (Baker & Trofimovich, 2005; Bosch et al., 2000; Kuhl, 2000), it is not always the case for all early bilinguals. Many early learners of a L2 still produce sounds heavily influenced by the L1 phonetic categories (Asher & Garcia, 1969; Baker, et al., 2008; Bosch et al., 2000; Flege, et al., 2006).

This is relevant to the long vowels of English as well: If a language does not contain short and long vowels that are phonetically distinct, L2 speakers of that language usually will not distinguish length, and will thus not discriminate between short and long vowels (Best & Tyler, 2007). L2 speakers therefore often assimilate contrasting L2 vowels (thus long vs. short vowels) into one vowel which is usually the one that occurs in the L1 (Tsukada, 1999).

No matter which approach to L2 acquisition is followed, the fact remains that the phonology of the L1 as well as that of the L2 play a role in the acquisition or learning process. This underscores the importance of L2 learners learning the phonology and sound system of the target language.

When children have to learn an additional language or even more importantly a second language, it is important for all stakeholders to be aware of the various aspects of language acquisition and learning. This awareness should inform second language syllabi as well as syllabi structuring literacy acquisition in the L2. Educators should be aware of the comparability in L1 and L2 acquisition especially. Although there are many similarities between L1 acquisition and L2 learning, there are

differences as well (Franson, 2009; Ipek, 2009; Saville-Troike, 2012). Some of the more prominent similarities and differences are briefly discussed below:

3.3.1.1 Similarities

3.3.1.1.1 Developmental sequence

The developmental sequence in L1 acquisition and L2 learning seems to be similar and Ellis (1994) suggests three stages of development; viz. the silent period, formulaic speech and structural and semantic simplification. During the initial period, the silent period, children acquiring their L1 as well as those learning a L2, all first listen to the language before they actually produce language.

Formulaic speech is chunks of speech, such as expressions, for example, which are used as the occasion requires (Lyons, 1968). According to Krashen (1982a) they can consist of routines (whole expressions memorised) - such as '*I don't know*' and patterns (partially unanalysed utterances with more than one possible token to be filled in) such as '*Could you tell me ...?*' These utterances can consist of entire scripts such as greetings, which are memorised, (Ellis, 1994).

Both structural and semantic simplification happen when sections of language are omitted from speech. Structural simplification happens when grammatical functional words such as determiners/articles and auxiliary verbs are omitted while semantic simplification implies that content words such as nouns and verbs are elided (Ipek, 2009). Ipek (2009) explains that there are two possible reasons why this simplification occurs. The first reason is that L2 learners have not yet acquired the required linguistic structures, while the second reason is that they cannot access the necessary linguistic structures during production of real-time speech.

3.3.1.1.2 Universal Grammar

According to Ellis (1994) Universal Grammar seems to influence language acquisition and learning. Some features of language are universal, meaning that they

are common to most languages. These universal features are labelled ‘unmarked features’ and are the features which learners tend to transfer from the L1 to the L2. The ‘unmarked’ features develop earlier and are easier to learn by both L1 and L2 learners (Ipek, 2009). ‘Marked features’ on the other hand, are intrinsic to a specific language and rules pertaining to these features are not governed by universal language principles. Such features are those that were borrowed from other languages; those that originated with the historical development of the specific language and those that cropped up accidentally (Ipek, 2009). It makes sense that such features are not readily transferred from one language to another and are more difficult to learn when learning a L2 (Davidson, 2011; Ellis, 1994; McLaughlin, 1987).

3.3.1.1.3 Order of acquisition

Research has attempted to establish whether there is an order of acquisition in acquiring grammatical morphemes or components (Krashen, 1982a). The order of acquisition seems to be similar in both the L1 and L2, although the findings concerning the sequence of acquisition are contradictory (Ipek, 2009). Concerning acquisition of morphemes or function words in the L1, Brown (1973) found a definite sequence for at least 14 functional words or morphemes in English as L1. These are prepositions, noun and verb inflections and articles. Teachers in the ELoLT classroom should be aware of this as L2 learners do not necessarily have the required knowledge of English morphemes. According to Lightbown and Spada (2006) studies show that question words – *why, what, where, who, when* and *how* – are acquired in the same way in the L1 and L2. Krashen (1982a) proposed his Natural Order Hypothesis in which he explains the order of L2 learning. This holds that the rules of a language are learned in a specific order, but not necessarily from the easier to the more difficult.

Although an order-of-acquisition could be suggested, inter-learner variability exists, meaning that not all L1 learners follow the ‘standard’ order of acquisition (Ellis, 1994). The inter-learner variability is dependent on gender, cognitive ability, social background and rate of learning and very importantly, the learner’s experience of

linguistic interaction. One can assume that these factors determine the rate and level of L2 skills as well.

McLaughlin (1987) claims that the learner's L1 influences the acquisition sequences when learning a L2. The L1 either slows the learning of the L2 or modifies it. He also states that inter-learner differences occur in the learning of a L2 and mentions that the differences are mainly due to different learning and communication strategies. These differences, according to McLaughlin (1987) make it difficult to determine the sequence of acquisition.

3.3.1.1.4 Input

Input is of extreme importance in the acquisition of the L1 and the learning of the L2 (Bialystok & Hakuta, 1999; Genesee & Nicoladis, 2009; Ghazali, 2006; Jordaan, 2011a; Krashen, 1982a; Lane & Molyneaux, 1992; McLean & Snyder-McLean, 1999; Owens, 2012). Richards, Platt and Weber (1989, p. 143) define input as the contact that learners have with language – usually by hearing it – from which they can learn. Both the Behaviourist and Interactionist views of language acquisition and learning maintain that input is central to this process. A child needs high measures of comprehensible, simplified but nurturing input from the environment in order for him/her to acquire the L1 as well as learning a L2.

According to the Interactionist approach to language acquisition and learning, input via interpersonal communication is of the greatest importance because it is modelled according to the need and level of language skills of the L2 learner. Impersonal input from the environment, such as radio, television and computer games are inadequate, according to Krashen (1982a). Saville-Troike (2012), however, mentions that although face-to-face interaction facilitates language learning, language learning is not impossible without it. The consolidation of acquired or learned language skills, however, only truly takes place through frequent interaction with L1 speakers of that language.

The importance of comprehensible and well-modelled English input in the South African classroom can therefore not be stressed enough. Should the learner not comprehend the input he/she receives, the development of the learner's language skills will be negatively affected, and needless to say, the academic content of the lesson will be lost to him/her.

3.3.1.2 Differences

The major differences between language acquisition and language learning are the following:

3.3.1.2.1 Acquisition versus learning

The first difference between acquisition and learning is that acquisition is an unconscious, informal, implicit learning process, while learning a language is a conscious and often formal process, involving explicit learning of the target language (Krashen, 1982a). Krashen (1982a) argues that learning does not become acquisition at some stage, but that acquisition may occur within an environment of meaningful interaction where communication is emphasised by means of interactional devices such as dialogues and role playing. This then implies that time should be allocated to such meaningful activities in the school syllabus.

3.3.1.2.2 Exposure and input

Harmer (2005) states that one of the areas where the greatest dissimilarities between L1 acquisition and L2 learning are noted, is exposure to the target language. High frequency input and regularity are necessary for the development of language. During the process of L1 acquisition, the child, in normal circumstances at least, is exposed to high levels of verbal input from the environment continuously through-out the day. This facilitates language acquisition (Owens, 2012). The L2 learner on the other hand, does not receive the same amount of exposure to the target language. In the South African context, it is often only when the African language L1 child starts pre-school or perhaps even school, that he/she is exposed

to high levels of English input during the day. Although this advanced exposure will accelerate language learning, it still amounts to a lot less exposure to the target language compared to L1-speaking learners who were exposed to English since birth every day, for the whole day.

Input that takes place when the child is exposed to language is of immense importance in both L1 and L2 development (Bialystok & Hakuta; 1999; Genesee & Nicoladis, 2009; Ghazali, 2006; Jordaan, 2011a). In a nurturing environment a child receives high levels of input, 'tailor-made' to his/her developmental levels, which facilitates the process of language acquisition, that in turn enhances cognitive development (Krashen, 1982a; Owens, 2012). The L2 learner, however, frequently receives input in the target language that is not modelled according to his/her language development level. This hampers language learning because it results in incomprehension and stress, which raises the affective filter, inhibiting learning.

Very often, the quality of the L2 input is not of a high enough level to facilitate development of cognitive academic language proficiency (CALP) before the learner needs to use those academic language skills in the classroom. This results in the learner not having sufficient high-level language skills to deal with academic content and assessment requirements (Seeff-Gabriel, 2003). More often than not, teachers themselves are L2 speakers without sufficient language skills to act as good language models as discussed in Chapter 2, Section 2.5.3.1 (Nel, 2004; Nel & Müller, 2010). Low-level language skills are thus perpetuated since the learner's language skills do not benefit sufficiently from the input received from the teacher. The situation is not much better outside the classroom since the input received from the media and other L2 speakers in the child's environment is frequently not rich enough to enable the learner to develop the extensive vocabulary needed in the academic environment (Paradis, 2009).

Concerning the input these English L2 learners receive on the sound system and phonology of English, one can state that these children are probably more exposed to Black South African English (BSAE) than to other dialects of English. This variety of English does not distinguish all the vowel phonemes of English, due to the

influence of the smaller vowel systems of the African languages as discussed in Chapter 4, Section 4.4.2.1 (Bekker, 2009). Seeff-Gabriel (2003) points out that the inability to discriminate between various vowels of English leads to meaning loss, which affects the learning process.

3.3.1.2.3 Age

Much research has been done on whether the age at which a person starts to acquire or learn a language influences the process (Bialystok & Hakuta, 1999; Birdsong, 1992; Burstall, 1975; Collier, 1988; Cummins, 2000; Flege, 1981; Ghazali, 2006; Harley, 1986; Harmer, 2005; Ipek, 2009; Lenneberg, 1967; Long, 1990; Owens, 2012; Riney, 1990; Saville-Troike, 2012; Singleton, 1995; Yule, 2010). The general belief amongst non-professionals and linguists alike is that children are better at learning a new language while adults struggle to learn it (Ghazali, 2006). This belief is supported by the Critical Period Hypothesis (CPH) (Lenneberg, 1967) which proposes that there is a period during the development of a child when he/she is sensitive for language acquisition and/or language learning. Ellis (1994) mentions that a speaker can achieve native-like (pronunciation) ability during the critical period. When this period has passed, a person will no longer learn a language as easily and unconsciously as during that period. There are various views concerning this hypothesis - differences of opinion exist concerning the commencement of this period, the duration of the period, whether it should rather be termed a 'sensitive period' or whether such a period exists at all. Some sources such as Lenneberg (1967), Burstall (1975), Flege (1981), Harley (1986), Long (1990), Riney (1990), Singleton (1995), Owens (2012), Yule (2010) and Birdsong (1992) deal with this issue.

The sensitive or critical period for language acquisition, according to various sources such as Long (1990), starts to 'close' from six years to puberty (Flege, 1981). Owens (2012) states that the pre-school years have therefore been viewed as the critical period for language learning. According to this view, when L2 speakers of English thus enter the school system at six or seven years of age, the sensitive period for language acquisition is already either closing or has already closed. Concerning the

acquisition of the phonemes of a second language, one can therefore assume that, as a child matures, and the sensitive period for language acquisition draws to a close, it becomes more difficult to extend the phoneme inventory of not only the L1 repertoire, but also that of the second language (Harmer, 2005). Therefore, in order to facilitate the necessary expansion of the phoneme inventory of the L2 learner, the sounds of the target language should be taught to the L2 learner during the early foundation phase. Since the vowel systems of English and Setswana differ to a large extent, English L2 learners should be taught the different vowels and diphthongs of English as early as Grade R.

3.3.1.2.4 Motivation

The reason or motivation for acquiring one's L1 differs from that for learning a L2. When acquiring one's L1 the motivation is to communicate, to elicit positive response from the people in the environment and to be part of the society. Although this may seem a lot to achieve, it happens unconsciously and informally without pressure from the environment. When acquiring or learning a L2 in a more formal setting such as pre-school or school, the motivation is also to 'survive' in the society in which one finds oneself, but it is now a more conscious process. In addition to the new environment in which the child finds him/herself, the language is new as well. Coupled with the need to learn the language in order to survive in the academic and new social environment, is a higher stress factor that may function as a stimulus, but may also raise the affective filter (Krashen, 1982a). The learner, however, should also be motivated by stakeholders in the environment, such as the teachers and parents to learn the target language. According to Howie et al. (2012) parental support and expectation play an important role in motivating the child to learn to read as was mentioned in Chapter 2, Section 2.5.2. This can be expanded to motivating a child to become proficient in the language of learning and teaching because of the negative implications a lack of skills in the target language has for academic achievement.

3.3.2 The development of language

Owens (2012) notes that by the age of five years (thus Grade RR or Grade R pre-school) the child has mastered almost all the phonemes of his/her first language and has mastered about 90% of the grammar of that language. However, many children and especially children from a stimulation-poor environment may take longer to acquire these skills (Owens, 2012). This should be taken into consideration when language syllabi are developed, especially in South Africa where many learners are from a stimulation-deprived environment.

Referring to language development at the age of six, Owens (2012) explains that Grade 1 is a time of stabilisation of existent language rules as well as the learning of new rules. This refers to the ideal situation of a child in a classroom where learning and teaching take place in his/her L1. He also states that by the age of 12 (thus Grade 6 - 7) the child has acquired many (but not all) of the cognitive and linguistic skills of an adult. Once again, this refers to a child learning through his/her L1. Since the period of maintenance of rules of the L1 is probably impeded in Grade 1 or Grade R by the introduction of English as LoLT, one can question the quality of or the effective transfer of L1 structures to the second language, which is a normal process in second language learning (Anderson, 2004; Chen et al., 2004; Hecht & Mulford; 1982). This focuses the attention on the need for the maturation of the mother tongue as discussed in Chapter 2, Section 2.5.2.

Since language development is related to cognitive skills (Owens, 2012), the question arises whether learners, not speaking English as a L1, are being disadvantaged in an English L1 learning and teaching environment. The answer could be 'Yes' (Alberts, 2012; Nel, 2004; Prinsloo & Heugh, 2013; Roodt, 2002; Vermeulen, 2001). If the LoLT is not successfully (and one can add here *very quickly*) mastered – according to McWilliam (1998), this means that the English language skills of L2 speakers of English should match those of L1 speakers of English – sufficient language skills may not exist to support comprehension and inference which are necessary for cognitive development and academic achievement (Nel, 2007; Rees, 2000; Seeff-Gabriel, 2003). Since learning takes

place via a L2 in many instances in the foundation phase in South African schools, the utmost importance of the optimal development of the L2 should therefore also be noted.

3.3.3 The acquisition of the phonology of the L2

Concerning the acquisition of phonetic and phonemic language skills, Owens (2012) explains that the child needs perceptual skills to discriminate between phonemes of a language and to process the speech sound sequences, which form part of the phonological structure of a language. Although an infant is capable of distinguishing every contrasting phoneme found in human language, this ability is lost by the time the child is one year old (Owens, 2012). This happens because the child focuses on his/her L1. The older child, who comes into contact with a L2, must therefore be made aware of the 'new' phonemes, i.e. those that do not exist in his/her L1 and those that are similar to the L1 sounds, but not identical. The learner should therefore receive instruction concerning speech processing of the L2. This issue forms the core of this study.

Stackhouse and Wells (1997) proposed a model according to which speech processing can be explained in terms of input and output processing. Davidson (2011) confirms the applicability of this model by stating that research has shown that the speaker's ability to distinguish between L1 and non-native sounds, or between two non-native sounds, influences his/her ability to produce these sounds. Flege (1995, p. 238) claims that "without accurate perceptual 'targets' to guide sensori-motor learning of sounds, production of the L2 sounds will be inaccurate." Accurate perceptual input thus functions as a production model for L2 speakers.

Research has shown that the phonology of the L1 influences the acquisition of the phonology of the L2 (Altemberg & Vago, 1983; Bohn, 1995; Broselow, Chen, & Wong, 1998; Cenoz & Garcia, 1999; Eckman, 1977; Eckman, 1981; Ellis, 1994; Flege, 1992; Gass & Selinker, 2008; Lado, 1957; Major, 2001; Paradis, 2009). Gass and Selinker (2008) mention that this influence can be seen as *transfer*, either positive (also known also as facilitation) or negative, which is then seen as

interference. Paradis (2009), referring to Flege’s Speech Learning Model, states that the phonetic system of the L1 is the point of departure for L2 speech development. Children were found to be more accurate in the production of phonemes present in both languages than in those present only in the second language.

Interference by the L1 phonological repertoire means that L2 learners of English tend to process segmental and supra-segmental aspects of English in terms of the categories of the L1 (Flege, 1979; Garcia Lecumberri, 2001; Leather & James, 1991; McCarthy, Evans, & Mahon, 2013; Seeff-Gabriel, 2003; Strange & Jenkins, 1978). According to various researchers, phonological representation development commences at a very early age (De Boysson-Bardies, Sagart, & Durand, 1989; De Boysson-Bardies & Vihman, 1991; Levitt, Utman, & Aydelott, 1992; Owens, 2012; Seeff-Gabriel, 2003). During this crucial, primary developmental stage of the L1 phonological system, a child raised in an African language environment acquires a vowel inventory of five to eleven vowels while his peer in an English L1 environment should acquire an inventory of 20 vowels and diphthongs. Compare the vowel charts of Setswana and English below:

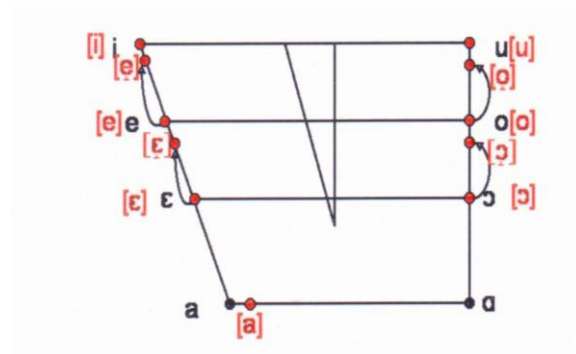


Fig. 3: The vowels of Setswana (Snyman, 1989, p. 58) (See a more detailed discussion of Setswana vowels in Chapter 4, Section 4.5).

Key: The arrows indicate vowel raising with the raised vowels being indicated with the diacritic [˥] on the vowel chart.

Symbols in red are the vowel symbols used to depict the vowels of Setswana.

Symbols in black are the symbols used to depict the cardinal vowels.

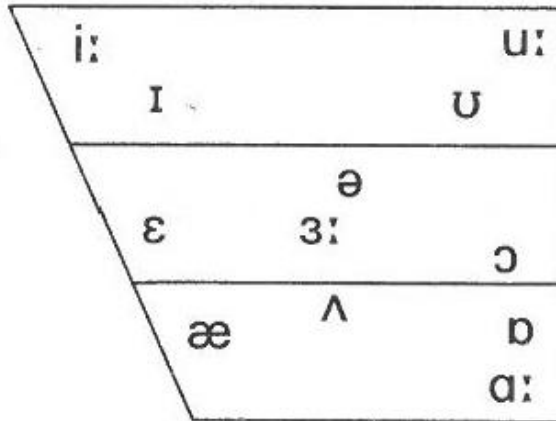


Fig. 4: The monophthongs of English (RP) (davenport & Hannahs, 1998, p.52).

The vowel systems of Setswana, the standard variety of South African English viz. White South African English (WSAfE) (Bekker, 2009), and BSAE will be addressed in detail in Chapter 4 of this study because of its critical importance in the acoustic analyses presented in Chapter 6.

Seeff-Gabriel (2003) explains that L2 learners of English in ELoLT classrooms have trouble perceptually distinguishing the different English vowels and in producing all these vowels successfully because of the interference of the L1 vowel system. Lanham and Traill (1965 as cited in Lanham, 1982, p. 342) mention the following interferences as “variables in pronunciation” (Seeff-Gabriel, 2003, p. 295) of the vowels of BSAE:

- No long-short contrast in vowel nuclei:
Short vowel [ɪ] as in ‘tick’ is lengthened to [i:]: thus sounds like ‘teak’
- No schwa quality vowel:
Vowel [ə] or [ɜ] as in ‘bird’ is pronounced as [ɛ]: thus sounds like ‘bed’
- No [æ] versus [ɛ] opposition:
Vowel [æ] is pronounced as [ɛ] as in the word ‘mat’: thus sounds like ‘met’

- No [ɑ:] versus [ʌ] opposition:

Vowel [ɑ:] in 'march' is pronounced as [ʌ]: thus sounds like 'much'

Because of the difference in vowel systems of the L1 and the L2, the L2 learner within the environment of ELoLT very often has poorer phonological awareness and discrimination skills as well as pronunciation skills of the L2 vowels when entering pre-school or primary school.

Transfer of phonological skills from the L1 to the L2 happens as well. Bada (2001) suggests, following a study of the influence of Japanese (L1) on the production of English sounds by Japanese learners, that some sounds were found to be troublesome and the problems attributed to the L1, while other sounds were produced with much less difficulty due to the already-present L1 phoneme inventory. The phoneme inventory of one's L1 may be an asset in the case of some sounds occurring in both English and Setswana, for example aspirated plosives. As Setswana makes use of aspirated plosives in initial word positions (inter alia), L2 speakers of English should not struggle to articulate the aspirated plosives in words such as [k^hæt] (cat). While doing a perceptual analysis of the recorded words used in this study, it was found that all Setswana L1 participants produced the aspirated plosives in English perfectly, showing that transfer could enhance the acquisition of the L2 phonology. Transfer from L1 to L2 seems to be short-lived, however, according to Anderson (2004), and inter-language patterns which develop as an 'intermediate' language due to transfer, do not become part of the L2 inventory and structure. The transfer of existing phonological knowledge, however, is essential at the time, as it provides a 'stepping stone' for L2 learners in the process of acquiring the phonological skills in the new language (Anderson, 2004).

In South Africa, the problem of poor English vowel perception and discrimination by English L2 learners influences these learners' English language proficiency. In addition, many English L2 learners are often taught by English L2 staff, many which also experience problems with successful discrimination between and articulation of the various English vowels. The occurrence and results of phonological and

pronunciation errors are especially important in the South African school environment where English as LoLT is the L2 of many learners.

3.3.4 Developing phonological awareness in the second language

Researchers such as Anthony and Francis (2005) and Ziegler and Goswami (2005) state that the progression of phonological awareness development appears to be parallel when comparing most of the alphabetic languages, while the rate of development and level of aptitude reached by children vary. According to Yeong and Liow (2012) the reason for this inconsistency is the dissimilarities in the characteristics of the children's oral language. Children whose first language is a language with a relatively simple syllabic structure and consistent, well-marked syllable boundaries tend to develop more sophisticated syllable awareness earlier than children who speak English (Demont & Gombert, 1996; Durgunoglu & Oney, 1999; Liberman et al., 1977). The less complicated the phonological structure of the language, the less sensitive to phonemic awareness the child seems to be (Anderson, 2004; Caravolas & Bruck, 1993; Chen et al., 2004; Durgunoglu & Oney, 1999; McBride-Chang, Tong, Shu, Wong, Leung, & Tardif, 2008; Yeong & Liow, 2012). This could apply to Setswana L1 learners in the ELoLT environment. Setswana, in contrast to English, as has been mentioned in Sections 3.2.2.3 and 3.2.4.2.5, has a consistent, open syllabic structure, which means that the Setswana-speaking English L2 learner may not have developed sufficient phonological awareness skills pertaining to syllable structure to cope with the more complicated structure of English.

The same conclusion can be drawn concerning the difference in size of the vowel inventories of Setswana and English (cf. pp.90, 91; Chapter 3) Another discrepancy between the vowels of English and Setswana is that while English distinguishes long monophthongs, Setswana does not. Length or duration in the African languages falls on the vowel of the penultimate syllable of words. Setswana speakers therefore very often do not distinguish the long English monophthongs. This means that the Setswana L1 learner has developed less sophisticated phonological awareness skills

concerning discrimination between vowels and none whatsoever concerning diphthongs which do not occur in Setswana (Seeff-Gabriel, 2003).

3.4 The importance of literacy instruction

Before the question of what to teach is addressed, it is important to mention when literacy instruction has to start. The process of literacy acquisition starts long before the child enters school when he/she acquires the rules of his/her first language and becomes familiar with the idea of language in printed form (Cunningham et al., 2009; Trehearne, 2011; McGinty & Justice, 2009). In ideal circumstances, literacy instruction therefore starts much earlier than even pre-school.

Concerning structured literacy instruction, various researchers indicate that pre-school is the period to start teaching literacy skills and not Grade 1 (Lessing & De Witt, 2005; Stuart, 1999; Trehearne et al., 2004). Many learners in South Africa enter the foundation phase of school in Grade 1 and not Grade R when literacy instruction should start. Sadly, however, learners who do attend Grade R are often not equipped with the necessary early literacy skills. Lessing and De Witt (2005) report on a study conducted by them to determine to what extent Grade R English L2 learners in South Africa mastered these skills indicates that most of the participants lack adequate skills necessary for early literacy development. Quality instruction, started early and offered in a structured way, is therefore once again of great importance.

Various researchers propose the teaching of literacy skills during Grade R in order to prepare the young learners for more formal literacy instruction in Grade 1 (Lessing & De Witt, 2005; Moats, 2007; Stewart, 2004; Trehearne, 2011; Trehearne et al., 2004; Wasik, Bond, & Hindman, 2006). These skills can be summarised as follows in Table 5 on the next pages:

Table 5: Literacy skills that should be taught during the early school-years

Cognitive and comprehension skills

- Learners have to develop cognitive and comprehension skills to learn deliberately.
- New information has to be linked to existing knowledge to facilitate learning.

Literacy concepts

Learners must be taught:

- The purpose of reading and writing
- The fact that oral language can be represented by symbols in written language
- The direction in which we read and write
- To print most letters him/herself and to recognise his/her name in print

Behaviours and attitudes

- Positive behaviour and attitude towards reading and print is of extreme importance
- Young learners should see themselves as readers and writers as this will motivate them for literacy acquisition
- Parents have to be partners in the literacy acquisition process and motivate and support children
- Success breeds success

Phonological and phonemic awareness skills

Learners should understand that spoken words consist of sound segments

They must be taught:

- The correct sound value of each phoneme, especially the vowels of English via clear and consistent articulation by the teacher
- Awareness that English contains more vowels than the L1. Some of the vowels are similar, some are completely different
- Rhymes: rhyme, onset-rime identification, alliteration
- Syllable awareness and identification
- Phoneme identification: (same sound in different words) /p/ in *pie*, in *ship*, in *up*
- Phoneme isolation: (recognise sound in word) /m/ in *man*
- Phoneme categorisation: (recognise sound that does not belong in group of words) *bun*, *bus*, *rug*, *bug*
- Phoneme blending: (blending spoken sounds into words) /p/ + /o/ + /t/ = *pot*
- Phoneme segmentation: (segmenting a word into sounds) *pot* = /p/ + /o/ + /t/
- Phoneme deletion: (recognising what word remains when a sound is deleted)
Smile becomes *mile* when the /s/ is deleted



Phonic Skills

Linking sounds to letter symbols and combining them to make words

- Decoding regularly spelled real words
- Applying phonemic awareness skills to assist with deep orthography and inconsistent vowel phoneme-grapheme coupling of English
- Reading nonsense words
- Reading words with irregular spelling
- Spelling words
- Comprehending text read silently or orally
- Reading text aloud accurately

Fluency

Reading with speed, accuracy and expression with comprehension

- Guided repeated oral reading
 - Repeated reading
 - Neurological impress
 - Paired reading
 - Shared reading
 - Assisted reading
- Independent silent reading
 - Sustained silent reading
 - Drop everything and Read, Accelerated Reader
 - Various incentive programmes

Comprehension:

Understanding word meanings and word relationships

- Explicit instruction in vocabulary: word meanings and definitions
 - Pre-teaching
 - Analysis of roots of words
- Implicit instruction through exposure to words during reading and use of multimedia methods
- Practice to increase capacity and association of meanings to new words
- Explicit instruction in other oral language skills such as syntax and morphology

Create a rich language environment in class and exposure to books

Note: Adapted from International Reading Association (2002)

http://www.reading.org/Libraries/Reports_and_standards/nrp_summary.sflb.ashx

Various researchers such as Moats (2007), Stuart (1999), Phillips et al. (2008) as well as Trehearne (2011) support such a programme.

3.5 Suggestions as to how to teach phonological awareness and oral language skills

Adams et al. (1998) as well as Trehearne et al. (2004) suggest a comprehensive curriculum for phonological awareness teaching during pre-school. They suggest that the curriculum includes oral games, for example, which the learner should experience as fun. Oral games encourage good listening skills, which is crucial in the educational environment of the classroom. In addition, oral games make the learner aware of rhyme and let him/her actively take part in rhyming activities. Lonigan (2007), Stewart (2004), and Lundberg, Frost and Peterson (1988) indicate that rhyme is an important aspect of phonological awareness and one that should not be assumed to be established by the time the child enters pre-school. Rhyme relies on the fact that words that rhyme share the same rime. Rhyme activities can therefore make the young learner more aware of the sounds of the target language (Stewart, 2004; Trehearne et al., 2004).

In addition, oral games stimulate the awareness of syllables forming a word (Adams et al., 1998; Lundberg et al., 1988; Trehearne et al., 2004). While pronouncing words, learners can clap the syllables. This strengthens the awareness of words consisting of various syllables (Lundberg et al., 1988). Syllable awareness or recognition is crucial as it lays the foundation for the more sophisticated skills of blending and segmentation. Stewart (2004) suggests that nursery rhymes should be taught with emphasis on onset-rime awareness that enhances the learner's ability to isolate specific phonemes. Researchers like Kirtley, Bryant, MacLean and Bradley (1989) and Stewart (2004, p. 36) suggest that alliteration activities will help learners to identify the onset and rime of words, e.g.

Jack and Jill (What sound is the same in 'Jack' and 'Jill'?)
Went up the hill (What sound is the same in 'Jill' and 'hill'?)

Stewart (2004) mentions that the poetic devices of alliteration, metre and rhyme assist in the development of listening skills and phonological awareness. Since these devices are present in nursery rhymes and songs, curricula should make use of these enjoyable and fun materials.

Another aspect of phonological awareness training is that of pronunciation modelling. Phillips et al. (2008) state that clear and consistent articulation by the teacher is one of the most important aspects of training learners in phonological awareness skills. They refer to the inconsistent phoneme-grapheme coupling of English vowels to illustrate the importance of this aspect. This is relevant in the South African context where many teachers themselves are English L2 speakers and do not always model the articulation of English vowels correctly (Nel & Müller, 2010). The teacher's inability to distinguish between various vowel phonemes of English will have an impact on the instruction of phoneme-grapheme coupling as well.

A very important aspect of phonological awareness training is the time spent on it. Trehearne et al. (2004) state that phonological awareness instruction should take place throughout the school day. They suggest that phonological awareness training should therefore be embedded in the daily reading and writing activities as well. This will ensure that learners have consistent opportunities to discover the nature of how sounds work to form words in the target language. This means that although some of the activities do not entail formal phonological awareness instruction, the young learner is still learning via fun activities and active participation.

Concerning the South African context, the CAPS First Additional Language indicates no time allocated to Reading and Phonics in Grade R (Government of South Africa, 2011b). This is surely a deficit in the syllabus as phonological awareness should be taught during pre-school as gleaned from the research of many scholars mentioned here. In addition to the fact that the young learner is ready to learn more sophisticated phonological awareness skills during the pre-school year, many learners change from L1 instruction to English LoLT in Grade 4. This means that they possibly do not have the same level of phonological awareness (and oral language) skills concerning English that English L1 learners have. The syllabus

allocates only 1 hour and 15 minutes weekly to Reading and Phonics in Grade 1; and 1 hour and 30 minutes weekly in Grades 2 and 3. If this time allocation is measured against that proposed by researchers like Trehearne et al. (2004) and Trehearne (2011), it seems to be insufficient to allow young learners to acquire the necessary literacy skills.

In the Home Language syllabus seven to eight hours per week maximum are allocated to language instruction in general in Grade R. Five hours per week are allocated to Reading and Phonics in Grades 1-3. Once again, time allocated to the crucial aspect of literacy acquisition seems insufficient, especially when comparing it to the suggestion of Trehearne et al. (2004) who state that phonological awareness training must be embedded in all activities through-out the school day, from as early as Grade R.

Chiang (2003) draws attention to the very important link between perception, production and phonological awareness. He states that perception and production are equal and essentially interactive. This means that any programme focussing on phonological awareness training should commence with aural discrimination of the sounds of the target language (Flege, 1979; Jones, 1972a). Teachers in the ELoLT classroom should make learners aware of the auditory differences amongst the English vowels and diphthongs and assist them through articulation training to produce these sounds. Articulatory exercises will familiarise the learner's articulatory apparatus with the new movements required by the target sounds. The teachers themselves, however, should be made aware of these differences and should see to it that they model their articulation accordingly in order to be good language models. Jones (1972a), however, acknowledges that this training may not have permanent results on the learner's articulation as it may occur that the articulation regresses to the original under certain conditions. However, in the South African context where English is widely used and the child can be described as 'immersed' in the language during the school day, one can reason that the results could be permanent, at least in the more formal classroom-environment. This, however, depends on the language model that the teacher presents to the class.

Concerning the teaching of oral language skills, storytelling is suggested as an effective and enjoyable activity that should be employed to teach oral language. Lessing and De Witt (2005) state that storytelling serves as a bridge between oral language and reading. The development of early literacy skills and therefore vocabulary are enhanced by listening to stories and the discussions around these stories.

3.6 Summary

While language acquisition is an innate ability, literacy acquisition is a learned skill. Although literacy acquisition is based on decoding skills, it entails much more: a child becoming literate needs cognitive skills such as problem solving, planning and execution skills as well as good oral language skills.

Literacy acquisition is said to start at birth and is enhanced by exposure to good oral language models and input from a stimulating environment. Such an environment includes the availability of printed materials to enrich the child's vocabulary and grammatical skills and to stimulate the child's awareness that oral language can be coded into print. In households with low SES, young children are usually not exposed to a print-rich and stimulating environment. Learners then enter school with insufficient pre-literacy skills such as a lack of vocabulary and the awareness that speech can be coded into print. Such deficits will inhibit the development of oral language abilities and literacy acquisition.

Decoding of words is seen as a primary component of reading acquisition, especially during the early stages. In order for the young learner to decode words successfully, he/she must have good phonic skills that depend on phonological awareness skills. Phonological awareness development is comparable to age. It is also related to working memory.

Spelling skills form part of literacy ability and relies heavily on phonological awareness, alphabetical knowledge and phoneme-grapheme coupling knowledge. It is therefore obvious that the orthography of the target language plays an import role

in phoneme-grapheme coupling skills. Languages with a transparent sound-to-letter coupling system enable spelling, while languages like English with an opaque orthography make it more difficult for learners to acquire the required skills.

Another component of reading acquisition is that depending on the various oral language skills. Of these, vocabulary skills are extremely important for reading comprehension and fluency. Oral language skills, except perhaps vocabulary skills, are seen as contributing more to the literacy acquisition process during the later stages of reading than during beginning reading.

When investigating the influence of oral language on literacy acquisition, language acquisition has to be addressed as well. The ability to acquire language is seen by many as either innate (Nativist approach) or acquired through interaction with the environment (Behaviourist approach). A more eclectic approach (Constructivism) recognises the influence of innate language abilities and the contribution by the environment to shape and enhance these natural capabilities.

Second language acquisition can also be referred to as *language learning* as it is usually a more conscious process which entails more formal instruction than the acquisition of a first language. Although there are differences in the acquisition of the L1 and the L2, there are similarities as well. The main difference is seen as the amount of exposure and input that the language learner experiences. The child acquiring his/her first language is normally exposed to good quality language input through-out the day. The L2 learner, on the other hand, does not necessarily have that high amount of exposure or quality of input. Researchers believe that aspects of language acquisition such as the developmental sequence, Universal Grammar and the order of acquisition are similar in both L1 and L2 acquisition.

Theories attempting to explain the process of second language acquisition agree that the sound system and phonology of the first language influence the acquisition of a second language. Both transfer and interference occur in second language acquisition. Interference is clearly noticeable in the vowel inventories of Setswana L1

– English L2 speakers where the extensive vowel inventory of English is reduced to be more in line with the smaller inventory of Setswana.

Language proficiency includes academic language skills or CALP. Academic language proficiency has an influence on the educational process, as was shown by various researchers. CALP requires higher order cognitive skills, a certain level of language proficiency and adequate vocabulary. BICS on the other hand, are defined as conversational fluency and do not provide the learner with sufficient language skills to function in the academic environment.

Reading acquisition in a second language is similar to reading acquisition in the first language. Pertaining to the target language, the second language learner frequently, however, does not have the same phonological awareness skills and vocabulary that the first language learner has. This results in the L2 reader often being not such a skilled reader. In order to rectify the lack of sufficient literacy skills, young learners need explicit teaching of the necessary skills from as early as Grade R in the foundation phase.

Researchers state that the required literacy skills are cognitive and comprehensive skills, symbolic representation and phonological awareness skills, oral language skills and skills pertaining to literacy concepts. The behaviours and attitudes of the young learner are of importance as well. Teachers and parents alike could contribute to positive attitudes and behaviours concerning literacy acquisition. For the purpose of this study, the focus is on the teaching of phonological awareness skills rather than on the other skills mentioned. Research indicates that rhyming activities contribute to phonological awareness in the sense of sensitising the learner to the sounds of the target language and should therefore be included in a foundation phase teaching programme. Fun activities teaching the syllable structure of the target language should also be part of such a programme. Syllable awareness forms the basis for the more sophisticated phonological awareness skills of segmentation and blending, which is required for reading and spelling. Researchers indicate that young learners need good vocabulary skills and knowledge of the other aspects of grammar as well. This will not only enhance his/her literacy abilities such as

comprehension, but facilitates his/her abilities to follow oral instructions, process the information received from the teacher, and to express his/her thoughts and ideas.

In the next chapter, the acoustic concept of the vowel space and the parameters thereof will be addressed. The vowels of WSAfE, BSAE, and the vowels of Setswana will be discussed. This discussion will provide background information for the presentation of the results of this study in the following chapters.

Chapter 4

Vowel quality, vowel space and the vowels of standard South African English and Setswana

“vowel: [vaʊəɪ] n: (Phonetics & Phonology) *phonetics* a voiced speech sound whose articulation is characterized by the absence of friction-causing obstruction in the vocal tract, allowing the breath stream free passage. The timbre of a vowel is chiefly determined by the position of the tongue and the lips”, (Collins English Dictionary, 2014).

4.1 Introduction and objectives

In the previous chapters statements were made pertaining to the fact that second language learners very often experience problems with language and literacy acquisition. It was also stated that the extensive vowel system of English, compared to the more limited system of the African languages, frequently creates discrimination and articulation complications for young EL2 learners in an ELoLT environment. In order to alleviate these complications, EL2 learners should be taught to perceptually distinguish and correctly articulate the vowels of English as mentioned in the previous chapters. The results of the research project investigating the influence of such intervention will be discussed in Chapter 5.

With the main focus of the thesis being on an acoustic comparison of the vowel spaces of EL2 learners before and after intervention, it is necessary to discuss the themes of vowel quality and vowel space in this chapter. This will then serve as a basis for the presentation and discussion of the acoustic results in Chapter 5. In addition to an acoustic background sketched in this chapter, it is necessary to investigate the vowel systems of the languages involved. Therefore, an overview of the vowels of Setswana and the standard variety of English, viz. White South African English (WSAfE) (Bekker, 2009) will be presented here.

In addition to the standard variety, however, various other forms of English have developed in South Africa as well; Black South African English (BSAE) being one of

these. The majority of the EL2 participants in this study come from a BSAE background. This variety of South African English (SAE) is therefore briefly discussed in this chapter as well.

The discussion of the vowel systems of WSAfE, BSAE and Setswana should serve to illuminate the problems young EL2 learners have concerning phonological awareness and knowledge of the vowel system of ELoLT as discussed in Chapter 3.

4.2 Vowel quality and vowel space

The term ‘vowel quality’ can be defined as the characteristic resonance of a vowel that constitutes the specific ‘character’ of that vowel (Crystal, 2008). The resonance that is generated during the articulation of a vowel sound depends on the size and shape of the vocal tract at the moment of production. These dimensions are mainly determined by the position and shape of the tongue and lips (Bekker, 2009; Ladefoged & Maddieson, 1996; Ladefoged & Johnson, 2011; Rietveld & Van Heuven, 2009). The various articulatory movements of these organs of speech gave rise to a system of classification of the vowels. This system classifies vowels from high to low, according to the vertical movement of the tongue; front to back, according to the horizontal movement of the tongue; and rounded or unrounded according to the shape of the lips (Ladefoged & Maddieson, 1996; Ladefoged & Johnson, 2011; Van Wyk, 1979).

These dimensions were used in the design of the cardinal vowel system by Daniel Jones (Bekker, 2009; Ladefoged & Johnson, 2011; Van Wyk, 1979). The cardinal vowels are a set of standard reference points having known acoustic qualities (Jones, 1934) according to which the vowels of a language can be identified and are depicted on the traditional vowel chart or vowel quadrilateral (Crystal, 2008). The position of a vowel on the vertical axis of the vowel chart signifies the degree of constriction of the tongue while the horizontal position indicates the place of constriction (Fourakis, Botinis, & Katsaiti, 1999; Rietveld & Van Heuven, 2009). Lip-rounding is represented by an additional symbol to each vowel on the vowel chart: the symbol on the left signifies the unrounded sound, while the symbol on the right

represents the rounded variant (Bekker, 2009). Thus, for example, in the extreme top left-hand position on the chart the vowels [i] and [y] appear, both representing the same vertical and horizontal modification of the tongue. The vowel [y], however, is articulated with lip-rounding, while [i] is unrounded. Below, the cardinal vowels appear on a traditional vowel chart:

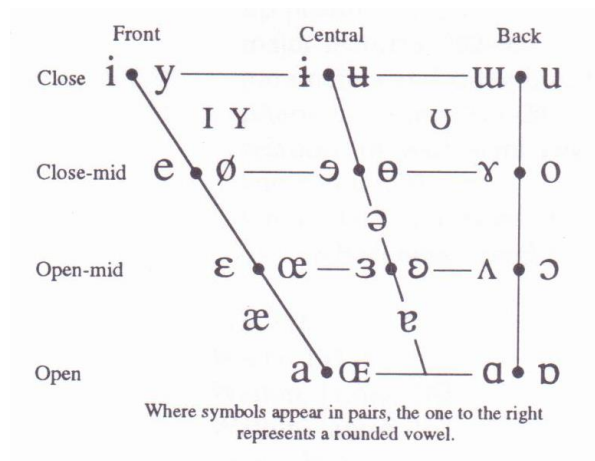


Fig. 5: The cardinal vowel chart (primary and secondary cardinal vowels) (Ladefoged & Maddieson, 1996, p. 426).

Although it is common to describe the articulation of a vowel by referring to the horizontal and vertical movement of the tongue and thus position the vowel accordingly on a vowel chart, Bekker (2009) and Ladefoged and Johnson (2011) state that this traditional vowel chart more precisely represents an acoustic-auditory vowel space than an articulatory one. Ladefoged (2001), referring to the method of describing vowel quality as a result of lingual modification versus describing vowels in terms of their acoustic properties, explains that early phoneticians believed that they were describing the highest point of the tongue, but were in fact describing formant frequencies .

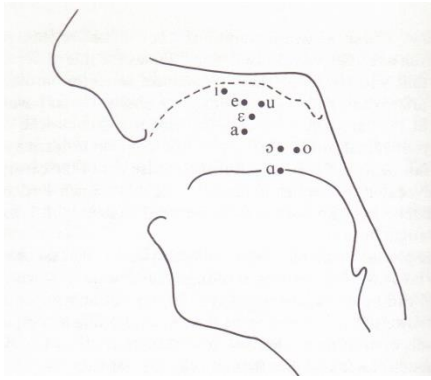


Fig. 6: Cardinal vowels positioned according to lingual behaviour (Ladefoged & Johnson, 2011, p. 221).

Describing vowel quality in terms of lingual modification is not without merit, however. Although Catford (1988) agrees that a reference point such as the 'highest point of the tongue' is just that, he reminds readers that lingual modification will result in specific articulation: if a speaker produce the correct lingual arrangements, the correct speech sound will follow. This is in line with the use of the Helmholtz resonator, for example, to explain how lingual and labial movement influence the resonating cavities during vowel articulation and as a result determine the formant frequencies of the vowels. (See Section 4.3.2.3 for a detailed explanation on the Helmholtz resonator.)

The vowel space is delimited by the vowels which occupy the most extreme positions during articulation. According to the position of cardinal vowels on the traditional vowel chart, the vowel space is therefore defined by [i] being the highest, most front vowel; [u] being the highest, most back vowel; [a] being the lowest front vowel with the [ɑ] as the lowest back vowel (Ladefoged, 2001). The area bound by these articulatory parameters is described as the vowel space (Bekker, 2009; Catford, 2001; Ladefoged, 2001).

Since the vowel space is determined by the size and shape of the oral-pharyngeal cavity during the articulation of each vowel, the term can be defined in more detail as follows:

“The vowel space illustration provides a graphical method of showing where a speech sound, such as a vowel, is located in both ‘acoustic’ and ‘articulatory’ space. The illustration shows an acoustic vowel space based on the first two formants for vowels (formants are the bands of energy that correspond to the resonances of the vocal tract for particular shapes). The vertical axis represents the frequency of the first formant (F1). The horizontal axis shows the frequency gap between the first two formants (F2-F1). This 2-dimensional representation corresponds, to a certain degree, to tongue body position, with indications of high vs. low and front vs. back positions -- an articulatory space”, (www.haskins.yale.edu/facilities/vowelspace.html).

Using acoustically determined formant frequencies to depict the vowel space occupied by the vowels of a language can be seen as a more accurate description of the articulatory and acoustic properties of vowels. To compare the vowel spaces of the participants in this study will thus allow one to describe the articulatory differences and similarities that exist in the production of the vowels of English by EL1 and EL2 learners.

4.3 An acoustic approach to vowel description

When discussing acoustic properties of vowels, the discussion usually centres round an explanation of the source-filter model of speech production. The sound wave, perceived as speech, is the result of the characteristics of the sound source and the filtering features of the vocal tract (Fant, 1970).

The supraglottal vocal tract, consisting of the pharynx and oral cavity when non-nasalised vowels are produced, therefore functions as a changeable acoustic filter – subduing the transmission of sound energy at certain frequencies, allowing maximum energy through at other frequencies (Lieberman & Blumstein, 1988) – that reacts on the source of the acoustic energy which is the vibrating vocal cords. The sound source should therefore be the starting point of a discussion of the source-filter function of the supraglottal vocal tract.

4.3.1 The sound source

Any mechanism that produces vibrations in the air is seen as a sound source (Clark & Yallop, 1990; Ladefoged & Johnson, 2011). When vowels are produced every sound starts out as a single sound produced by the vibrating vocal cords (Ladefoged & Johnson, 2011). Pickett (1980) explains that the production of voiced sounds such as vowels is based on the periodic or regular modulation of the pulmonic airstream by the action of the vocal folds, as explained in the paragraphs that follow.

The vocal folds are positioned horizontally across the larynx with their lateral edges attached to the inner wall of the larynx (MacKay, 1987). The medial edges are attached at the back of the larynx to the arytenoid cartilages. The movement of the arytenoid cartilages part the vocal folds or draw them together. The vocal folds and the arytenoid cartilages form the slit-like opening known as the glottis (Clark & Yallop, 1990).

During the production of vowels, the medial edges of the vocal folds close the glottis. Pulmonic and subglottal pressure forces the vocal folds apart and a puff of air escapes into the supraglottal vocal tract (Catford, 2001). The pressure is momentarily decreased in the lungs before the vocal folds are once again drawn together to close the glottis (Van Wyk, 1979). This closure occurs because of elastic tension of the laryngeal muscles coupled with the Bernoulli-effect (MacKay, 1987). The Bernoulli-effect is responsible for a local drop in air pressure in the area of glottal closure, resulting in the air itself travelling at high speed to suck the soft edges of the vocal folds inwards to press against each other again, and so once again close off the glottis (Laver, 1994). Subglottal pressure builds up again, forces the vocal folds apart and another puff of air escapes. The process is repeated between 80 and 500 times per second and results in vocal fold vibration (Rietveld & Van Heuven, 2009).

This vibration is known as phonation or voicing (Ladefoged & Johnson, 2011; MacKay, 1987). Laver (1994, p. 193) explains that the “acoustic shock-wave”

created by instant glottal closure travels upwards through the air in the vocal tract where it is modified or filtered according to the configuration of the vocal tract.

4.3.2 The vocal tract as an acoustic filter

Sound waves radiate three dimensionally from the sound source (MacKay, 1987). This implies that the acoustic waves generated at the glottis will collide with the inner walls of the supraglottal vocal tract, resulting in the amplification of certain frequencies and the elimination of others. Whether a wave with a specific frequency is amplified or exterminated depends on the configuration of the vocal tract at that specific instant when a specific sound is articulated (MacKay, 1987). The configuration of the supraglottal vocal tract being responsible for the amplification of certain frequencies while exterminating others is known as the source-filter theory (Clark & Yallop, 1990).

Catford (2001, p. 153) relates the concept of the vocal tract as acoustic filter determining the resultant formant frequencies as follows:

“As the complex wave-form of voice passes through the cavities above the larynx – the pharynx and mouth – these cavities act as a series of resonators, which pick out and reinforce some frequencies in the sound-wave and subdue others. Since it is precisely these resonances that determine the spectrum, or form, of the complex sound-wave, they are called *formants*, and their frequencies are called formant frequencies.”

Before the concept of ‘formants’ is discussed, however, the concept of harmonics resulting in formants will briefly be investigated.

4.3.2.1 Harmonics

During vocal fold vibration additional vibrations having higher frequencies than the vocal tract resonance (or fundamental frequency) are generated by the vibration of the supple, undulating vocal folds (Johnson, 1997). He continues to explain as follows (when the fundamental frequency/pitch is 150Hz):

“A Fourier analysis of voicing waveform gives us a power spectrum that shows the component frequencies and their amplitudes... The fundamental frequency is the first (lowest-frequency) peak in the power spectrum, and each of the other peaks in the spectrum is at a multiple of the fundamental frequency. So, for example, the second peak in the spectrum occurs at 300Hz, the third at 450Hz, and the tenth at 1,500Hz. The components of the voicing spectrum are called **harmonics**.”

Because of harmonics, a pure tone is seldom heard during speech production. What is heard is the fundamental frequency together with a number of harmonics. A grouping of amplified harmonics at a certain frequency, corresponding to a resonant frequency of the air in the vocal tract, gives rise to formants (Crystal, 2008; Ladefoged, 1975).

4.3.2.2 Formants

The concept ‘formant’ can be defined as a grouping of acoustic energy, reflecting the way air travelling from the lungs vibrates in the supraglottal vocal tract (Crystal, 2008). The frequencies of formants are dependent on the fundamental frequency (F_0).

The fundamental frequency of a sound can be described as the pitch of the voice and is the frequency of vocal fold vibration during voicing (Catford, 2001; Laver, 1994). The formants, however, are directly related to the natural resonances in the vocal tract, depending on the configuration of the vocal tract at that moment (Catford, 2001). The lowest resonant frequency is called formant one (F_1), the second lowest formant two (F_2), etc. (Crystal, 2008). Vowels are normally identified by their first three formants and more specifically by the relation between F_1 and F_2 (Fry, 1979; Ladefoged, 1975).

Concerning the formants that characterise the different vowels, Ladefoged and Johnson (2011) explain that the air in the vocal tract will resonate at specific frequencies as long as the configuration of the vocal tract remains the same, giving

rise to formants. As soon as the vocal tract changes configuration, other frequencies will be amplified and extinguished, and another sound will be perceived (Catford, 2001; Crystal, 2008; Fry, 1979; Ladefoged & Johnson, 2011). Formant frequencies are therefore closely related to the configuration of the vocal tract which determines vowel quality (Bekker, 2009; Ladefoged & Johnson, 2011; Rietveld and Van Heuven, 2009). The importance of the configuration of the vocal tract created by the various movements of the articulators – mainly the tongue and the lips – as determiner of vowel quality is therefore clear.

4.3.2.3 Vocal tract configuration during vowel articulation

The supraglottal vocal tract forms a tube stretching from the glottis to the lips during vowel articulation (Ladefoged, 2001; Ladefoged & Johnson, 2011; Minifie, 1973). This tube includes the pharynx and oral cavities that act as resonating chambers during vowel articulation, determining the formant frequencies as was mentioned earlier.

The configuration of these resonance chambers is altered by the movement of the tongue, lower jaw, lips and pharyngeal wall; each change bringing about a different phonetic quality (Pickett, 1980; Rietveld & Van Heuven, 2009). Johnson (1997) includes the lowering of the larynx as an important factor in increasing the over-all length of the vocal tract, saying that it has an impact on the resonance taking place.

It is not easy, however, to precisely explain the relation between the configuration of the vocal tract, the resultant vowel and its formants (Rietveld & Van Heuven, 2009). In order to attempt such an explanation, various resonator models were suggested (Johnson, 1997). The double Helmholtz resonator is seen as a model that could, to an extent, account for the complicated configurations of the pharynx and oral cavity during vowel articulation (Rietveld & Van Heuven, 2009). They explain that the coupled double Helmholtz resonator could be used to explain the formant-cavity affiliation of F_1 and F_2 . As the F_1 and F_2 of the relevant vowels will be determined and depicted in this study, the double Helmholtz resonator is used to explain, by approximation, vocal tract configuration and formant structure .

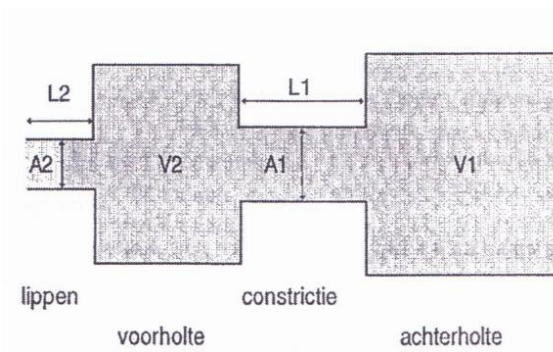


Fig. 7: The double Helmholtz resonator depicting the articulation of [u] (Rietveld & Van Heuven, 2009, p. 149).

The layout of this resonator can be explained as follows:

- V1 and V2 depict the volume of the resonating chambers; the pharyngeal and oral cavities respectively (m^3);
- The narrow section, L1, that links the two resonator chambers V1 and V2 corresponds with the length of the narrow passage between the palate and the tongue surface;
- A1 depicts the area of the constriction between the tongue and the palate (m^2);
- A2 depicts the area of the 'tube' formed by the lip protrusion (m^2); and
- L2 depicts the length of the lip protrusion.

Rietveld and Van Heuven (2009) suggest the following formula to determine the resonant frequency of the resonator:

$$F = \frac{c}{2\pi} \sqrt{\frac{A}{LV}}$$

Where

- F is the resonant frequency in Hertz (Hz)
c is the speed of sound (340m/sec)
L is the length of the lip protrusion
A is the area of the lip protrusion
V is the volume of the resonance cavity
 π is 3.1416

They state that the following formant-cavity affiliation rules can be deduced from this formula, explaining the resultant vowel formants:

- The resonant frequency of the resonator increases as the volume of the cavity decreases, and vice versa;
- The resonant frequency decreases as the length of the lip protrusion increases, and vice versa;
- The resonant frequency decreases as the area of the lip protrusion decreases and vice versa. The area of the lip protrusion is relatively small when a vowel with a high degree of lip rounding such as [u] is articulated. When a vowel with less lip rounding is articulated, e.g. [ɔ], the area of the lip protrusion increases, leading to an increase in the resonant frequency.

Concerning cavity affiliation, Rietveld and Van Heuven (2009), explain that the volume of the back cavity or resonator (V_1) is responsible for the first resonant frequency (F_1), while F_2 is determined by the resonance taking place in the front resonator (V_2). Linking the influence of the configuration of the resonators, the resonance taking place in the cavities and the influence the resonance has on the specific formant frequencies to the articulatory movements of the speech organs during vowel articulation, Rietveld and Van Heuven (2009) distinguish four important aspects that may influence the formant frequencies of vowels. These factors are place of constriction, degree of constriction, area and length of lip protrusion and lip rounding.

4.3.2.3.1 Place of constriction

The tongue, including the tongue root, usually determines the place of constriction. The place of constriction depends on the horizontal movement of the tongue (Rietveld & Van Heuven, 2009). When the tongue moves towards the front of the oral cavity during vowel articulation, the place of constriction will be more towards the front and vice versa.

With the forward movement of the tongue, the length of the front cavity (V_2) decreases, while that of the back cavity (V_1) increases, and vice versa. The place of

constriction determines the length of the cavities and influences the resonant cavities as follows: when the place of constriction moves towards the front of the oral cavity, the length of the back cavity increases, so the resultant resonance frequencies will be lower in the back cavity. The length of the front cavity becomes less, therefore the resonance frequencies of the front cavity will be higher (Rietveld and Van Heuven, 2009).

Relating this horizontal movement of the tongue during vowel articulation, it can be stated that during the articulation of front vowels, the tongue will move towards the front of the oral cavity, decreasing the volume of this cavity (V_2) while increasing the volume of the back cavity (V_1). This means that F_1 will be lowest when the most front vowel [i] is articulated, while F_2 will be highest. During the articulation of back vowels, the tongue moves backwards, decreasing the volume of the back cavity (V_1) and increasing that of the front cavity (V_2).

Ladefoged (1975) explains that when the American English vowels [i], [ɪ], [ɛ], [æ], [ɑ], [ɔ], [ɒ] and [u] are articulated in this sequence, i.e. from the front vowel [i] through to the back vowel [u], the volume of the front cavity will incrementally increase. This will result in the air in the front cavity (V_2) resonating at a lower and lower frequency. The result will be that F_2 decreases consistently from [i] to [u]. Therefore it can be said that the place of constriction during vowel articulation determines the frequency of F_2 . One can also say that the F_2 of vowels is inversely related to the volume of the back resonator and directly related to the place of constriction during vowel articulation (Fourakis et al., 1999; Kent & Read, 1992).

With the decrease of the back resonator (V_1) during the articulation of the above-mentioned sequence, one would expect the F_1 to increase correspondingly. Ladefoged (2001), however, mentions that research has shown that the F_1 of vowels increases from [i] to [ɑ], and then decreases from [ɑ] to [u]. (See the graph on the next page, depicting the formant behaviour of eight American English vowels). This suggests that the place of lingual constriction is not the only factor involved in determining the configuration of the resonators and therefore the unexpected behaviour of F_1 . Rietveld and Van Heuven (2009) mention that constriction between

the tongue root and the pharyngeal wall, affecting the resonance that takes place in V1 during the articulation of the low back vowels, plays a role as well. In the light of the fact that the correlation between articulatory movement, the consequent configuration of the vocal tract and the resultant formant frequencies is not that clear-cut, Fry (1979) warns that the formant configuration of a speech sound is the result of the acoustic character of the entire vocal tract operating as one complete resonant structure.

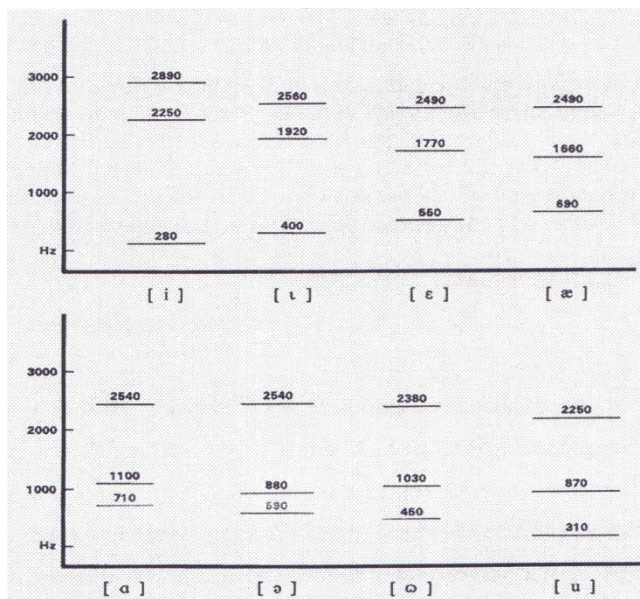


Fig. 8: The first three formants of eight American English vowels (Ladefoged & Johnson, 2011, p. 193).

4.3.2.3.2 Degree of constriction

According to Fourakis et al. (1999), the F_1 of vowels is dependent on the vertical modification of the tongue, i.e. the dimension of tongue height. The height of the tongue during vowel articulation determines the degree of constriction. Ladefoged and Johnson (2011) as well as Kent and Read (1992) state that F_1 is inversely related to the degree of constriction and therefore to vowel height.

This implies that the F_1 of high vowels such as [i] and [u] will be lower than that of low vowels such as [a] and [ɑ]. Rietveld and Van Heuven (2009) explain that if the

tongue assumes a high position, the area of the constriction decreases and therewith the resonance frequency of the back volume, which will decrease the frequency of the F_1 .

Lingual constriction, however, is not alone responsible for the resultant formant frequencies. Pickett (1980) states that pharyngeal constriction, between the tongue root and the pharyngeal wall, causes the F_1 to be raised during the articulation of low back vowels. According to him, the more the pharyngeal constriction, the higher the F_1 will be.

Pharyngeal constriction could therefore explain the decrease of F_1 during the articulation of [ɑ] to [u]: because of the decrease in volume of the back resonator (V_1) during the sequential articulation of back vowels, one would expect the F_1 to increase incrementally. This, however, does not occur. As Pickett (1980) posits that the higher the degree of pharyngeal constriction the higher F_1 will be, it could explain why [ɑ] has a higher F_1 than [u]. The low back vowel [ɑ] is thus articulated with more pharyngeal constriction than the high back vowel [u].

Once again, however, researchers like Fry (1979), Lieberman and Blumstein (1988) and Ladefoged, DeClerk, Lindau, and Papcun (1972) caution that the acoustic differences between vowels are the result of resonance taking place in the supraglottal vocal tract as a whole, not only those determined by the contour and position of the tongue.

4.3.2.3.3 Area and length of lip protrusion

Lengthening of the lip protrusion will result in the lengthening of the front resonator (V_2), which will cause the F_2 to decrease (Rietveld & Van Heuven, 2009). Lieberman and Blumstein (1988) state that the area of the lip opening is determined by the comparative protrusion or retraction of the lips. This will influence the length and overall volume of the front cavity (V_2), which will result in a decrease of F_2 .

4.3.2.3.4 Lip rounding

Researchers like Rietveld and Van Heuven (2009), Kent and Read (1992), Minifie (1973), Fourakis et al. (1999) and Ladefoged and Maddieson (1996) all agree that lip rounding lowers the formant frequencies of vowels. While the majority of them mentioned here state that it is usually F_1 and F_2 that are lowered, Ladefoged (1975) state that it is the frequency of the higher formants that are affected. He explains that it is usually the F_3 of front vowels and the F_2 of back vowels that are affected by lip rounding. The reason for the lowering of the formant frequencies is that the overall length (and thus the volume) of the vocal tract as increased by lip rounding, resulting in a lowering of formant frequencies.

Regarding the use of a model like the Helmholtz resonator to link acoustic characteristics such as formant frequencies with articulatory movement, Rosner and Pickering (1994, p. 46) caution that “formant-to-cavity affiliations only hold to a limited extent.” Although a tool such as the Helmholtz resonator clearly does not provide an absolute method to explain what exactly happens during vowel articulation and how it can be related to the resultant formant frequencies of vowels, it does contribute to the understanding of articulatory movement, resonance and how these aspects influence the acoustic properties of the vowels.

Since the articulatory movements of the organs of speech cannot be divorced from the acoustic properties of the resultant sounds (Catford, 2001), a plotting of the F_1 and F_2 of vowels on a vowel quadrilateral can enable one to discuss the influence of the movement of the tongue and lips during articulation to some extent at least.

4.3.3 Positioning of formants on a vowel quadrilateral

With the development of the sound spectrograph and the spectrogram, phoneticians were able to identify the relationship between the vertical and horizontal axes of the vowel chart and the formant frequencies of the vowels (Joos, 1948). As was mentioned earlier, the positioning of the formant values on a figure reminiscent of the traditional vowel chart gives rise to a more reliable form of vowel space as it not only

encompasses articulatory behaviour, but also acoustic properties (Johnson, 1997; Ladefoged & Johnson, 2011; Minifie, 1973; Rietveld & Van Heuven, 2009).

Bekker (2009) states that the frequencies of F_1 and F_2 are generally used to plot the acoustic quality of vowels. As was discussed earlier, the values of F_1 are commonly related to vowel height (thus the vertical movement of the tongue) while that of F_2 are related to the degree of 'frontness' or 'backness' (thus the horizontal movement of the tongue). Bekker (2009) explains the general method of representing acoustic vowel quality is to plot the F_1 values on an inverted y-axis and F_2 on an inverted x-axis. Another way of plotting the acoustic values is to position the F_2 minus F_1 values on an inverted x-axis while F_1 values are positioned on an inverted y-axis (Ladefoged & Maddieson, 1996). This then represents the fact that vowel height is inversely related to the F_1 frequency value while the F_2 frequency value decreases as the vowels are articulated more towards the back. An example of such a figure, reminiscent of the traditional vowel chart, but indicating the acoustic quality of the vowels and depicting the vowel space can be seen on Figure 9 below:

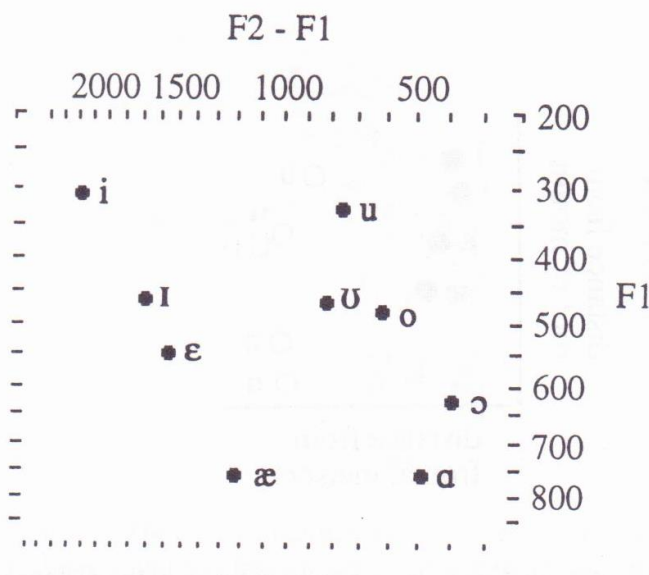


Fig. 9: An acoustic representation of a mean set of American English vowels (Ladefoged & Maddieson, 1996, p. 286).

Such figures will be used to discuss the results of the data analysis in Chapter 5, with reference to the vertical and horizontal modification of the tongue.

With a basic theoretical background on the acoustics of vowels now sketched, the characteristics of English and Setswana vowels will be presented next.

4.4 Various forms of English in South Africa

Although English in South Africa initially consisted only of the two L1 varieties mentioned in Chapter 2, there are various varieties of English spoken in South Africa today. English is no longer the property of white English first language speakers alone but is also spoken as first language by the majority of Indian people and by many Coloured and Black speakers (Bekker, 2012; Kamper & Niesler 2014; Mesthrie, 2010). In addition, it has become a well-established second language that is spoken by the majority of the 40 million citizens of this country (Bekker, 2009; Branford, 1996; Government of South Africa, 2011a; Kamper & Niesler, 2014; Mesthrie, 2010; Van Rooy, 2002; Van Rooy & Terblanche, 2010).

The majority of English L2 speakers in South Africa have one of the African languages or Afrikaans as a home language (Wissing, 2002). Under such circumstances it is normal that various varieties of English develop. The division and labelling of English in South Africa into various varieties or dialects is not easy and the labelling seems to be adapted constantly. Various authors refer to South African English (SAE) as the umbrella term including all the varieties of English in South Africa (De Wet, Louw, & Niesler, 2007; Hartmann & Zerbian, 2009; Kamper & Niesler, 2014; Lass, 1990; Mesthrie, 2010; Niesler, Louw & Roux, 2005; Pienaar & De Klerk, 2009; Reis Esteves & Hurst, 2009; Van Rooy, 2000). Bekker (2012) uses the abbreviation SAfE to refer to 'South African English'. He mentions that WSAfE refers to the variety of English primarily spoken by 'white' English L1 speakers. This abbreviation will be used to refer to the standard variety of English spoken by the EL1 participants in this study.

De Klerk, Adendorff, De Vos, Hunt, Niesler, Simango and Todd (2006) explain that WSAfE as standard variety of English in South Africa was established by white, English-speaking people coming from Britain who were inclined to socialise with and marry their countrymen. Enforced isolation of linguistic and ethnic communities during apartheid contributed to this variety of English being essentially the variety spoken by the white L1 linguistic community in the country. It is therefore seen as the standard or norm for English in South Africa as was mentioned earlier, "... however unpalatable its socio-political implications and how unsavoury its origins", (Lass, 1995, p. 89). Therefore, for the purposes of this study, WSAfE speakers were selected to participate in the Norm group while BSAE speakers participated in the Control and Experimental groups. (See Chapter 5 on the method).

SAE as a variety of World English is an extremely complex dialect cluster (Lass, 1990) and therefore difficult to classify as it includes the L1 variety spoken by 'white' English mother tongue speakers as well as those spoken by 'non-white' L1 speakers of English as well as the various L2 varieties. Because of this complexity, various classificatory principles are used.

The terms 'White', 'Coloured', 'Indian' and 'Black' South African English seem to distinguish English according to race. These terms, however, are widely used by well-known scholars of English in South Africa such as De Klerk (1999), De Klerk et al. (2006), De Klerk and Gough (2002), Lanham and Macdonald (1979), Bekker (2007, 2009, 2012), De Wet et al. (2007), Coetzee-Van Rooy and Van Rooy (2005), Van Rooy and Van Huyssteen (2000), Van Rooy (2002), Van der Walt and Van Rooy (2002), Da Silva (2008), Louw and De Wet (2007), Wissing (2002), Mesthrie (2010) and Kamper and Niesler (2014). Many of these linguists acknowledge that although these racially based categories may be grating, Mesthrie and McCormick's (1992) observation that segregation in South Africa during the apartheid era divided SAE into ethnolects still holds true in many instances. Changes are occurring, however. Mesthrie (2008) mentions that many of the younger generation of BSAE speakers model their accent on that of their schoolmates and friends so that the version of English spoken by them is in effect a South African version of southern British English (RP).

Researchers like Lass (1995), Bekker and Eley (2007) and Bowermann (2004) suggest classificatory terms such as ‘Cultivated’, ‘General’ and ‘Broad’ (these terms are derived from Mitchell and Delbridge’s (1965) work on Australian English) to distinguish various sociolects of SAE. Bekker and Eley (2007) mention that these terms could replace the terms ‘Conservative’, ‘Respectable’ and ‘Extreme’ used by Lanham (1967). De Klerk et al. (2006) use a classification ‘Educated South African English’ based on the speech patterns of educated members of the wider speech community in South Africa.

For the purpose of this study, the classification of authors such as Bekker (2009; 2012) and Mesthrie (2010) especially, but also Kamper and Niesler (2014) and Hartmann and Zerbian (2009) will be followed, including the *General* epithet as suggested by researchers like Lass (1995), Bekker and Eley (2007) and Bowermann (2004). This classification distinguishes the following varieties of SAE:

- WSAfE – White L1 South African English, related largely to southern British (or standard) English. Bekker and Eley (2007) refer to this sociolect as stretching from *General* to *Cultivated*.
- ISAE – Indian South African English, L1 for certain speakers, but L2 for numerous others (Mesthrie, 2010);
- CSAE – Coloured South African English, L1 for certain speakers, but L2 for numerous others (Mesthrie, 2010);
- ASAE – Afrikaans South African English, L2 variety with some overlap with WSAfE (Kamper & Niesler, 2014);
- BSAE – Black South African English, L2 variety (Bekker, 2009; Mesthrie, 2010; Van Rooy, 2002; Kamper & Niesler, 2014).

The vowel characteristics of WSAfE will be discussed below.

4.4.1 White South African English (WSAfE)

Standard SAE is *General* White South African English according to Bekker (2012) and is the most widely spoken sociolect of WSAfE. The vocalic characteristics of WSAfE according to Bekker (2012), Bekker (2007), Bekker (2009), Bekker and Eley

(2007) Reis Esteves and Hurst (2009), Dore, Mantzel, Muller, Wright and Sylva (Eds.) (1996), Bowerman (2004) and Loots and Niesler (2011), are the following:

Short monophthongs:

- KIT vowel [ɪ]:
Wells (1982) and Bowerman (2004) state that the KIT⁴ split is characteristic of General WSAfE, but not of Cultivated WSAfE. This vowel appears in words such as *kin*, *spin*, *sit* and *thin*. Within certain phonological contexts, this vowel is realised as two different allophones in General WSAfE (Bekker, 2009). According to Bekker and Eley (2007) the KIT vowel is pronounced as the more front [ɪ] when in the initial position in a word, e.g. *it*, after [h], e.g. *hip*, before and after velar consonants [k] and [g], e.g. (Bekker & Eley, 2007, p. 109) *big*, *flick*, *kill*, *gill* and often before the palato-alveolars [ʃ] and [ʒ], e.g. *tissue* and *vision*. Lass (1990) states that a more centralised allophone [ɪ̞] is used in most other settings, frequently moving further back to [ə] in the proximity of labials (*limb*, *miss*), as well as following /r, l/.
- DRESS vowel [e]:
In General WSAfE this vowel is articulated as [e], but is lowered to [ɛ] in Broad WSAfE, according to Bowerman (2004).
- TRAP vowel [æ]:
The vowel [æ] is slightly raised in General WSAfE, becoming [æ̟] (Bowerman, 2004).
- LOT vowel [ɒ]:
According to Bekker and Eley (2007), this vowel is generally weakly rounded, centralised and raised above the cardinal position in General WSAfE, thus [ɒ̟]. In some instances the lip rounding is so weak that the articulation approaches that of [ɔ̟], or so strong that the articulation suggests that of [ɔ̞]. Bekker (2009)

⁴ Words such as KIT, FLEECE etc. which will be encountered in the following discussion, are part of what Wells (1982) refers to as lexical sets. They “refer concisely to large groups of words which tend to share the same vowel, and to the vowel which they share”, (Wells, 1982: xviii).

states that this vowel very often overlaps with the STRUT vowel as well as the BATH vowel, discussed below.

- **STRUT vowel [ʌ]:**
According to Bowerman (2004) and Bekker and Eley (2007), this vowel has a wide range of variation in WSAfE, but is seldom realised as [ʌ]. Bowerman (2004) states that it is typically a low to mid centralised vowel, thus ranging from [ä] to [ɐ]. Bekker and Eley (2007) state that variations such as [ʌ̃] and [ɛ̃] are possible as well.
- **FOOT vowel [ʊ]:**
This vowel is usually realised as a high, back centralised [ʊ] (Bowerman, 2004). He states that it is generally articulated with less lip-rounding than other English L1 varieties around the world.
- **LETTER [ə]:**
This vowel is articulated as [ə] in all varieties of WSAfE, (Bowerman, 2004).
- **COMMA [ə]:**
Bowerman (2004) states that this vowel is mainly realised as [ə] in General WSAfE. He posits that it may be lower in Cultivated WSAfE, even as low as [ɐ].

An acoustic study done by Bekker (2009) determined the average formant values of these WSAfE vowels to be the following, as appearing in Table 6:

Table 6: The short monophthongs of WSAfE (participants: 27 females, aged 18-19 years)

Type	Vowel	Context	F ₁ (Hz)	F ₂ (Hz)
Short monophthongs	[ɪ]	KIT	584.10	1952.33
	[e]	DRESS	712.15	2004.00
	[æ]	TRAP	920.50	1709.50
	[ʌ]	STRUT	860.20	1562.50
	[ɒ]	LOT	718.45	1456.50

	[u]	FOOT	554.05	1305.50
	[ə]	LETTER	778.50	1666.00

The vowel space in which these vowels are articulated, according to the formant values determined by Bekker (2009), can be depicted as follows:

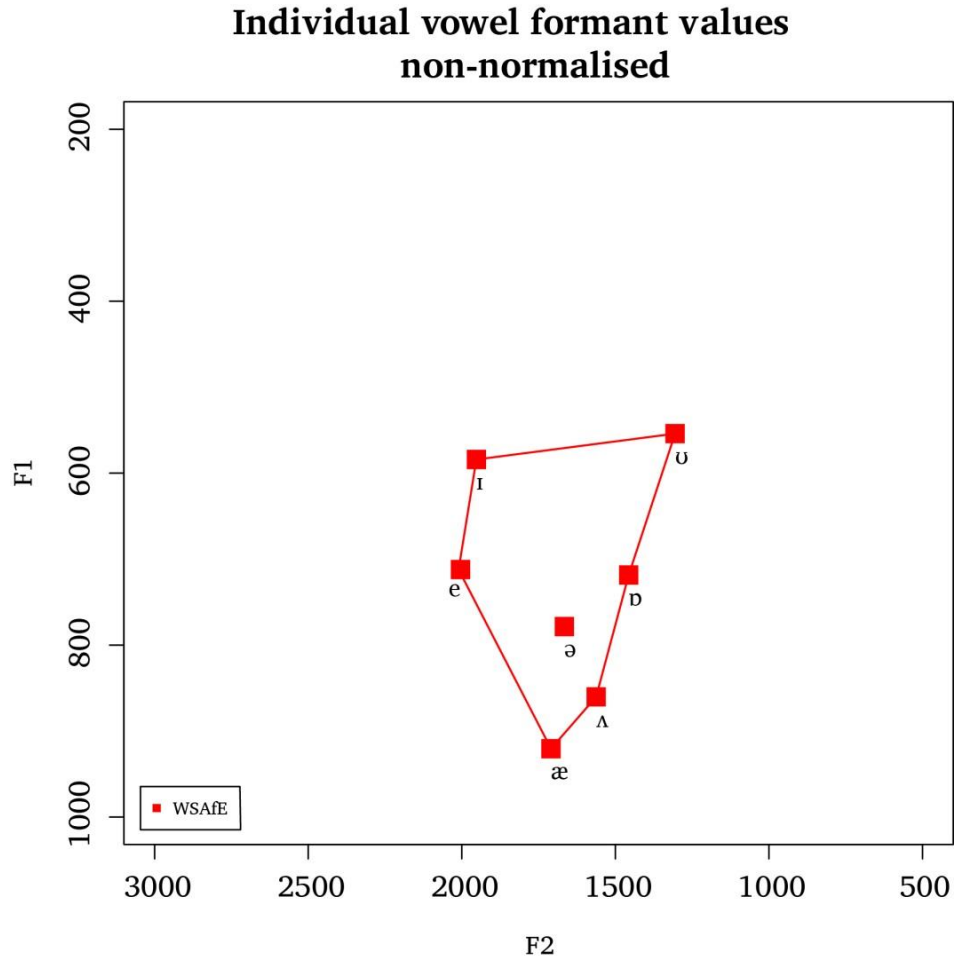


Fig. 10: The vowel space occupied by the short WSAfE vowels according to the formant values determined by Bekker (2009).

Long monophthongs:

- FLEECE vowel [i:]:
According to Bekker and Eley (2007) this vowel is invariably realised as the long, high front monophthong [i:]. Bowerman (2004) mentions that the vowel [i:] in HAPPY is usually articulated as [i:], but can be half long [i:] as well.

- NURSE vowel [ɜ:]

According to Bowerman (2004) Cultivated WSAfE realises this vowel as a fairly central unrounded vowel [ɜ:], which is similar to RP (Received Pronunciation). Other varieties than Cultivated, thus including General, have more rounded and centralised realisations, namely [ø:] and [œ:], according to Bekker and Eley (2007) and Bowerman (2004).

- GOOSE vowel [u:]:

This vowel is realised as a high central vowel [ɨ:] in WSAfE which is more front than the [u:] produced in Cultivated WSAfE (Bekker, 2007; Bekker & Eley, 2007; Bowerman, 2004; Lanham & Macdonald, 1979). Lass (1995) posits that in all varieties other than Cultivated WSAfE, [u:] is never further back than central [ɨ:].

- BATH vowel [ɑ:]:

Bekker and Eley (2007) as well as Bowerman (2004) state that in General WSAfE this vowel is realised as the low back vowel [ɑ:]. In Cultivated WSAfE, however, Bekker and Eley (2007) state that the articulation can range from the centralised [ä:] to central [æ:].

- THOUGHT vowel [ɔ:]:

According to Bekker and Eley (2007) and Bowerman (2004) this vowel is realised as [ɔ:] in General WSAfE. In Cultivated WSAfE, it is realised as the lower [ɔ:], similar to RP.

- SQUARE [ɛ:]:

Bowerman (2004) states that as in RP, this sound is pronounced as the diphthong [ɛə]. Once again, he explains that General WSAfE speakers tend to monophthongise the diphthong to the long vowel [ɛ:]. This vowel will therefore be treated as a long monophthong [ɛ:] for the purposes of this study.

The average acoustic values of these vowels, according to Bekker (2009) are presented in Table 7:

Table 7: The long monophthongs of WSAfE (participants: 27 females, aged 18-19 years)

Type	Vowel	Context	F ₁ (Hz)	F ₂ (Hz)
Long monophthongs	[i:]	FLEECE	443.10	2550.00
	[u:]	GOOSE	415.75	1516.80
	[ɜ:]	NURSE	588.55	1711.00
	[ɔ:]	THOUGHT	498.70	847.95
	[ɑ:]	BATH	831.75	1247.50
	[ɛ:]	SQUARE	603.90	2332.00

The vowel space in which these vowels are articulated, according to the formant values determined by Bekker (2009), can be depicted as follows:

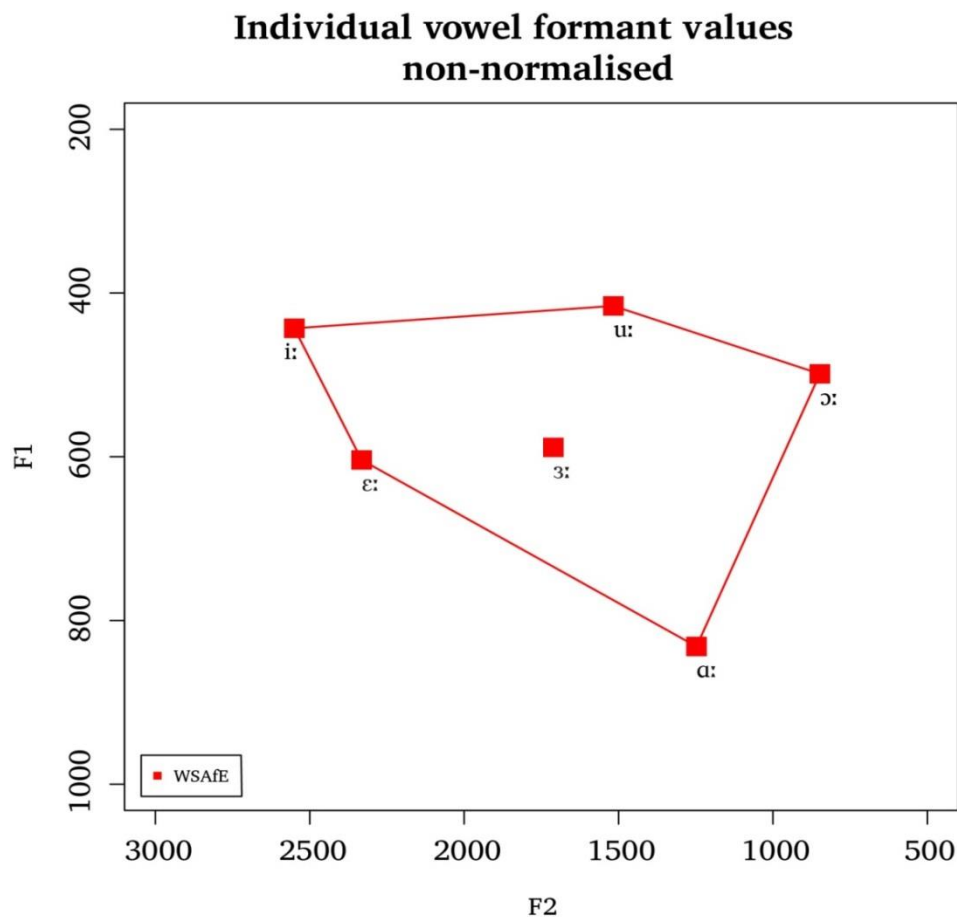


Fig. 11: The vowel space occupied by the long WSAfE vowels according to the formant values determined by Bekker (2009).

Diphthongs:

- FACE [eɪ]:
According to Bowerman (2004) this diphthong is realised as [eɪ] in both Cultivated and General WSAfE.
- PRICE [aɪ]:
In Cultivated WSAfE the articulation of this diphthong is close to the RP [aɪ], according to Bowerman (2004). He explains that the first element of the diphthong is often lengthened to [a:] by General WSAfE speakers.
- MOUTH [aʊ]:
According to Bowerman (2004), in Cultivated WSAfE the first element of this diphthong has a more back pronunciation, namely [ä]. In General WSAfE the tendency is to monophthongise the diphthong to [ɑ:].
- CHOICE [ɔɪ]:
Bowerman (2004) states that this diphthong is usually pronounced as [ɔɪ] in all varieties of WSAfE.
- GOAT [əʊ]:
Cultivated speakers do not round the first element of this sound; therefore the realisation is [ɛʊ] or [œʊ] (Bowerman, 2004). He explains that the onset is always rounded and mid-low in General WSAfE, while the offset (or offglide) is more central, sometimes unrounded. Once again, according to Bowerman (2004), there is a tendency in General WSAfE to monophthongise this sound. The General WSAfE articulation of this diphthong will therefore be [œʌ], [œʏ] or [œ:].
- NEAR [ɪə]:
Bowerman (2004) states that this diphthong is normally articulated as [ɪə] in all varieties.

- CURE [ʊə]:
Bowerman (2004) states that this diphthong is realised as [ʊə] in Cultivated and General WSAfE.

The average acoustic formant values for the WSAfE diphthongs are the following, according to Bekker (2009):

Table 8: The diphthongs of WSAfE (participants: 27 females, aged 18-19 years)

Type	Diphthong	Context	F ₁ (onset) Hz	F ₂ (onset) Hz	F ₁ (offset) Hz	F ₂ (offset) Hz
Diphthongs	[eɪ]	FACE	682.50	2192.00	563.15	2311.00
	[əʊ]	GOAT	647.80	1312.00	517.70	1363.90
	[ʊə]	CURE	561.80	1672.00	712.00	1621.00
	[ɪə]	NEAR	517.40	2422.00	711.30	1832.00
	[aʊ]	MOUTH	949.00	1445.00	823.45	1239.50
	[aɪ]	PRICE	939.15	1441.50	817.80	1806.00
	[ɔɪ]	CHOICE	546.80	1014.10	567.25	2056.00

The vowel space occupied by the diphthongs of WSAfE according to the formant values above can be depicted as follows:

Individual vowel formant values non-normalised

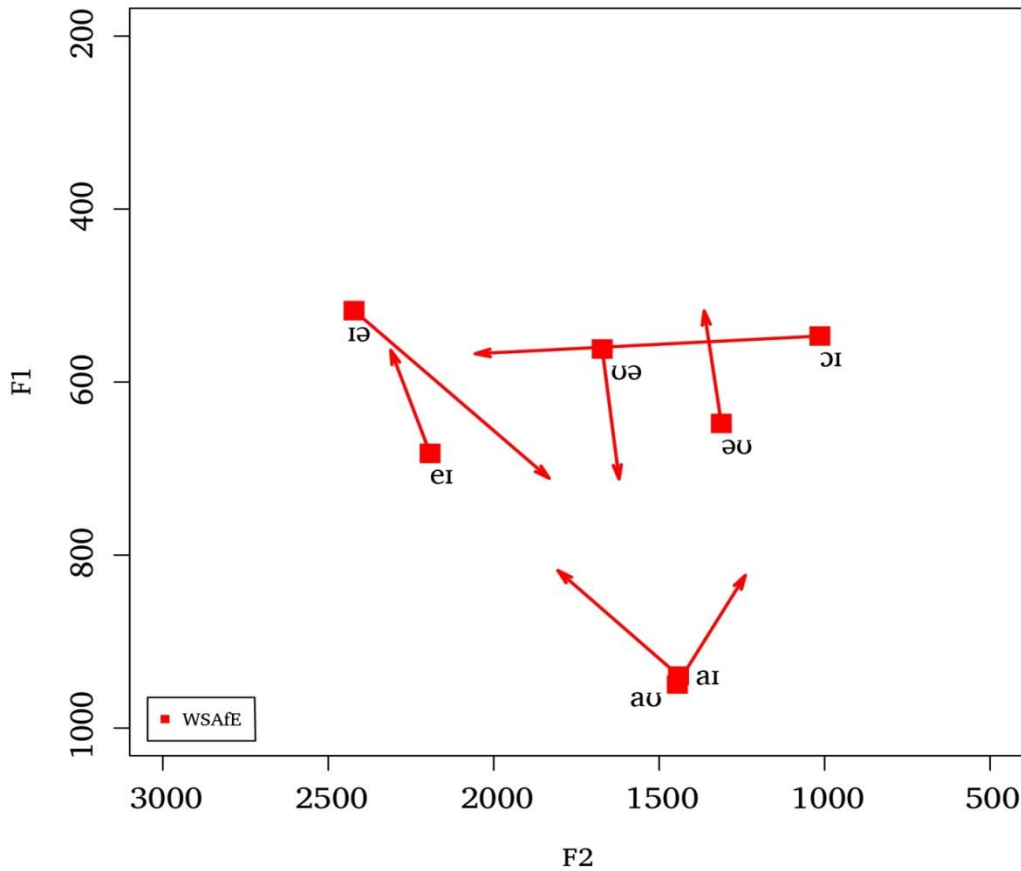


Fig. 12: The vowel space occupied by the diphthongs of WSAfE according to the formant values determined by Bekker (2009).

4.4.2 Black South African English (BSAE)

BSAE can be defined as a L2 variety of SAE spoken by mother tongue speakers of a South African Bantu (African) language (Coetzee-Van Rooy & Van Rooy, 2005; Da Silva, 2008; De Klerk & Gough, 2002; De Wet et al., 2007; Kamper & Niesler, 2014; Mesthrie, 2010; Wissing, 2002). The origin of this variety of SAE can be traced to BSAE-speaking teachers providing English language education in township schools (Coetzee-Van Rooy & Van Rooy, 2005; De Klerk & Gough, 2002; Van Rooy, 2000). According to Van Rooy (2000), this then excludes black speakers of English from an English private school educational background whose speech resembles standard British or WSAfE models. The variety BSAE therefore refers to that L2 variety of English heavily influenced by the African language L1 characteristics of its speakers

and not to an adherence to old racial or ethnic categorisation. Although the influence of the L1 African languages can be seen in linguistic aspects other than only phonetics (De Klerk & Gough, 2002), the characteristics of the vowel system of BSAE will be discussed for the purpose of this study.

4.4.2.1 The vowels of BSAE

BSAE differs markedly from WSAfE as far as the vowel systems are concerned (Van Rooy & van Huyssteen, 2000). The vowel system of BSAE is influenced by the vowel systems of the L1 African languages of BSAE speakers (Brink & Botha, 1999; De Klerk & Gough, 2002; De Wet et al., 2007; Louw & De Wet, 2007; Niesler et al., 2005; Seeff-Gabriel, 2003; Van Rooy, 2000, 2002; Van Rooy & Van Huyssteen, 2000; Wissing, 2002). As was mentioned in Chapter 3, the vowel system of Setswana is limited to seven or 11 monophthong short vowels while the vowel system of WSAfE consists of seven short monophthongs, six long monophthongs and seven diphthongs, (Bekker, 2009; Bowerman, 2004).

The researchers mentioned above indicate that BSAE speakers interpret the vowels of English in terms of the limited vowel systems of their mother tongues and therefore do not distinguish all the vowels of WSAfE, but only those that are similar in both the L1 and L2. Wissing (2002), in his research on the phonetics of BSAE, shows that concerning BSAE at least, the transfer-based theories claiming that perception and production of vowels that are similar in both the L1 and L2 are easier to master, are correct.

4.4.2.1.1 The monophthongs of BSAE

A major characteristic of the monophthongs of BSAE is the neutralisation of tense/lax⁵ or short/long contrasts between vowels (Niesler et al., 2005; Van Rooy & Van Huyssteen, 2000). Lax vowels occur frequently in English, but not in the African languages. Although the quality of BSAE monophthongs is generally described as

⁵ Lax vowels are shorter, lower, and slightly more centralised than the corresponding tense vowels (Ladefoged, 1975:74).

tense, meaning that they occupy positions more towards the outer limits of the vowel space, Van Rooy (2004) mentions that these vowels are often found intermediate between a tense and lax vowel.

Neutralisation of the tense/lax contrast means that in BSAE the contrast between the vowels KIT/FLEECE such as in the minimal pair 'sit - seat' are not observed. Van Rooy and Van Huyssteen (2000) mention that sporadic lengthening of vowels occurs, however there is no correspondence to a logical division between tense and lax vowels. This occasional lengthening might occur when the vowel occurs in the penultimate syllable of the word, which is the position in which Setswana (and other South African Bantu languages) vowels are lengthened (Cole, 1955; Hundleby, 1964; Snyman, 1989; Ziervogel, 1967).

Another aspect of BSAE vowel realisation concerns the avoidance of central vowels, especially the schwa [ə] (De Wet et al., 2007; Van Rooy, 2004). Van Rooy and Van Huyssteen (2000) mention that central vowels are usually replaced with vowels which lie closer to the limits of the articulatory space. In this way the central vowel [ɜ:] in NURSE is fronted and shortened to [ɛ] and the word pronounced as [nɛs]. When comparing the positioning of these two vowels on the vowel chart on p. 91, it is clear that although they are horizontally different, they are vertically similar. In addition to neutralisation of central vowels in BSAE, the central schwa [ə] is replaced by a low vowel [a] or even [ɑ] in open syllables (De Wet et al., 2007; Van Rooy & Van Huyssteen, 2000). This suggests that in a word like LETTER, the [ə] is pronounced as [a], becoming [lɛta]. Based on research on BSAE as spoken by Setswana L1 speakers, Van Rooy and Van Huyssteen (2000) provide a range of replacements for schwa, depending on the position of the vowel in the word and whether the vowel occurs in a closed or open syllable. In 51% of cases, the [ə] was replaced with a [a] and with an [ɛ] in 48% of cases.

According to Louw and De Wet (2007), in keeping with the avoidance of central vowels, no vowel reduction takes place in unstressed syllables in BSAE. In the word 'seventy', for example, the vowel [e] or often [ɛ] will not be reduced to the schwa [ə].

Van Rooy and Van Huyssteen (2000) as well as Wissing (2002) state that English vowel qualities that do not occur in the African language, tend to be replaced with the closest corresponding phone of the L1, as was mentioned earlier. Table 9 below illustrates the monophthongs of WSAfE and their replacement in specifically Setswana-English. As there is not much difference in quality between the vowels of BSAE produced by speakers of the various South African Bantu languages, one can consider these vowels as the vowels of BSAE (Louw & De Wet, 2007; Van Rooy, 2004; Van Rooy & Van Huyssteen, 2000; Wissing, 2002).

Table 9: The monophthongs of BSAE (participants: five female Setswana L1 speakers, aged 18-21 years), according to research by Van Rooy and Van Huyssteen (2000). The percentages in brackets indicate the frequency of occurrence of each phone. Only phones with an occurrence of 10% or more are included in the list (n= 845 vowels)

Reference word	SAE	BSAE (Setswana)					
KIT	[ɪ]	[i] 81%					
SIT	[ə ~ ɪ]	[i] 50%	[ɛ] 14%				
DRESS	[e]	[ɛ] 43%	[e] 29%				
TRAP	[æ]	[ɛ] 47%	[æ] 12%	[a] 10%			
STRUT	[a] ⁶	[a] 59%	[ɑ] 32%				
LOT	[ɒ]	[ɔ] 70%	[ɒ] 11%				
FOOT	[ʊ]	[u] 100%					
FLEECE	[i:]	[i] 94%					
GOOSE	[ʊ ~ u:]	[u] 83%					
NURSE	[ɝ:]	[ɛ] 47%	[e] 19%				
THOUGHT	[ɔ:]	[ɔ] 88%					
BATH	[ɑ:]	[a] 59%	[ɑ] 40%				
COMMA	[ə]	[a] 51%	[ɛ] 48%	[e] 44%	[ə] 42%	[ɑ] 42%	[ɜ] 14%

Perceptual studies conducted by Wissing (2002) confirm the identification of these vowels as the vowels of BSAE, while Van Rooy and Van Huyssteen (2000) add the low back vowel [ɑ] as an additional vowel.

⁶ This symbol was used by Van Rooy and Van Huyssteen (2000) instead of the symbol [ʌ].

Gleaned from this data by Van Rooy and Van Huyssteen (2000), the most frequently occurring vowels of BSAE as produced by Setswana L1 speakers were determined and, together with the ranges of their F_1 and F_2 formant frequencies, are given in Table 10 below.

Table 10: The most frequently occurring vowels in BSAE (participants: five female Setswana L1 speakers, aged 18-21 years) and their first two formant values

Vowel	F_1 (Hz)	F_2 (Hz)
[i]	250-350	2200-2500
[ε]	450-550	2100-2300
[a]	650-800	1900-2300
[ɑ]	650-800	1700-1300
[ɔ]	450-550	1700-1300
[u]	250-350	1700-1300

The acoustic vowel space determined by F_1 versus F_2 values can be depicted as follows:

Individual vowel formant values non-normalised

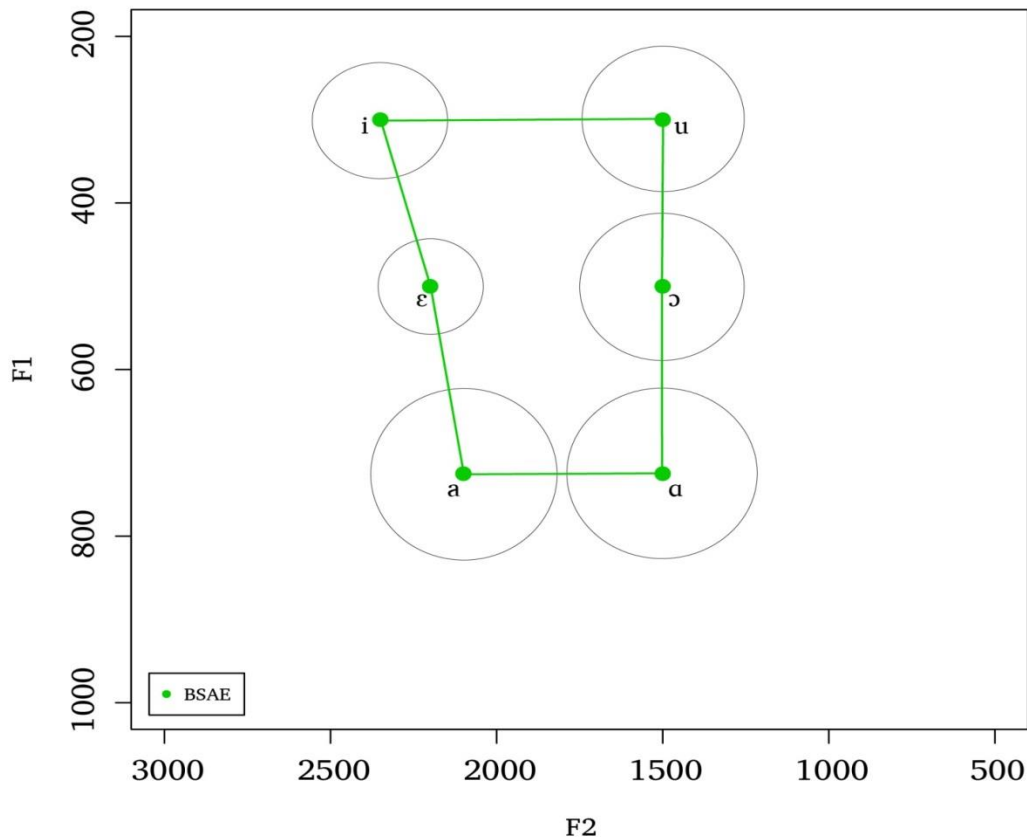


Fig. 13: The vowels of BSAE depicted according to formant values determined by Van Rooy and Van Huyssteen (2000).

The vowel system of BSAE can be observed above as a totally harmonious system, reminiscent of the vowel systems of the African languages, with back and front vowels corresponding in number, height and front-backness.

4.4.2.1.2 The diphthongs of BSAE

Diphthongs can be defined according to their manner of articulation as a vowel where the quality changes from that of one vowel to another in one syllable (Crystal, 2008). In WSAfE, diphthongs are therefore normally articulated as a vowel starting with one quality and changing to another quality in one syllable. In BSAE, however, the general ‘rule’ is that diphthongs are frequently realised as monophthongs (Van Rooy, 2004). Different tendencies can be noticed concerning diphthong production in

BSAE, however (De Klerk & Gough, 2002; De Wet et al., 2007; Louw & De Wet, 2007; Van Rooy & Van Huyssteen, 2000).

The first of these tendencies concerns the rising diphthongs; thus those diphthongs where the first element (onset) is a lower vowel, while the second (offset) is a higher vowel, such as [aɪ] in PRICE. During the production of these diphthongs, the offset is tensed in BSAE (Louw & De Wet, 2007; Van Rooy & Van Huyssteen, 2000). There is thus greater lingual movement between the starting point and the endpoint of the diphthong, and the articulation of such diphthongs can be described as “wider” than that of the corresponding WSAfE diphthongs (Van Rooy & Van Huyssteen, 2000, p. 24).

The second tendency concerns the centring diphthongs. These are sounds that have a centralised offset (Crystal, 2008). In BSAE, the offset of centring diphthongs is usually replaced by a lower vowel, usually [a] (Louw & De Wet, 2007; Van Rooy & Van Huyssteen, 2000). Thus, the diphthong [ʊə] in ‘poor’ may be realised as [ua] in BSAE, being positioned more on the outer limits of the vowel space than WSAfE. Concerning centring diphthongs, the general tendency of BSAE to avoid central vowels, result in these diphthongs usually being realised as monophthongs (De Klerk & Gough, 2002; Van Rooy, 2004).

Thirdly, narrower diphthongs such as those in GOAT and FACE (Wade, 1996) with less lingual movement between the onset and offset, are realised as single monophthongs once again (De Wet et al., 2007; Louw & De Wet, 2007; Van Rooy & Van Huyssteen, 2000). The diphthong [æɪ] (Bowerman, 2004) or [əʊ] (Wells, 1982) will thus be realised as [ɔ ~ ɔu] in BSAE Mesolect⁷ or [o~ɔ > əʊ] in BSAE Acrolect. As these narrow diphthongs seem to include central vowels, reducing the diphthong to a single monophthong and in the process avoiding the central segment, holds with the tendency to neutralise central vowels.

⁷ Mesolect can be defined as the intermediate linguistic variety of a language/dialect between the standard (acrolect) and the variety furthest away from the standard, the basilect.

De Klerk and Gough (2002) and Wade (1996) mention that broader diphthongs, i.e. those with more extensive lingual movement such as those in PRICE, MOUTH, CHOICE, NEAR and CURE, are often produced as two monophthong vowels extending over the syllable boundary.

Van Rooy and Van Huyssteen (2000) summarise the discussion concerning diphthongs in BSAE by stating that only one true diphthong occurs, namely [ɔɪ] in CHOICE. They state that the difference between F_1 and F_2 of the other diphthongs are too small to allow these sounds to be classified as diphthongs. Table 11 below portrays the formant values of F_1 and F_2 of BSAE diphthongs as produced by Sotho speakers:

Table 11: Average formant frequencies of BSAE (participants: three male, three female Sotho L1 speakers, aged 18-21 years) diphthongs

Diphthong	F_1 (onset)	F_1 (offset)	F_2 (onset)	F_2 (offset)
FACE	390 Hz	337 Hz	2226 Hz	2314 Hz
PRICE	548 Hz	467 Hz	1913 Hz	1942 Hz
MOUTH	572 Hz	431 Hz	1575 Hz	1528 Hz
CHOICE	417 Hz	367 Hz	1256 Hz	2187 Hz
GOAT	441 Hz	408 Hz	1357 Hz	1496 Hz
SQUARE	426 Hz	404 Hz	2218 Hz	2197 Hz
POOR	399 Hz	464 Hz	1066 Hz	1295 Hz
NEAR	379 Hz	408 Hz	2092 Hz	2100 Hz

The figure on the next page illustrates the diphthongs of BSAE:

Individual vowel formant values non-normalised

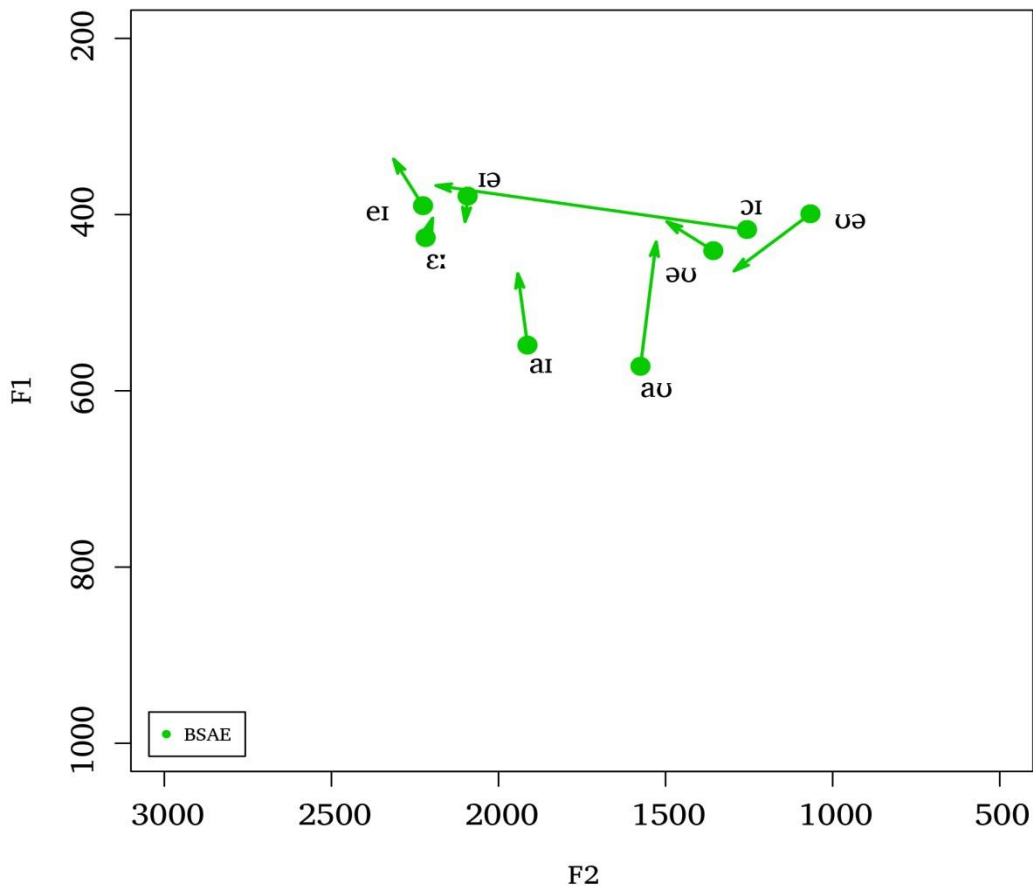


Fig. 14: The diphthongs of BSAE depicted according to formant values determined by Van Rooy and Van Huyssteen (2000).

There are, however, according to Van Rooy and Van Huyssteen (2000), a difference between single monophthongs used in BSAE and the monophthongs that replace the diphthongs. They explain that one reason for this postulation is that the BSAE monophthongs replacing diphthongs could play a role in directing word stress to the final syllable of a word instead of on the penultimate syllable as is usual in BSAE. Another reason stated is the acoustic difference between the monophthongs and diphthongs of BSAE. Van Rooy and Van Huyssteen (2000, p. 30) postulate that there is “a fairly systematic contrast between tense and lax vowels, where the former are acoustically characterised by frequency values corresponding to higher and more centralised vowels.”

There seems to be no question that the vowels of BSAE differ from that of WSAfE in quality as well as in length while BSAE diphthongs generally seem to be monophthongised. The characteristics of both these groups of vowel sounds in BSAE are directly linked to the influence of the vowel systems of the mother tongues of the speakers. With this influence in mind, Wissing (2002) performed a study on the perception of vowels by BSAE speakers. The finding of this study that is most relevant to the current study has to do with the way that BSAE speakers perceive and distinguish English vowels. He found that BSAE listeners perceived the English vowels as produced by English L1 speakers much more accurately than those produced by BSAE speakers and were able to distinguish between the different vowels of English better when listening to English L1 speakers reading target words.

This has relevance to the model of English to which many English L2 learners are exposed in school. If learners are not taught to distinguish the various vowels of English because teachers themselves are not aware of the differences in quality, decoding skills in the reading and spelling process as well as general comprehension must surely be negatively influenced. A good starting point to expanding the English vowel repertoire of foundation phase learners would be to make both teachers and learners aware of the characteristics of the vowel system of the learners' L1 and how it differs from that of English.

4.4.2.1.3 The monophthongs of BSAE compared to the short monophthongs of WSAfE

In Figure 15 a comparison of the vowel spaces occupied by these vowels can be observed. A large difference in occupied vowel space can be noted. Although [ɪ], [e], [ɑ] and [ɒ] share the vowel space, they are far apart in perceptual, articulatory and acoustic characteristics. The only vowels close to one another horizontally and vertically are [ɑ] and [ɒ], and [a] and [e]. Interestingly, Van Rooy and Van Huyssteen's (2000) study indicates that WSAfE [ɒ] is substituted for [ɑ] in BSAE in only 11% of instances. It is interesting to note that BSAE [a] and WSAfE [e] are very close vertically and horizontally, indicating that they are close in quality. The same can be said for BSAE [ɑ] and WSAfE [ɒ].

Individual vowel formant values non-normalised

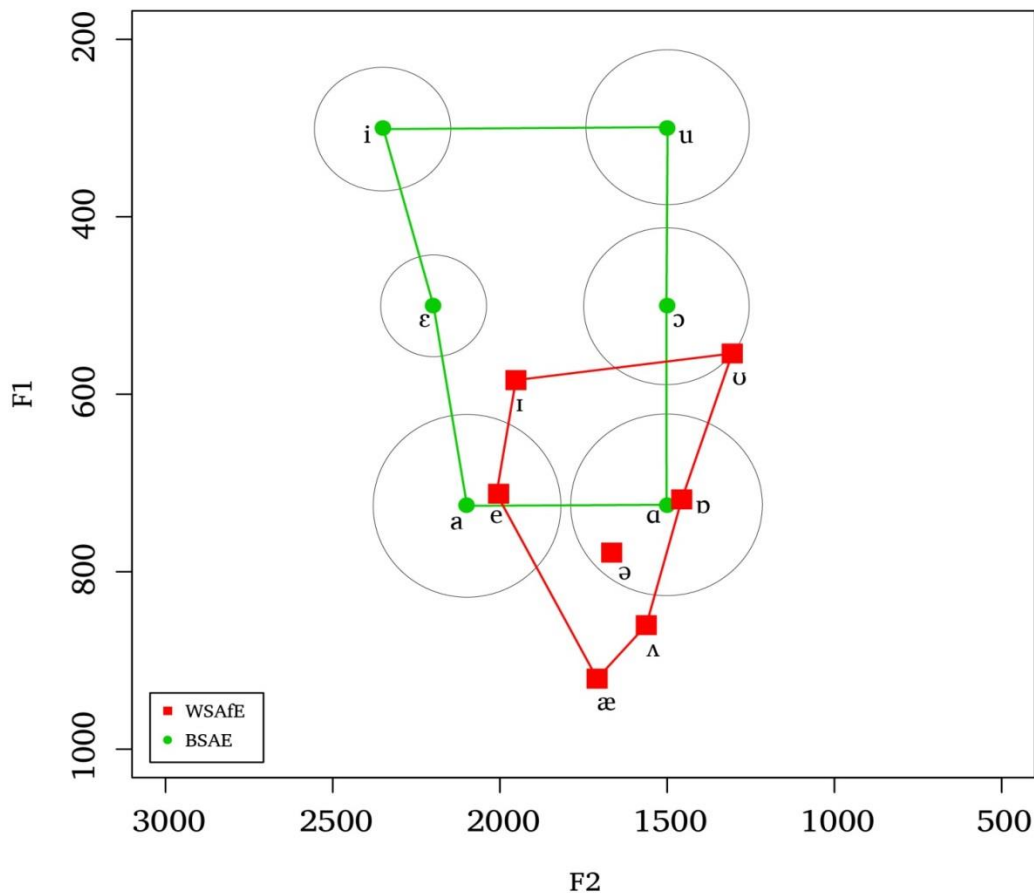


Fig. 15: The vowels of BSAE depicted according to formant values determined by Van Rooy and Van Huyssteen (2000) compared to the short monophthongs of WSAfE depicted according to the formant values determined by Bekker (2009).

4.4.2.1.4 The monophthongs of BSAE compared to the long monophthongs of WSAfE

In Figure 16 the vowel spaces occupied by these vowels can be observed. Although a significant difference in occupied vowel space can be noted, more vowels share the vowel space than in the case of the short WSAfE monophthongs and BSAE monophthongs. In the overlap between vowels spaces the vowels [ɛ], [ɜ:], [u:], [ɔ] and [ɑ] are found. Despite the overlap, only one case of substitution concerning the overlapping vowels were found according to Van Rooy and Van Huyssteen’s (2000) study: [ɜ:] is replaced by [ɛ] in 47% of cases.

Individual vowel formant values non-normalised

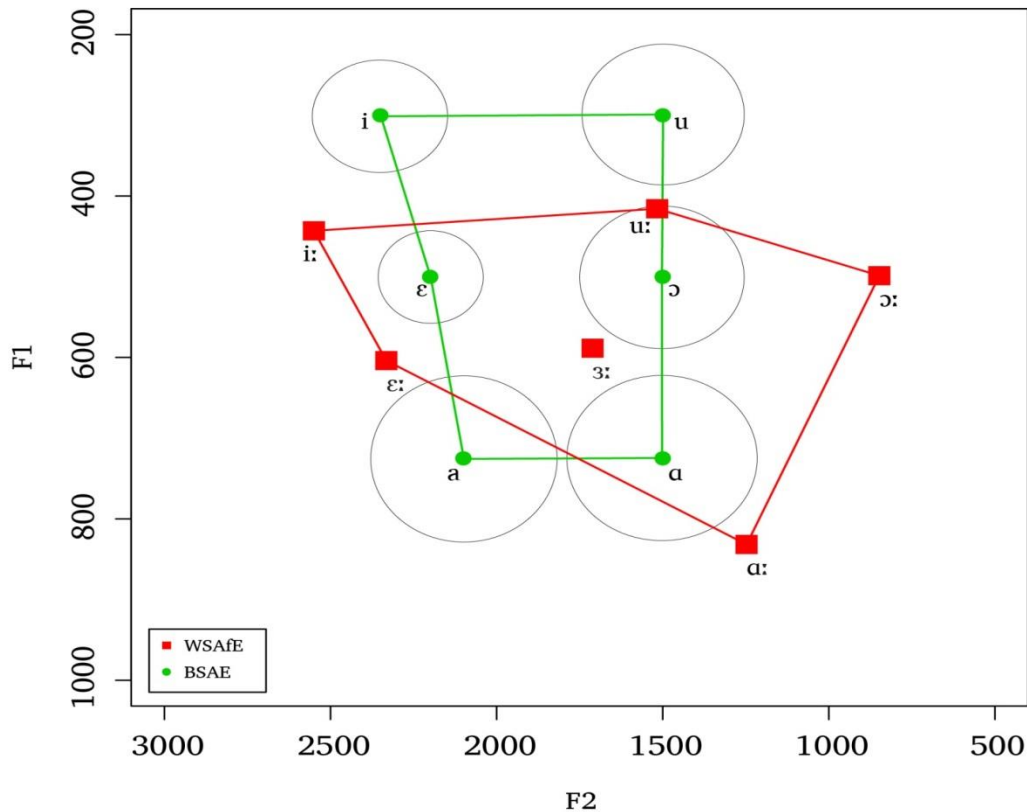


Fig. 16: The vowels of BSAE depicted according to formant values determined by Van Rooy and Van Huyssteen (2000) compared to the long monophthongs of WSAfE depicted according to the formant values determined by Bekker (2009).

4.4.2.1.5 The diphthongs of BSAE compared to those of WSAfE

Contradictory to the statement made by Van Rooy and Van Huyssteen (2000) that BSAE rising diphthongs consist of a ‘wider’ articulation, the offset of these diphthongs seem to be less tense – less than is the case with the corresponding WSAfE diphthongs (see Figure 17). There is less lingual movement between the onset and the offset of the BSAE diphthongs [eɪ], [əʊ] and [aɪ] compared to these of WSAfE. Although the BSAE diphthong [aʊ] shows more lingual movement between the start and end points, it is still less than that seen in the articulation of WSAfE [aʊ].

Concerning centring of diphthongs, it can be noted that centring in BSAE is less obvious than in WSAfE, as mentioned by Van Rooy and Van Huyssteen (2000); it is

absent in the case of [ɪə] while the offset of [ʊə] is moving only slightly towards the centre of the BSAE vowel space.

The BSAE diphthongs [əʊ], [eɪ] and [ɪə] are in fact much narrower than their WSAfE counterparts, although [əʊ] and [eɪ] do not seem to be monophthongised (Van Rooy & Van Huyssteen, 2000). Van Rooy and Van Huyssteen (2000) included the SQUARE vowel as a diphthong [eə] in their list, while it is treated as a long monophthong in WSAfE. In the figure below, it can be seen that this sound is in fact produced as a monophthong [ɛ:]. In Figure 17 it can be observed that this sound and the diphthong [ɪə] are monophthongised as there is very little or no movement between the onset and offset of the diphthong.

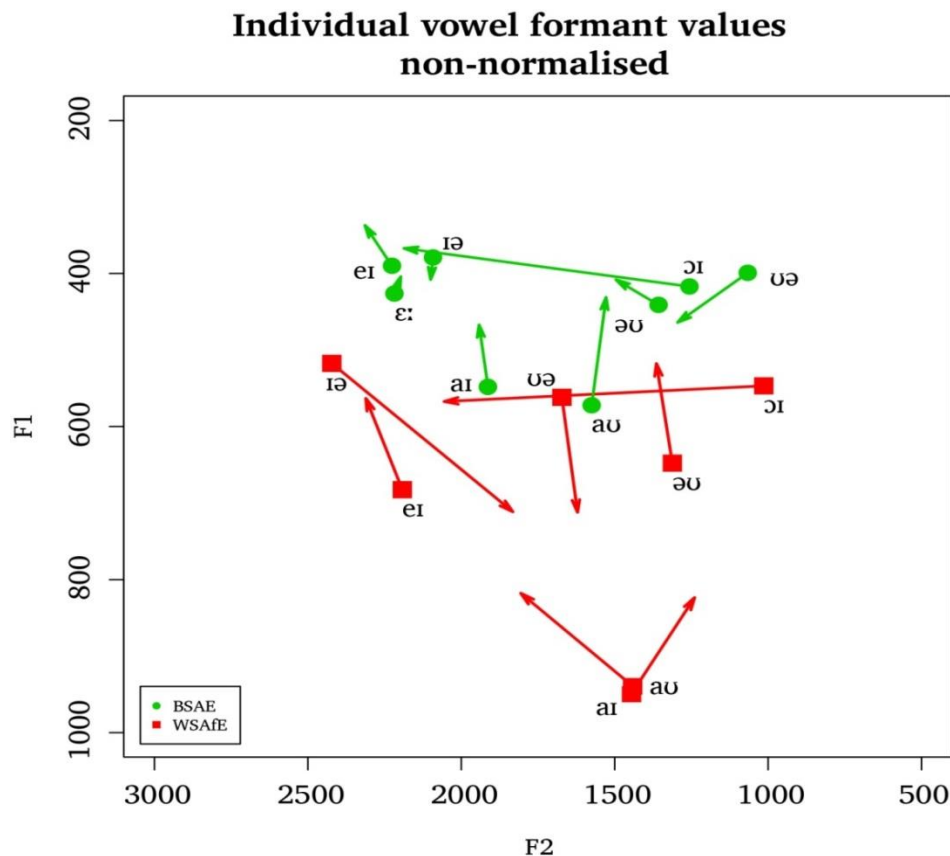


Fig. 17: The diphthongs of BSAE depicted according to formant values determined by Van Rooy and Van Huyssteen (2000) compared to the diphthongs of WSAfE depicted according to the formant values determined by Bekker (2009).

When referring to the phonetic characteristics of L2 varieties of English, such as BSAE in this case, one cannot but mention accent. Crystal (2008) defines accent as

the cumulative auditory effect of those features of pronunciation that differs from the perceived ‘standard’ variety of a language. Since vowels form the nucleus of a syllable and therefore carry the supra-segmental characteristics of speech, accent depends on the articulation of vowels to large extent. Speaking a second or additional language with an accent is normal because of the influence of one’s L1 and such a L2 variety should not be seen as inferior. In the academic environment, however, it seems that the more limited vowel system of BSAE results in meaning loss and may impact on literacy acquisition (Seeff-Gabriel, 2003). Since the majority of African learners complete their schooling in English and study via the medium of English at tertiary institutions, it would be to their advantage if they were taught the more complex vowel system of WSAfE explicitly.

4.5 The vowel system of Setswana

Setswana (S31) is a Bantu language spoken in Southern Africa, belonging to the South Eastern Zone (Ziervogel, 1967). It is one of the three sub-groups of the Sotho language group and is spoken as first language by approximately 8.2% of the population of South Africa (Government of South Africa, 2012a).

The vowel system of Setswana consists of seven basic vowels [i, e, ε, a, ɔ, o, u] and four raised variants of the mid vowels, namely [e̥, ε̥, ɔ̥, o̥] (Snyman, 1989). On the traditional vowel chart below, the vowels of Setswana (in red) are positioned according to their auditory qualities compared to those of the cardinal vowels (in black). The arrows indicate vowel raising:

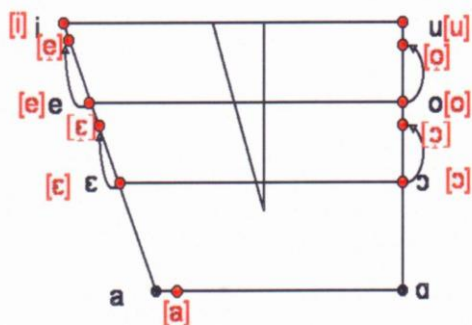


Fig. 18: The vowels of Setswana (Snyman, 1989, p. 58).

The vowels of Setswana, however, can be positioned on a vowel quadrilateral according to their F_1 and F_2 formant values. As was mentioned earlier, such positioning on a figure reminiscent of the traditional vowel chart gives rise to a more reliable form of the vowel space as it not only encompasses articulatory behaviour, but also acoustic properties (Johnson, 1997; Ladefoged & Johnson, 2011; Minifie, 1973; Rietveld & Van Heuven, 2009). The formant frequencies for the Setswana unraised vowels are presented in Table 12 below:

Table 12: The acoustic values of Setswana unraised vowels as determined by Le Roux (2004); participants: three male speakers, aged 32-42 years

Vowel	F_1 (Hz)	F_2 (Hz)
[i]	329	1957
[e]	402	1810
[ɛ]	507	1734
[a]	758	1321
[ɔ]	503	921
[o]	422	807
[u]	306	811

These vowels can be depicted on a vowel quadrilateral showing the vowel space occupied as follows:

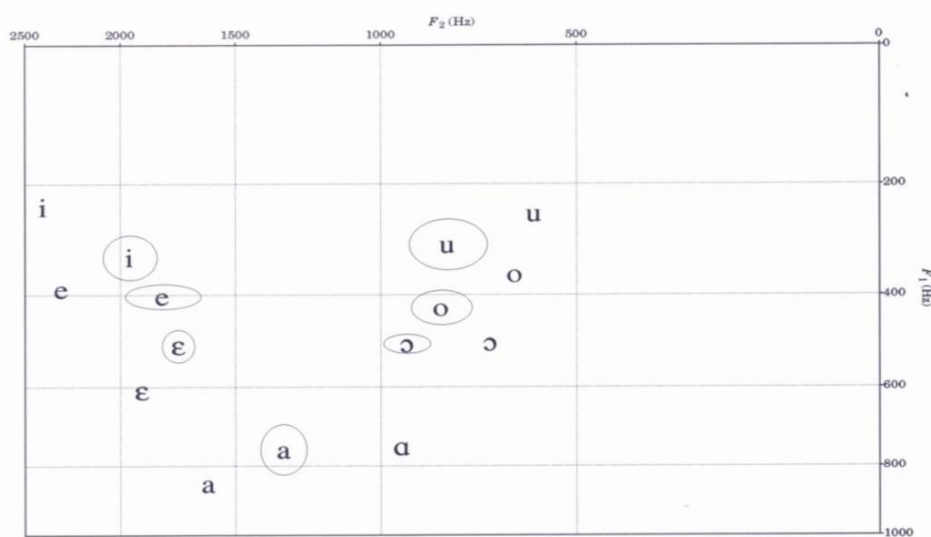


Fig. 19: An acoustic comparison of the unraised vowels of Setswana (circled) compared to the cardinal vowels (Le Roux, 2012, p. 178).

Studying this figure, it is clear that the Setswana vowel space is in actual fact smaller than that of the cardinal vowels as determined by Catford (1988). This means that the vertical lingual modification of the tongue is not so extreme as to position the Setswana vowels as high or as low as the cardinal vowels as is usually done when depicting the vowels on Setswana on a traditional vowel chart. The horizontal movement of the tongue also seems to be less extreme as there is less distance between the front and back vowels of Setswana than between those of the cardinal vowels.

Vowel raising occurs due to the phonological environment in which the mid vowels occur. When the mid vowels [e, ε, ə, o] are followed by a higher vowel, these mid vowels are articulated with the tongue in a higher position. They are then realised as raised allophones of the mid vowels, [e̠, ε̠, ə̠, o̠]. The formant values of the raised vowels appear in Table 13.

Table 13: The acoustic values of mid vowels and the raised allophones of Setswana vowels as determined by Le Roux (2004); participants: three male speakers, aged 32-42 years

Vowel	F ₁ (Hz)	F ₂ (Hz)
[e]	402	1810
[e̠]	367	1856
[ε]	507	1734
[ε̠]	434	1761
[ə]	503	921
[ə̠]	445	937
[o]	422	807
[o̠]	372	875

The position of the unraised or basic mid vowels as well as the raised allophones of Setswana can be seen in Figure 20.

Comparing the unraised and raised vowels of Setswana, it is clear that the raised variants are definitely higher than their unraised counterparts. There is also a large amount of overlap visible amongst the front vowels, meaning that where these vowels overlap, they cannot be perceptually distinguished from one another, confirming Roux's (1983) statement that it is not easy to distinguish these vowels from one another. A lesser degree of overlap exists amongst the back vowels, meaning that these vowels can be more easily perceptually distinguished from one another.

4.6 An acoustic comparison of BSAE and Setswana vowels

When comparing the vowels of BSAE and Setswana, it is interesting to note that the vowel spaces once again show a significant difference, contradictory to what one would expect. Although there is much variation in horizontal tongue movement, the difference in vertical movement of the tongue is not that marked. The Setswana vowels are generally slightly lower than those of BSAE, except for the mid-low vowels, which are identical in height. Compare Figure 22:

Individual vowel formant values non-normalised

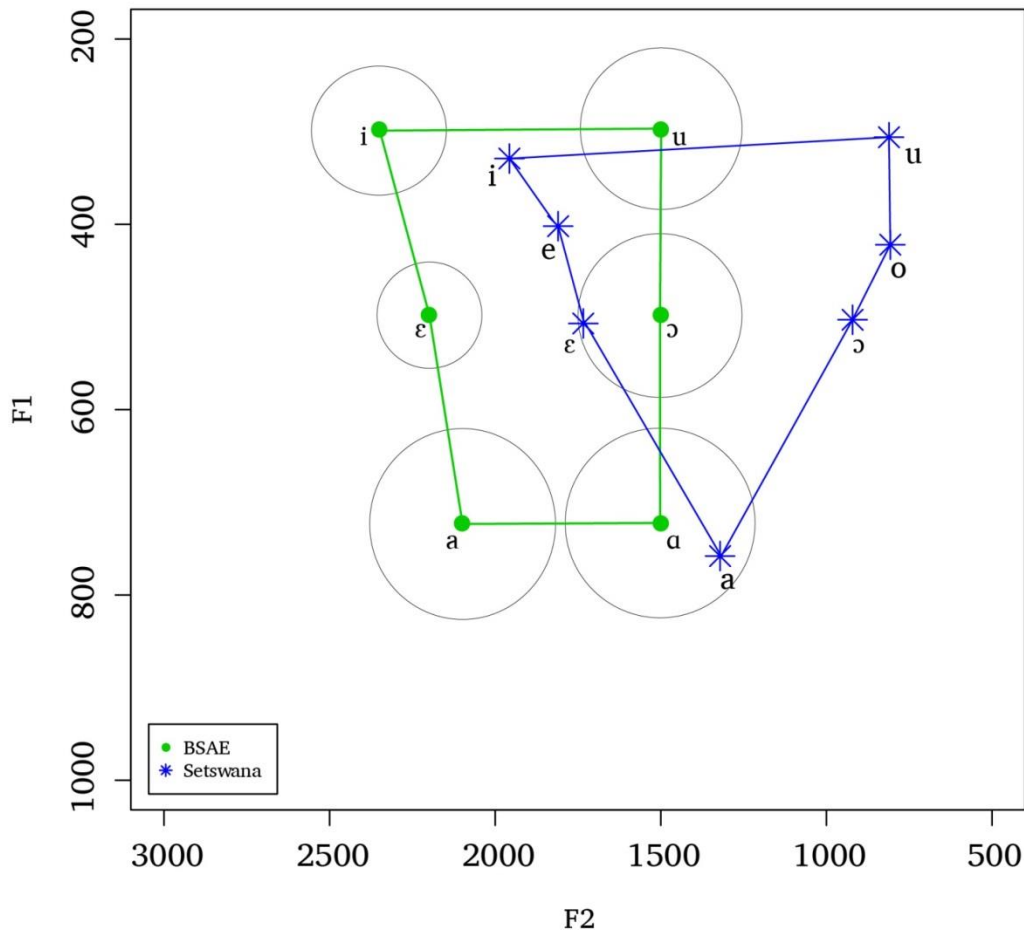


Fig. 22: The acoustic vowel space occupied by Setswana vowels and BSAE vowels as pronounced by Setswana L1 speakers.

4.7 An acoustic comparison of WSAfE and Setswana vowels

The monophthongs of WSAfE are divided into short and long monophthongs and will be compared separately with the unraised vowels of Setswana for reasons of clarity. This comparison will be done by referring to the horizontal and vertical movements of the tongue during the articulation of the vowels.

Such a comparison, however, is reminiscent of the perceptual comparisons and descriptions of early linguists like Frédoux (1864), Brown (1875), Crisp (1881), Wookey (1905), Cole (1949), Sandilands (1953), Ziervogel (1967) and Snyman (1989). Although the vowel spaces occupied by the vowels of these two languages

were determined acoustically – thus much more scientifically than the methods used by the earlier linguists referred to above – it is difficult to compare because of the many differences that are present. It is interesting, however, to observe how much the vowel spaces differ as that gives one an indication of the influence the vowels of Setswana has on that of EL2, and in effect on Setswana-BSAE.

4.7.1 The short monophthongs of WSAfE compared to Setswana vowels

The tables containing the F_1 and F_2 values of the vowels of the two languages will be repeated in this section for the ease of reference.

Table 14: The short monophthongs of WSAfE and the frequencies of their first two formants (participants: 27 females, aged 18-19 years)

Type	Vowel	Context	F_1 (Hz)	F_2 (Hz)
Short monophthongs	[ɪ]	KIT	584.10	1952.33
	[e]	DRESS	712.15	2004.00
	[æ]	TRAP	920.50	1709.50
	[ʌ]	STRUT	860.20	1562.50
	[ɒ]	LOT	718.45	1456.50
	[ʊ]	FOOT	554.05	1305.50
	[ə]	LETTER	778.50	1666.00

The formant frequencies of the F_1 and F_2 of the Setswana unraised vowels are presented in Table 15 below:

Table15: Setswana unraised vowels and the frequencies of their first two formants as determined by Le Roux (2004); participants: three male speakers, aged 32-42 years

Vowel	F_1 (Hz)	F_2 (Hz)
[i]	329	1957
[e]	402	1810
[ɛ]	507	1734
[a]	758	1321
[ɔ]	503	921
[o]	422	807
[u]	306	811

Individual vowel formant values non-normalised

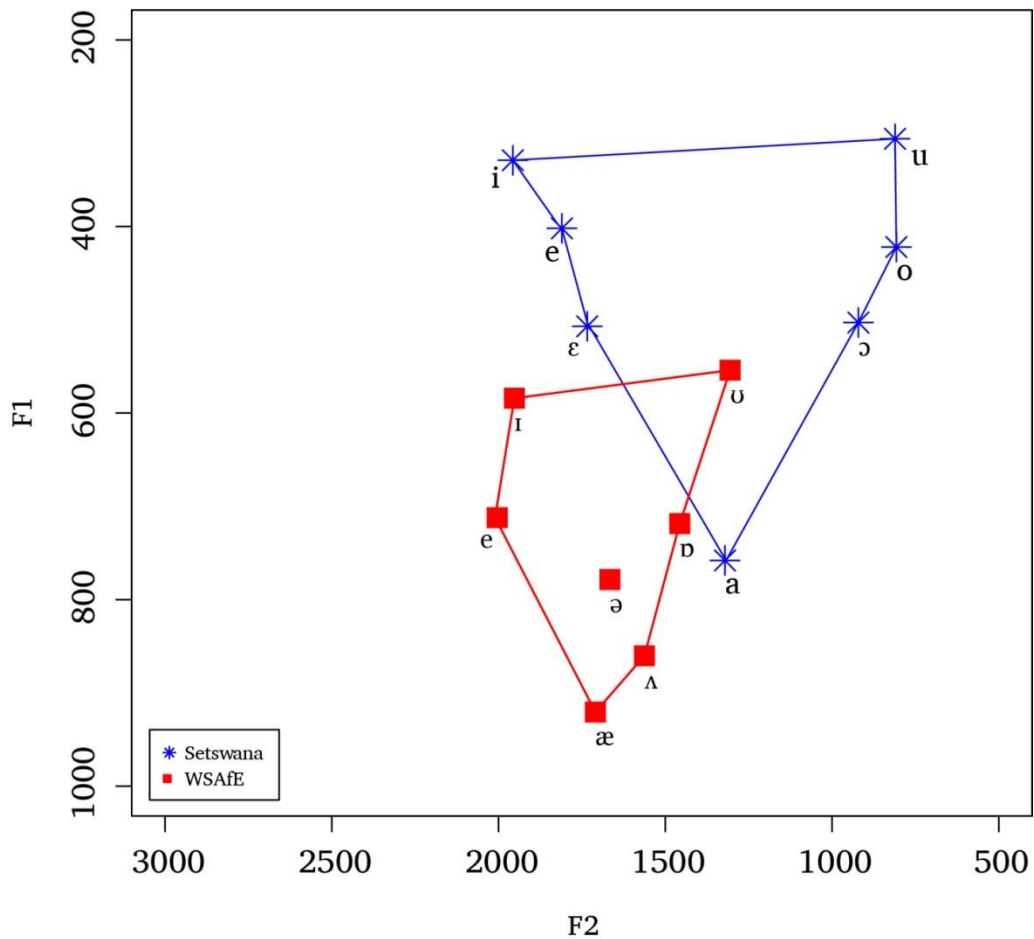


Fig. 23: Acoustic results of the seven unraised Setswana vowels (Le Roux, 2004) compared to the short monophthongs of WSAfE as determined by Bekker (2009).

In general, it can be observed that the vowel spaces are extremely different from one another. The vowel space occupied by Setswana vowels is much larger than that of the WSAfE vowels. This suggests more horizontal and vertical movement of the tongue during articulation. In addition, it proposes that Setswana vowels are articulated more towards the back of the oral cavity. The Setswana vowel system is more balanced with front and back vowels occurring in harmony. The absence of central vowels in the vowel inventory of Setswana is evident. Only during the articulation of [ʊ] is there an overlap of vowel spaces, indicating that although being lower than WSAfE [ʊ], horizontally it is more or less intermediate between Setswana [ɛ] and [ɔ]. The vowels are compared according to lingual movement:

[i]: This vowel is horizontally identical to Setswana [i], meaning that the horizontal movements of the tongue during the articulation of these vowels are the same.

Vertically, however, there is a large difference, meaning that the tongue is raised much higher for Setswana [i] than for WSAfE [i].

[e]: Horizontally, the tongue is far to the front; much more than for Setswana [e], [ɛ] or even [i].

Concerning tongue height, it can be stated that [e] is much lower than Setswana [e] and [ɛ]. It is only slightly higher than the Setswana low vowel [a].

[ə]: This central vowel has no Setswana counterpart as central vowels do not occur in Setswana. It can be observed that it is even lower than the Setswana low vowel [a], but not much.

Horizontally, however, it is very similar to Setswana [ɛ].

[æ]: Horizontally, this vowel is identical to Setswana [ɛ].

Vertically, it is lower than any of the Setswana vowels, however.

[ʌ]: Horizontally, this vowel is articulated with the tongue in a more advanced position than during the articulation of Setswana [a], but more towards the back than during the articulation of Setswana [ɛ]. In addition, it is articulated more towards the back than Setswana mid-low back vowel [ɔ].

It is articulated with the tongue lower than during the articulation of even the Setswana low vowel [a].

[ɒ]: The articulation of this WSAfE vowel is horizontally not much more forward than that of the Setswana front vowel [a], but articulated much more towards the front than the Setswana back vowel [ɔ].

Vertically, however, it is slightly higher than the Setswana [a].

[ʊ]: Horizontally, this vowel is identical to Setswana low vowel [a].

Vertically, its articulation is much lower than the Setswana high back vowel [u]; even lower than that of the mid-low Setswana vowel [ɔ].

When comparing the vowels of these two languages, it seems that some of the vowels are horizontally more similar than others. In this way [i] and [ɪ] are articulated with the place of constriction more or less the same. This could perhaps be why Van Rooy and Van Huyssteen (2000) indicate that 81% of BSAE (Setswana speakers) pronounced the English vowel [ɪ] as [i].

The vowels [ɛ] and [æ] are horizontally identical. This similarity could be the reason why 47% of Setswana participants articulated the English vowel [æ] as [ɛ] (Van Rooy & Van Huyssteen, 2000).

Seeing that the vowel spaces occupied by these two vowel systems are so completely different, larger horizontal differences such as those between [e] and [ɛ] could still be cited as a reason why 43% of Setswana participants articulated the English vowel as [ɛ] (Van Rooy & Van Huyssteen, 2000). The same can be said of [ʌ] and [a]: 59% of Setswana participants articulated this vowel as [a].

The central vowel [ə], when in word final positions, was established to be replaced by [a] and [ɛ] in 51% and 48% of instances respectively (Van Rooy & Van Huyssteen, 2000). This could be because these two vowels are horizontally not too different from one another.

Interestingly, [ɒ] and [a] are not far apart horizontally. The research done by Van Rooy and Van Huyssteen (2000), however, does not indicate any occurrence of [ɒ] articulated as [a].

Vertically, the two sets of vowels are very different. The only vowels which are remotely similar in degree of constriction are [ɪ] and [ɛ]; [e] and [a]; [ɒ] and [a], and [ə] and [a]. The only instances of Setswana participants replacing one member of these pairs of vowels with one another, is in the case of [ə] and [a] where 51% of participants substituted [ə] with [a] (Van Rooy & Van Huyssteen, 2000).

4.7.2 The long monophthongs of WSAfE compared to Setswana vowels

The tables containing the F_1 and F_2 values of the vowels of the two languages will be repeated in this section for the ease of reference.

Table 16: The long monophthongs of WSAfE and the formant frequencies of the first two formants (participants: 27 females, aged 18-19 years)

Type	Vowel	Context	F_1 (Hz)	F_2 (Hz)
Long monophthongs	[i:]	FLEECE	443.10	2550.00
	[u:]	GOOSE	415.75	1516.80
	[ɜ:]	NURSE	588.55	1711.00
	[ɔ:]	THOUGHT	498.70	847.95
	[ɑ:]	BATH	831.75	1247.50
	[ɛ:]	SQUARE	603.90	2332.00

The formant frequencies of the first two formants of the Setswana unraised vowels appear in Table 17 below:

Table 17: Setswana unraised vowels and the formant frequencies of the first two formants as determined by Le Roux (2004); participants: three male speakers, aged 32-42 years

Vowel	F_1 (Hz)	F_2 (Hz)
[i]	329	1957
[e]	402	1810
[ɛ]	507	1734
[a]	758	1321
[ɔ]	503	921
[o]	422	807
[u]	306	811

Individual vowel formant values non-normalised

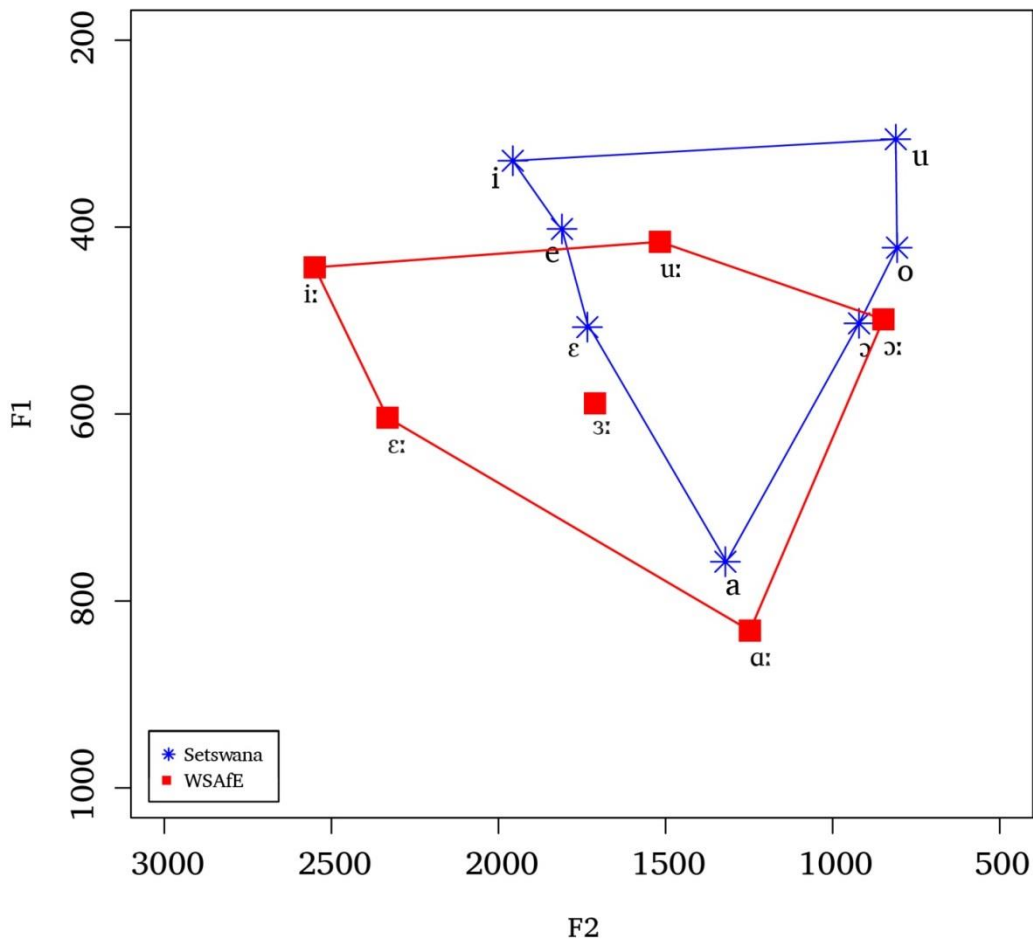


Fig. 24: Acoustic results of the seven unraised Setswana vowels (Le Roux, 2004) compared to the long monophthongs of WSAfE as determined by Bekker (2009).

Although still different, the vowel spaces overlap much more when the long monophthongs of WSAfE are compared to the vowels of Setswana. The vowels [u:], [ε], [a], [ɔ] and [ɔ:] (very close to [ɔ]), share the same vowel space. The vowels are compared according to lingual movement below:

[i:]: Horizontally, this vowel is much more advanced than Setswana [i].
Vertically, Setswana [i] is higher than WSAfE [i:], but the difference is less than when comparing WSAfE [i] with Setswana [i].

[ε:]: This WSAfE vowel is horizontally more advanced than Setswana [ε].

Vertically it is closer to Setswana [ɛ] than WSAfE [ɛ] is to Setswana [ɛ].

[ɑ:]: Horizontally, this vowel is very close to the Setswana low vowel [a]; only slightly more towards the back.

It is only slightly lower than Setswana low vowel [a].

[ɔ:]: This WSAfE back vowel is almost identical to the Setswana back vowel [ɔ], only slightly higher and more towards the back.

[u:]: Horizontally, this vowel is more advanced than the Setswana back vowel [u], more than [u] compared to Setswana [u].

Vertically, however, it is not that much lower than [u]. It is almost at the same height than Setswana mid-high vowel [o]; only slightly higher.

[ɜ:]: This central vowel is horizontally very similar to Setswana [e] and [ɛ]. Vertically, it is similar to the Setswana mid-low front vowel [ɛ].

Regarding place of constriction or horizontal modification of the tongue, the vowels [ɜ:], [ɛ] and [e] are basically identical. This could be the reason why [ɜ:] was produced as [ɛ] and [e] in 47% and 19% of instances respectively in BSAE according to the findings of Van Rooy and Van Huyssteen's (2000) study. Horizontally, [i] and [ɜ:] are very similar, but [ɜ:] was not substituted for [i] according to their study. The vowels [ɑ:] and [a] share almost identical places of constriction. This could be why the study referred to here, found that 59% of participants articulated [ɑ:] as [a]. The back vowels [ɔ:] and [ɔ] are horizontally very close and an 88% substitution of [ɔ:] with [ɔ] were noted.

The vowels [i:] and [i] are relatively close to one another regarding their degree of lingual constriction and this could be why 94% of participants replaced [i:] with [i] in the study of Van Rooy and Van Huyssteen (2000). The same can be said for the back vowels [u:] and [u]. In this case, 83% of participants replaced [u:] with [u] (Van Rooy & Van Huyssteen, 2000). Although the study of Van Rooy and Van Huyssteen (2000) does not provide information on the articulation of the vowel [ɛ:], it can be

noted that it differs not much vertically from [ɛ] and it can be assumed that it could be a reason why [ɛ:] is often replaced with [ɛ] in BSAE, taking the non-occurrence of long monophthongs in Setswana into account. The difference in degree of constriction between [ɑ:] and [a] is not much. Once again, this could be the reason why [ɑ:] is often substituted with [a] in BSAE (Van Rooy & Van Huyssteen, 2000).

Although similarity in the degree of constriction and place of constriction can be cited as possible reasons for the substitutions of sounds that occur as mentioned here, lingual behaviour cannot account for all the differences between WSAfE and Setswana and the resultant BSAE productions. This once again confirms the statement made by researchers that the contour and position of the tongue are not the only factors that determine the acoustic differences between vowels (Fry, 1979; Ladefoged et al., 1972; Lieberman & Blumstein, 1988).

The vast differences in perception and articulation of the vowels of Setswana, WSAfE and BSAE result in a lack of auditory discrimination abilities in young EL2 learners. This impacts on the learners' academic achievement as it has a negative effect on comprehension in the academic environment (Seeff-Gabriel, 2003). The distinction of meaning in many minimal pairs in English, such as 'sick : seek', for example, depends on whether the vowel is a short or long monophthong. Learners who cannot discriminate between such words will experience meaning loss.

Vowel length is not the only factor that determines word meaning. In minimal pairs such as 'bad : bed' substituting the WSAfE vowel [æ] with [ɛ] will affect the meaning of the utterance as well as the learner's comprehension of the intended word. In order for the young EL2 learner to fully benefit from academic activities, he/she cannot afford meaning loss.

4.8 Summary

The quality of a vowel is determined by the complete production process. This includes the behaviour of the main articulators, viz. the tongue and lips as well as the resonance that is generated by the movements of these organs of speech. Lingual

and labial movement during the articulation of vowels gave rise to the classification of vowels as being 'high front vowels, articulated with lip spreading' or 'low back vowels, articulated with the lips in a neutral position', such as [i] and [ɑ] for example. These classifications were (and still are) used to plot the position of the vowels on a vowel chart. Various researchers mention that although this method of discussing the articulation of vowels is useful and widely used, it is not necessarily an accurate depiction of the articulatory vowel space.

Using acoustically determined formant frequencies to determine the vowel space however, is much more accurate. Since lingual behaviour plays an important role in determining the configuration of the oro-pharyngeal resonance chambers and as such in determining the formant frequencies, the vertical movement of the tongue is said to determine the values of F_1 while the horizontal movement determines F_2 . What can be seen depicted as the vowel space can therefore be discussed in terms of lingual modification, although it is not *only* lingual movement that determines the over-all configuration of the vowel space.

Various varieties of English exist in South Africa, some L1 and others L2 varieties. WSAfE is seen as the standard variety as it derives from the white L1 speakers who arrived in the country in the early 1800's. One of the L2 varieties of English spoken in South Africa is BSAE. While WSAfE has seven short and six long monophthongs as well as seven diphthongs, BSAE has six short monophthongs only. The BSAE monophthongs are fewer than those found in WSAfE as BSAE is influenced by the African languages which have a smaller vowel inventory. Setswana, for example, has only seven basic vowels and four raised vowels. Since African languages do not have diphthongs, it makes sense that BSAE, being influenced by the L1 African languages, does not distinguish all the diphthongs. According to research only one true diphthong, namely [ɔɪ], occurs in BSAE.

When comparing the vowels of WSAfE, BSAE and Setswana there is clearly a substantial difference between the vowel spaces of these languages. When the vowel spaces of the EL2 (Setswana L1 speakers) and EL1 participants are compared in Chapter 6, one can therefore expect to see significant differences.

Chapter 5

Method

“The purpose of research is to discover answers to questions through the application of scientific procedures”, (Kothari, 2004, p. 2).

5.1 Introduction and objectives

This study involved the collection and analysis of acoustic data from 42 participants: EL1 and EL2 (Setswana L1, who received instruction through the medium of English from Grade 1) Grade 3 learners. Setswana L1-speaking participants were decided on because of the researcher’s knowledge of the sound system of that language. In addition to the collection of acoustic data, the participants’ auditory processing skills were assessed, focussing on their phonological awareness skills which are deemed necessary for the acquisition of good literacy skills. Data on the literacy skills of both the EL1 and EL2 participants was also collected and analysed. Two sets of data each to address a specific aim of the study were therefore accumulated.

The quasi-experimental research design that was utilised is a well-known design used in studies with human subjects (Mitchell & Jolley, 2013). The design was well-suited for this research project as it aims to indicate a definite variation in the participants’ behaviour (or in this case, skills) pre- and post-intervention. Concurrently, a comparative design was implemented (Antal, Dierkes, & Weiler, 1987).

In order to do the acoustic comparison, norm values for EL1 WSAfE vowels as produced by eight to ten year-old foundation phase learners were needed. A Norm group consisting of EL1 learners was therefore selected against which the two EL2 groups, the Experimental and Control groups, could be compared. The data obtained can be used to fulfil the sub-aim focussing on providing speech-language therapists with information on the production of English vowels by both EL1 and EL2 learners. The research method that was followed in this research project is discussed in detail in the subsequent sections.

5.2. Aims

5.2.1 Main aim

The main aim of this thesis was to assess the effects of intervention on the auditory perception and articulatory skills of EL2 Grade 3 learners concerning the vowels of WSAfE. In order to achieve this, an acoustic phonetic investigation into the differences in vowel space occupied by the English vowels as produced by English L1 and L2 (Setswana L1) speaking learners in Grade 3 was conducted before and after intervention.

5.2.2 Sub-aims

The first sub-aim was to determine the phonological awareness skills of both the EL1 and EL2 participants in this study. The second sub-aim was to supply measurable evidence of the effect of vowel perception and production intervention on the literacy skills of EL2 (Setswana L1-speaking) learners in Grade 3. Flowing from the results of this investigation, educators and educationalists could be reminded of the importance of and the need to focus on the sound system of the LoLT in the ELoLT classroom.

The third sub-aim was to provide speech-language therapists with measureable acoustic evidence concerning the differences in the vowel system of English as perceived by the EL1 and EL2 participants in the study. In addition, the differences in the vowel systems of Setswana and English were evident. Such evidence could enhance auditory perception and pronunciation intervention materials and methods.

5.3 Research design

Burns and Grove (2003) refer to the research design as a scheme for undertaking a research project. This suggests that the research design and method should be of such a nature that it can be replicated. The research design that was used in this study can be described as a quasi-experimental design. Similar to the experimental

design, quasi-experimenters want to demonstrate that a specific change in the participants' behaviour or scores is the result of the researcher administering a specific treatment (Mitchell & Jolley, 2013). A quasi-experimental design can be defined as an experimental design that lacks key components of the true experimental design. The quasi-experimental design may therefore lack a) pre- and post-test design, b) an experimental (or treatment) group and a control group and c) randomly assigned participants.

While this research project adheres to the requirements of the experimental design, randomisation of participant selection could only be taken up to a point – various criteria for participant selection had to be observed in order to limit variables. In addition, the researcher could not control non-treatment variables (Mitchell & Jolley, 2013) such as the language competency of the participants, cognitive ability and class room factors such as the first language of the teachers teaching the two groups of EL2 participants. Although the researcher planned to have the participants in the Experimental group in the classes of EL1 teachers so that the learners would be exposed to EL1 models, the one school could not comply. Learners, including members of the Experimental group, were assigned to new teachers after intervention had started. As a result, nine participants were taught by BSAE-speaking teachers, meaning that the intervention received was not reinforced on a daily basis as suggested by researchers such as Moats (2007). The participants in the Control group were all taught by WSAfE-speaking teachers. A quasi-experimental design is therefore useful for assessing the effects of real-life treatments, especially when researching the effects of intervention on humans (Mitchell & Jolley, 2013).

The researcher did, however, go to much effort to rule out the effect of non-treatment variables that, other than the intervention given, may have caused a change in the participants' scores (Campbell & Stanley, 1963). The variables that were addressed are *Testing* (pre-test – post-test design), *Maturation* (period between pre-test and post-test was kept to a minimum to eliminate biological changes), *Instrumentation* (standardised tests were used for assessment), *Regression* (the mean of all results of participants were used; not individual scores), *Mortality/Attrition* (intervention was

presented in such a way that the participants enjoyed the experience and did not drop out of the project) and *Selection* (the selection criteria was such that the participants in all groups were as similar as possible).

Simultaneously, the study also utilised a comparative design as a Norm group is involved against which the Experimental and Control groups were measured pre- and post-intervention (Antal, Dierkes, & Weiler, 1987). Therefore, not only were the results of the Experimental and Control groups measured before and after intervention, but the results obtained from these two groups were also compared against that of a Norm group. This was necessary as a norm for acoustic values of WSAfE vowels as produced by eight to ten year old foundation phase learners does not exist for either EL1 or EL2 speakers.

5.4 Participants

5.4.1 Criteria for selection of participants

5.4.1.1 Norm group

Fifteen eight to ten year old English L1 learners were selected. However, only twelve of the selected participants took part in the project. The participants who were selected to serve as a 'norm' for the articulation of the English vowels were English L1 (General White South African English mother tongue) speakers. Bekker (2009; 2012) states that the variety of English spoken by these members of society can be seen as standard South African English (See Chapter 4 where certain varieties of South African English were discussed). These participants attend an English medium school in Pretoria.

5.4.1.2 Experimental group

Fifteen eight to ten year-old English L2 (Setswana L1-speaking) learners were selected to function as the Experimental group. These participants received

additional input concerning the vowel system of English in the form of intervention by final year EL1 speech-language therapy (SLT) students.

The Experimental group were English L2 learners attending two primary schools in the Moot area of Pretoria. Their mother tongue or first language is Setswana. This group of learners received instruction through the medium of English from Grade 1. Two different schools were involved in this research project as enough Setswana L1 speakers who were willing to participate could not be found in either one of the two schools that were willing to participate.

5.4.1.3 Control group

Fifteen eight to ten year-old English L2 (Setswana L1-speaking) learners were selected as participants in the Control group. These participants did not receive intervention.

The participants are English L2 learners. Their mother tongue or first language is Setswana. They too received instruction through the medium of English from Grade 1. They were selected from the same schools as participants in the Experimental group.

5.4.1.4 Age

All participants were in Grade 3 and were between eight and ten years old. The reason for focussing on this age is because it is the age of learners in the last year of the foundation phase of primary school. Learners were thus exposed to English as medium of instruction for three to four years. Keeping in mind the influence of a critical age of language acquisition as suggested by researchers such as Lenneberg (1967), Flege (1981) and Long (1990), learners who are within this age-bracket may just still fall in the range where optimal acquisition is possible, since these learners are still pre-pubescent (Flege, 1981). On the other hand, as these learners are older (than pre-schoolers, for example), one might expect that they have a better knowledge of their L1 (Setswana), which should assist them in acquiring a second

language (Bongaerts, Planken, & Schils, 1995; Janich, 2004). Basic literacy skills should also have been established. These skills were necessary for the reading and spelling assessments in this study.

5.4.1.5 Gender

The subjects were male and female. The reason for choosing participants from both genders was that as they were pre-pubescent and thus gender should not have a major influence on the acoustic data generated. Another reason was that at least 15 Setswana L1-speaking learners were needed as participants in each group. Not enough male-only or female-only learners were available for selection at the primary schools that were willing to take part in this research project.

5.4.1.6 Socio-economic and geographical status

All groups attended former Model C primary schools. The schools were in the Pretoria area, because this area was convenient for both the researcher and the students who provided intervention. The school attended by the participants in the Norm group was in a higher socio-economic area. Although the schools attended by the participants in the Experimental and Control groups were in lower socio-economic areas than that attended by the Norm group, the participants in the Experimental and Control groups were not necessarily from lower socio-economic households: according to the records of these schools, many parents found it logistically easier to enrol the children in those particular schools due to their proximity to various main routes into the CBD and surrounding areas of Pretoria.

5.4.1.7 Normal speech and hearing ability

All participants had normal speech ability and hearing as assessed by the teachers who taught the participants from Grade R or Grade 1 to the end of Grade 2.

5.4.2 Procedure for selection of participants

- Various schools in the Pretoria area were contacted, but only three schools were willing to participate in the research.
- Participants were randomly selected, with certain restrictions such as age, first language, normal speech, hearing and cognitive abilities and level of schooling.
- After permission to conduct the research at these schools was received from the Gauteng Department of Education (See Appendix A3), letters of consent were distributed to the principals of the schools, the chairmen of the school governing bodies, the heads of department of the foundation phase and the parents (See Appendices A4 to A7). The participants themselves received a page with a 'smiley face' and a 'sad face' (See Appendix A8) which they could use to indicate whether they would like to continue with the intervention or not.

5.5 Materials

- A monosyllabic, age-appropriate word list (Appendix B1) was compiled with input from experienced speech-language therapists. This word list was designed in such a way that it contained all the different monophthongs and diphthongs of English. The word list was planned to contain three token words containing each vowel according to Wells' (1982) lexical sets. (See Chapter 4 for an explanation of the notion of 'lexical sets'). The word list was structured to be culture-sensitive as well as geographically and socio-economically relevant. The majority of the participants in the Experimental and Control groups, however, could not read this monosyllabic, age-appropriate word list and the word list could therefore not be used for recording purposes.
- Picture cards to elicit words containing the various vowels (monophthongs and diphthongs) of English were designed to replace the above-mentioned

word list (See Appendix B3). Each vowel was represented by three token words (See Appendix B2).

- A Lenovo notebook G550 using a Microsoft LifeCam as a recording device with an external microphone was used for recording of the participants' production of the words.
- The Test of Auditory Processing Skills, Third edition (TAPS-3) (Martin & Brownell, 2005) was used to assess the auditory processing of all three groups of participants. This test comprises various sub-tests. The first three sub-tests deal with phonological processing and were the focus of this thesis. These sub-tests assess Word Discrimination, Phonological Segmentation and Phonological Blending. Although working memory influences phonological awareness skills, the next section of the TAPS-3 which deals with memory, was not focussed on, although its results will be presented as part of the overall standard index scores of the tests. The reason for this is that the intervention plan focused on phonological abilities and not on memory per se. Lucker (2012, p. 2) corroborates this decision by stating "tests of memory are not tests of auditory processing."

The TAPS-3 was selected because it assesses the auditory skills necessary in academic activities, inter alia. Not only does this test assess the phonemic skills of blending and segmentation, it also focuses on the discrimination of phonological similarities and differences in word pairs. As word discrimination plays an important role in especially the L2 class room, it was necessary to determine the participants' skills on this sub-test.

The sub-tests selected also provided information on spelling and reading abilities, further justifying the choice of the TAPS-3. Another reason for selecting this test was that the student SLT students who assisted with the assessment of the participants were skilled in using the TAPS-3.

- The One-minute Reading Test (Transvaal Education Department, 1987) was used to assess the reading ability of all three groups. This test consists of 158 single-syllable words that are read against time, within a time limit of one minute. The test measures reading accuracy to produce a chronological reading age. This test was added to the test battery as it is time-efficient and consists of words which were deemed to be age-appropriate. The reading style is artificial in that the words are not associated in sentences, but the format provides a standardised means of measuring reading fluency and accuracy. The number of correct words read within the allotted time period is noted and corresponds with a reading age equivalent ranging from 6 years 6 months to 13 years 10 months.
- The UCT Spelling Test (University of Cape Town, 1985) was used to assess the participants' spelling skills. The UCT Spelling Test is a graded spelling test that was standardised in South Africa. This made it an appropriate spelling assessment tool for the study. The test is frequently used in the academic environment and does not take long to administer. Its list of 100 words starts from simple one and two letter words and increases in complexity to senior phase words. When the participant writes five consecutive incorrect words, the test is stopped and the correct words are counted. The score can then be translated into a spelling age ranging from 5 to 14 years 6 months.
- An intervention plan was designed with the input of qualified and experienced teachers and speech-language therapists. (See Section 5.7 and Appendix C1 for a detailed description of the intervention plan).

5.6 Procedures

5.6.1 Procedure for data collection

- After consent was received from the various stakeholders mentioned in Section 5.8, the participants in all groups were assessed to determine their reading and spelling skills as well as their auditory perception/processing. The

tests were administered in a classroom or office at the schools by female English L1-speaking speech-language therapy students who were trained to use the tests. The order of the tests was randomised to counterbalance effects of fatigue on the last administered test. Testing took approximately 60 minutes per participant. The results were calculated and stored.

- Following the assessments referred to above, the participants were recorded when saying words as elicited by the picture cards explained in Section 5.5. Initially, the participants were asked to read a monosyllabic, age appropriate word list (See Appendix B1). Less than 50% of the participants in the Experimental and Control groups could read the word list, however. In order to have the participant produce the required English vowel or diphthong, it was decided to use picture cards to elicit the required words (See Appendix B3 and B2). The SLT students elicited the required word by showing the picture card to the participant and prompted with a sentence such as:

‘This is not my mother, it is my ...’ (Showing a picture of a man and woman and pointing to the man). The desired word is ‘father’.

The recordings were made in a room in the administrative area of the schools. Although it was not close to the classrooms or playgrounds, it was quite noisy with many interruptions such as lawn mowers, phones and the ringing of the school bell. All precautions possible were taken, however, to assure the best recording quality possible. The windows and doors were covered with blankets and a blanket was used to cover the table on which the recording equipment was positioned to minimise reverberation. The microphone was positioned about 15cm away from the participants’ mouth. After asking permission from the head of the foundation phase all participants were ‘rewarded’ for participation with fruit juice and a sweet.

- Six-thousand-seven-hundred-and-seventy-two sound files were recorded, and 5375 of these were used for analysis purposes. The reason why not all 6772 sound files were used was that some of these files were corrupted due to

noise from the environment such as the school bell, teachers that talked loudly outside the door, etc. In addition, some of the recordings were unintelligible as the participant spoke too softly or moved around during the recording. The sound files were accumulated by eliciting three token words for each English vowel and diphthong. In addition, various minimal pairs were formed and three token words for each minimal pair were elicited. The recordings were cut and saved according to the various lexical sets.

- After the Experimental group received 12 weeks of intervention the participants in each group were once again assessed using the same procedures, materials and tests referred to in Section 5.5. The results were calculated and stored.
- The participants were also once more recorded when producing the words elicited by means of the picture cards. All steps mentioned during the pre-intervention process of recording were once again taken to ensure the best possible recording quality.

The post-intervention recordings were made during winter and some of the participants were wearing Drimac jackets. These participants were requested to remove their jackets as it produced a rustling noise when they shifted around during the recording session. Some of the participants had post-nasal drips which resulted in undesired vocal cord vibration during speech. All participants were then requested to blow their noses and clear their throats before recordings started.

5.6.2 Procedure for data analysis

- The 5375 operational sound files generated by all three groups of participants, were analysed, and the vowel spaces drawn in the following ways:
The recordings were automatically segmented and transcribed to obtain the steady state of each vowel using an algorithm developed by Van Niekerk (2009). Manual quality control of the transcription was done in the acoustic

analysis program Praat (Boersma & Weenink, 2014), by making use of standard segmentation procedures, such as a sudden spectral change, used to determine the position of a boundary (Yuan, Ryant, Liberman, Stolcke, Mitra, & Wang, 2013).

The formant values of the short and long monophthongs were extracted from the segmented files by making use of Voice Sauce (Shue, 2010). During the analysis of the short monophthongs, a total of 224400 measurements were made, while a total of 238058 were made when the long monophthongs were analysed. The large number of measurements on the monophthongs was obtained by determining about 6000 data points (dependent on the length of the vowel) per vowel per group pre-intervention and again post-intervention. Thus, for the schwa for example, 4403 measurements were made in the Control group pre-intervention. This approach was used because the frequencies of all formants were not always easily measured as one reading at the steady state of the vowel. It was therefore decided to make numerous measurements in order to obtain a more reliable average formant frequency value. The formant values of the diphthongs were extracted by making use of PHONAAS (Wissing & Pienaar, 2015). PHONAAS takes the first measurement on 10% of the length of the diphthong, and the end measurement on 90% of the length of the diphthong. When the diphthongs were analysed only one measurement was therefore taken at the onset and the offset of each diphthong (10% and 90%), resulting in 1677 measurements.

The formant values extracted were then plotted on graphs by making use of W-NORM (Wissing & Pienaar, 2015). W-NORM calculates the mean value for the vowel group and then plots it on a $F_1 - F_2$ graph, with F_1 values on the vertical axis and F_2 values on the horizontal axis. This graph depicts the vowel space in which the vowels are articulated as the F_1 values on the vertical axis depict the vertical movement of the tongue, while the F_2 values on the horizontal axis depict the horizontal movement of the tongue.

The vowel space occupied by the three groups of participants was compared before and after intervention. Based on the comparison of the vowel space, it could be determined whether intervention concerning the different acoustic qualities and articulatory characteristics of English vowels improved the auditory discrimination and articulatory abilities of young EL2 learners.

- In addition to comparing the vowel spaces of the three groups of participants pre- and post-intervention, between-group comparisons of the distance between the F_1 (and F_2) position pre- and post-intervention were made. These calculations were used to determine how much (and if at all) the frequencies of the first and second formants changed post-intervention.

The mean pre- and post-intervention formant frequencies and standard deviations of the vowels were determined. The distances between the Norm and Experimental, Norm and Control and Control and Experimental groups' mean pre-intervention F_1 and F_2 frequencies were then determined. A similar calculation was carried out for mean post-intervention F_1 and F_2 distances between the same groups. The difference between these mean pre- and post-intervention distances was also determined for each between-group comparison.

The distance between the F_1 of each group's production and again between the F_2 of each group's production were measured using the following formulae:

$F_1: \sqrt{(y_2 - y_1)^2}$ where y_2 is the Norm group value and y_1 is the Experimental group value pre-intervention on the vertical axis.

$F_2: \sqrt{(x_2 - x_1)^2}$ where x_2 is the Norm group value and x_1 is the Experimental group value pre-intervention on the horizontal axis.

These formulae allowed the measurement of the distance between two positions, one on the x-axis and one on the y-axis. The calculations of the

difference in distance between the formant values of each vowel as produced by the three groups, as presented in the tables on the next pages, were done as follows:

The EL2 groups' F_1 value pre-intervention was subtracted from the Norm group's F_1 value pre-intervention. The same procedure was followed for the post-intervention values, as well as for the F_2 values. The mean differences⁸ in distance between F_1 and F_2 as produced by the different groups, pre- and post-intervention, could therefore be compared and discussed. Since F_1 was plotted on the y-axis and F_2 on the x-axis, this formula in effect enabled the discussion of the vertical and horizontal movement of the tongue respectively.

- Significance tests are influenced by the sample size, and a very large sample size will result in even trivial differences between groups being regarded as statistically significant. The sample sizes of acoustic measurements for each vowel in this study were in excess of 2000, an extremely large sample size which would result in all differences tested being highly significant. Therefore, effect sizes provided a more useful description of the magnitude of differences between the groups in this case, and Cohen's d effect sizes (Cohen, 1988) were calculated. Cohen's d expresses the mean difference between two groups in terms of standard deviation units (Cohen, 1988). Smaller standard deviations, indicating a more homogenous sample group, will result in a larger effect size. Conversely, smaller effect sizes will be noted in sample groups with highly variable data. It is possible to have a large percentage difference between two groups, but small effect size if the standard deviations are large (Coe, 2002). The more variable the data is, the greater the mean difference would have to be between the two groups for a large effect size to be observed.

⁸ Difference = Mean post-intervention value – Mean pre-intervention value: If the difference in distance is <0 (i.e. a negative value): the distance has decreased, signalling an improvement towards the Norm group's production. If the difference in distance is >0 (i.e. a positive value): the distance has increased, signalling a movement away from the Norm group's production.

The interpretation of Cohen's d is dependent on the research question at hand, and a small effect may still produce clinically significant results. Cohen (1988) provided a standard guideline as to the interpretation of the effect size viz. an effect size of 0.2 represented a small effect, 0.5 a moderate effect and 0.8 an effect of large practical significance. For the purposes of this study, the magnitude of the effect sizes was defined as follows (Becker, 2000):

<0.1	Negligible
0.1-0.35	Small
0.36-0.65	Moderate
0.66-1.0	Large
>1.0	Very large

- The auditory perception/processing of the three groups of participants were tested by using the TAPS-3. The overall score of the TAPS-3 is based on the sum of all the scaled scores of the sub-tests, and are reported as standard scores (Martin & Brownell, 2005). The scaled scores range from 1 to 19 in value. The standard scores are based on a population distribution with a mean of 100 and a SD of 15. Therefore, a standard score of 100 indicates that the participant's performance is at the mean of a particular age group.

The overall results are presented, but the focus was on the results of the first three sub-tests dealing with phonological ability. The results of the sub-tests Word Discrimination, Phonological Segmentation and Phonological Blending are presented separately as well because of their importance to this study. The results of all three groups of participants were compared pre-intervention and again after intervention was given to the Experimental group. The results are presented in tables and bar graphs in Chapter 6.

- The data on the reading and spelling assessments were analysed according to the design of the respective tests. The scores of the One-minute Reading Test relate to the number of words read correctly in one minute. The results are presented as mean raw score per group in Chapter 6. The scores of the UCT Spelling Test relay the number of correctly spelled words. The score is

then translated into a spelling age ranging from 5 to 14 years 6 months. The mean value of the raw score per group is presented in Chapter 6.

The results of all three groups of participants were compared pre-intervention and again after the Experimental group received intervention. The results are presented in table format and bar graphs in Chapter 6. Data was analysed using Stata 12.1. Descriptive statistics were calculated for all variables, viz. mean and standard deviation. In addition, the median and interquartile range (IQR) was determined for the highly skewed pre-test scores for spelling and phonological blending. A two-way ANOVA was carried out on the data to identify main effects and possible interactions between treatment (groups) and time (pre- and post-intervention). Main effects and interactions were considered significant if $p < 0.05$. Post-hoc Student's t-tests were used to examine further individual differences in the pre- and post-test results of normally distributed variables, both between and within each of the participating groups. Likewise, the Wilcoxon signed-rank test (McDonald, 2014) was used in the analysis of non-normal variables. A Bonferroni adjustment of $p < 0.0167$ was applied to the pairwise test results, thus taking the effect of multiple comparisons on significance levels into account.

5.7 Intervention description

For the vowel perception and production intervention, the researcher, in conjunction with three experienced speech-language therapists and an experienced foundation phase teacher, combined the Traditional Approach (Van Riper & Emerick, 1984) and Cycles Phonological Remediation Approach (Hodson, 2006) to compile the intervention programme (See Appendix C1). Aspects taken from the Traditional Approach followed a specific course of intervention beginning with sensory-perceptual training (ear training) which consisted of identification, isolation, stimulation, and discrimination of the vowel contrasts. The sensory-perceptual training was enhanced by the use of real-time spectrographic analysis (Huckvale, 2013). Each vowel was produced in isolation, and the real-time spectrogram provided visual reinforcement of the participant's production compared to the

therapist's. The use of visual reinforcement is an essential part of pronunciation training as it enables participants to focus on movement outcomes as a result of the movement characteristics.

Perceptual training was followed by production training in which the target vowel sound was established or acquired and then stabilised (Creaghead, Newman, & Secord, 1989). In order to stabilise the sounds, the participants were given the opportunity to practice the production of the vowel sounds in isolation, nonsense syllables and words. Adapted aspects of the Cycles Phonological Remediation Approach (Hodson, 2006) were also used to guide the intervention programme. Since intervention was given only once a week instead of daily as suggested by research (Trehearne et al., 2004), revision was deemed to be necessary and more in line with educational approaches. Therefore target sounds from the previous session were reviewed with some production practice of words from the previous session. Thereafter a listening activity was done followed by production practice (See Appendices C2 and C3). The sessions incorporated segmentation and blending activities since research indicates that this is the way in which phonemic awareness skills should be taught to enable reading and spelling ability (Moats, 2007). These activities also emulate the approach that teachers (may) use to teach literacy skills, which could enhance the benefits of the intervention.

The words for reading and spelling practice were selected using age-appropriate reading lists as suggested by the Curriculum Assessment Policy Statement (CAPS) (Government of South Africa, 2011b). (See Appendices C2 and C3). Ten words for spelling and ten words for reading were randomly selected for each vowel where possible. The words presented in the sessions were not in the UCT Spelling Test (1985) or in the One-Minute Reading Test (Transvaal Education Department, 1987) used for assessing the participants.

The researcher targeted each of the 20 WSAfE (Bekker, 2009) vowel sounds with a maximum of two vowel sounds covered in each session. A total of 12 weekly intervention sessions were conducted. During every second intervention session, a single vowel sound was targeted. The intervention session was then concluded with

revision of the vowels previously treated. When no revision was conducted, two vowel sounds were targeted.

Each session lasted approximately 45 minutes. The session was conducted in a group setting with three participants in each session with one student SLT conducting the session. When two vowel sounds were targeted, the student SLTs would introduce the first vowel sound and perform the discrimination, production and reading task. The second vowel sound would be introduced and targeted. The vowel sounds were then targeted concurrently for the spelling task. The intervention programme followed a set structure for each session (See Appendix C1). During sessions, the student SLTs gave augmented verbal feedback about the different auditory and articulatory characteristics of the relevant vowel(s) to the participants. This feedback was sustained for the duration of the study.

5.8 Ethical considerations

Permission to conduct the study was obtained from the relevant ethics body of the University of Pretoria (See Appendix A2). Permission was also obtained from the Gauteng Department of Education (See Appendix A3). Consent was requested and received from the principals and governing bodies of the participating schools (See Appendices A4 – A6 and Appendix A9). Parents of participants signed a consent form (See Appendix A7) while participants had a ‘happy face’ and a ‘sad face’ card to show when they did not want to participate any longer (See Appendix A8). During all assessments and intervention sessions, care was taken to minimise any discomfort that the participants might have experienced. Participants were praised for their diligence and willingness to participate. None of the participants withdrew from the project and all of them indicated that they enjoyed the sessions and were looking forward to the interaction with the student SLTs.

The Control group did not receive intervention concerning the vowel system of English by the SLT students. Should the results of this study indicate that additional input is beneficial to EL2 learners, the parents of this group may request similar

intervention that will then be arranged. The data collected for this study will be stored for 15 years by the University of Pretoria.

5.9. Presentation of results and discussion

The results pertaining to the main aim were presented first. The pre-intervention results were presented first, followed by the post-intervention results with the comparison between pre- and post-intervention results presented last. At the completion of the presentation and discussion of the results pertaining to the main aim, the results and discussion of the sub-aims relating to phonological awareness skills and literacy skills followed. The third sub-aim, namely to provide SLTs with acoustic data concerning the discrimination and articulation of the English vowels of Grade 3 EL1 and EL2 learners, was not addressed as a separate aim. The presentation and discussion of the data of the main aim were considered as sufficiently illuminating of this sub-aim.

5.9.1 Results of acoustic analysis and resultant vowel space

The vowels of WSAfE were divided into three groups: short monophthongs, long monophthongs and diphthongs, as discussed in Section 4.4.1 of Chapter 4. The results of each group of vowels were presented and discussed separately. This approach was necessary as the figure depicting the vowel space would have become too cluttered if all vowels were depicted simultaneously on one figure. The results of the acoustic analysis of each of these groups were compared across the three groups of participants, pre- and post-intervention.

The mean F_1 and F_2 values of each vowel in each of the three groups were presented in a table. The reason why the values of these two formants are presented was discussed in detail in Chapter 4, Section 4.3.2.3. Following the table, a figure depicting the vowel space occupied by the vowels belonging to each of the three groups of vowels, was provided. Between-group comparisons of the difference in distance between mean F_1 and F_2 (respectively) pre- and post-intervention were made, based on calculations made using the formulae presented on pp.170. The

discussion of the results followed. The discussion centred round the comparisons made. At the completion of these discussions, a general discussion of the results is presented in order to try to provide possible reasons for the formant behaviour of the different vowels, and the resultant positions in the vowel space.

5.9.2 Results of phonological awareness skills, reading and spelling assessment

The over-all mean standard results of the TAPS-3, the results of the sub-tests focussing on phonological awareness skills, namely Word Discrimination, Phonological Segmentation and Phonological Blending, as well as the results of the reading and spelling assessment, pre- and post-intervention, were presented in tables and bar graphs, and subsequently discussed. The discussion focused on the comparison of the results obtained by all groups.

5.10 Summary

In this chapter the research design that was utilised was discussed and it was explained why the quasi-experimental design was selected. The method adhering to the guidelines of this design was discussed in detail. The discussion included the main and sub-aims, selection criteria of the participants, the materials such as standardised tests used, the procedures for data collection and analysis, and a description of the intervention that took place. A detailed description of the ethical considerations that were adhered to was given, being in line with the quasi-experimental design which is often used when human participants are involved in a study.

Finally, an exposition of the way in which the results will be presented and discussed in Chapter 6 was given. With the background prepared, the next chapter contains the crux of this study, namely the results obtained during this research project and the discussion thereof.

Chapter 6

Results and discussion

“All progress is born of inquiry”, Hudson Maxim (1853-1927).

6.1 Introduction and objectives

Having provided the theoretical background to this study in Chapters 2 to 4 and the method in Chapter 5, this chapter will focus on the presentation of the results and discussion thereof. The first results that will be presented and discussed are those relevant to the main aim of this thesis, namely the acoustic comparison of the vowel space of the three groups of participants, English first and second language speakers, before and after intervention. These results are divided into three groups, according to the three groups of English vowels studied, namely the short monophthongs, long monophthongs and diphthongs. With each of these three groups of vowels, the mean F_1 and F_2 values of each monophthong and diphthong, as produced by the three groups of participants before and after intervention, will be presented in tables indicating the standard deviation (SD) as well. To illustrate these mean values, a figure depicting the vowel spaces (see Chapters 4 and 5) of the three groups of participants is offered for each group of vowels.

In order to provide a meaningful discussion of the vowel positions prior to and after intervention, thus in effect of the vowel space, between-group calculations determining the difference in distance between the mean F_1 and F_2 values are done (see Chapter 5), and presented in table format. This difference in distance is measured in Hertz. Effect sizes portraying the quantified size of the difference that occurred due to the intervention (Coe, 2002), are provided as well. These measurements are then discussed, and conclusions drawn as to the effectiveness of the intervention on the first (F_1) and second (F_2) formant frequencies. As a summary of the changes or improvements that occurred in the F_1 and F_2 behaviour of the Experimental group, a table is provided after each group of vowels are addressed, indicating whether the intervention resulted in the Experimental group's articulations

approximating the productions of the Norm group or not. Observations pertaining to the formant behaviours are offered below the summative table.

Lastly, a general discussion of the results pertinent to the main aim of the study is provided. In this section the position of the vowels within the vowel space are discussed with reference to some of the perceptual theories briefly addressed in Chapter 3. This is done in an attempt to explain why some vowels approximate the Norm productions and others do not.

The results relating to the measurable sub-aims of the thesis are then addressed. Within and between-group comparisons are made, and this information is presented in table format, followed by graphs and discussions thereof. Since auditory processing lays the basis for literacy skills, the results of the TAPS-3 (Martin & Brownell, 2005) will be presented and discussed, focussing on the sub-tests for phonological skills. The results of the TAPS-3 will be followed by the results and discussion of the reading and spelling assessments. A general discussion of the results of the TAPS-3, as well as the reading and spelling assessments, are presented. Finally, the results pertaining to the main and sub-aims are summarised, focussing on the effectiveness of the intervention.

6.2 The results of the acoustic analyses of the short monophthongs

6.2.1 The pre-intervention results of the acoustic analyses of the short monophthongs

The following table presents the mean formant values and standard deviations of each of the short monophthongs across all three groups before the intervention phase:

Table 18: Mean pre-intervention formant frequencies of the short monophthongs across all three groups

Groups	Vowel	F ₁ (Hz)	F ₂ (Hz)	SD (F ₁)	SD(F ₂)
Norm	[ɪ]	541	2451	80.30	259.50
	[e]	555	2470	58.10	154.70
	[æ]	1026	2196	122.00	121.40
	[ʌ]	1057	1732	123.30	207.30
	[ɒ]	870	1335	121.70	165.40
	[ʊ]	595	1388	92.10	207.30
	[ə]	768	1725	149.50	167.10
Experimental	[ɪ]	407	2948	101.90	499.20
	[e]	491	2476	95.10	446.30
	[æ]	721	2332	170.50	315.50
	[ʌ]	1055	1799	145.20	272.10
	[ɒ]	807	1362	208.90	225.60
	[ʊ]	411	1179	116.60	290.30
	[ə]	914	1828	228.80	207.40
Control	[ɪ]	339	2901	85.80	363.30
	[e]	525	2520	100.90	333.30
	[æ]	650	2401	131.30	250.80
	[ʌ]	960	1731	185.30	281.40
	[ɒ]	701	1280	160.10	270.40
	[ʊ]	422	1195	164.20	405.30
	[ə]	751	1804	218.90	211.90

Note: SD = Standard deviation

Figure 25 depicts the pre-intervention vowel spaces occupied by the short monophthongs as produced by all three groups. The dimensions of the vowel spaces are based on the formant frequencies provided in Table 18.

Mean vowel formant values non-normalised

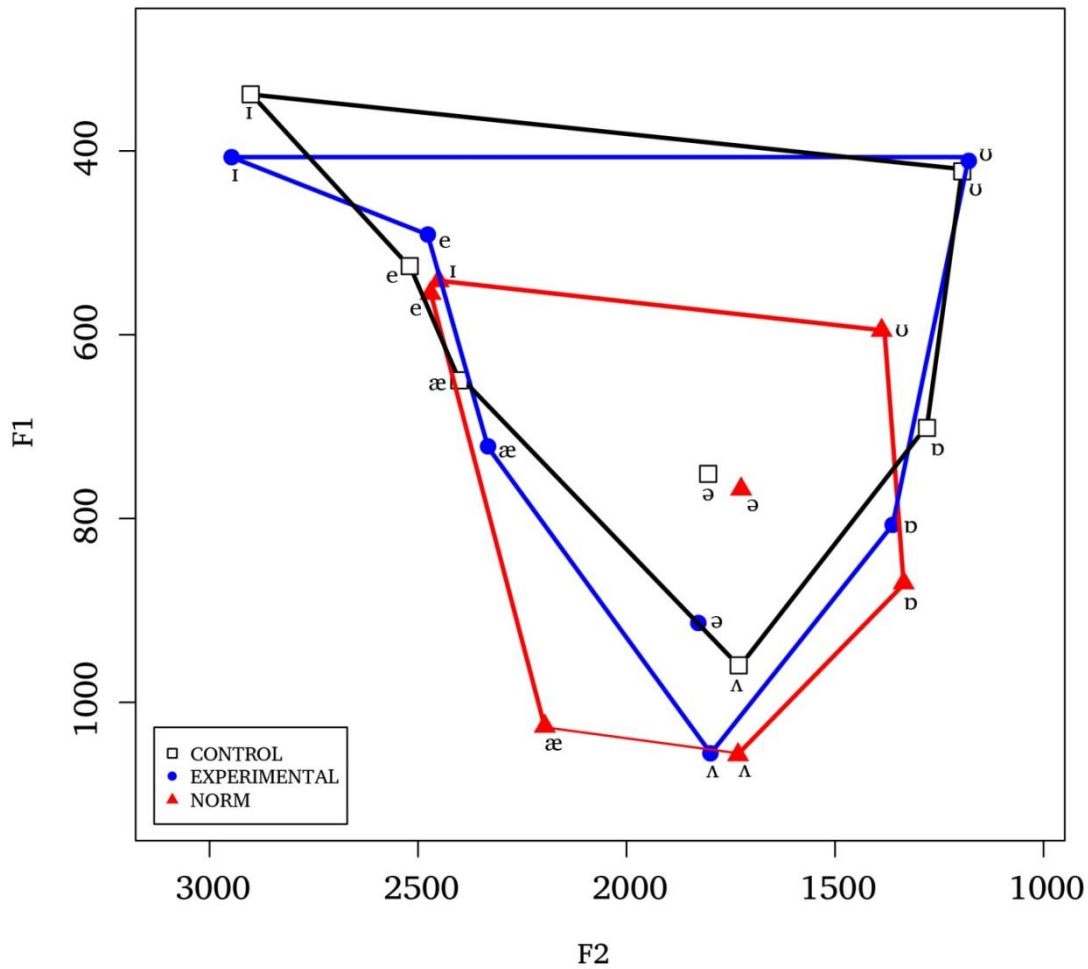


Fig. 25: The vowel spaces of the short monophthongs as produced by the three groups of participants prior to intervention.

6.2.2 The post-intervention results of the acoustic analyses of the short monophthongs

Table 19 presents the mean formant values and standard deviations of each of the short monophthongs across all three groups after intervention.

Table 19: Mean post-intervention formant frequencies of the short monophthongs across all three groups

Groups	Vowel	F ₁ (Hz)	F ₂ (Hz)	SD (F ₁)	SD(F ₂)
Norm	[ɪ]	565	2692	74.80	370.90
	[e]	616	2608	83.90	351.80
	[æ]	950	2172	161.10	162.80
	[ʌ]	1031	1753	154.00	204.80
	[ɒ]	873	1353	148.70	158.80
	[ʊ]	637	1368	95.40	196.70
	[ə]	730	1739	131.50	97.20
Experimental	[ɪ]	412	2801	108.90	365.00
	[e]	606	2574	154.00	415.00
	[æ]	773	2414	190.90	358.50
	[ʌ]	1054	1742	113.90	238.30
	[ɒ]	845	1370	194.00	200.10
	[ʊ]	518	1368	179.20	351.40
	[ə]	851	1697	192.10	219.70
Control	[ɪ]	413	2773	95.00	341.10
	[e]	586	2475	145.20	301.30
	[æ]	716	2436	114.50	327.70
	[ʌ]	1036	1640	117.00	185.70
	[ɒ]	808	1303	134.00	158.10
	[ʊ]	432	1374	115.40	304.30
	[ə]	879	1631	279.20	245.10

Note: SD = Standard deviation

Figure 26 depicts the post-intervention vowel spaces occupied by the short monophthongs as produced by all three groups. The dimensions of the vowel spaces are based on the formant frequencies provided in Table 19.

Mean vowel formant values non-normalised

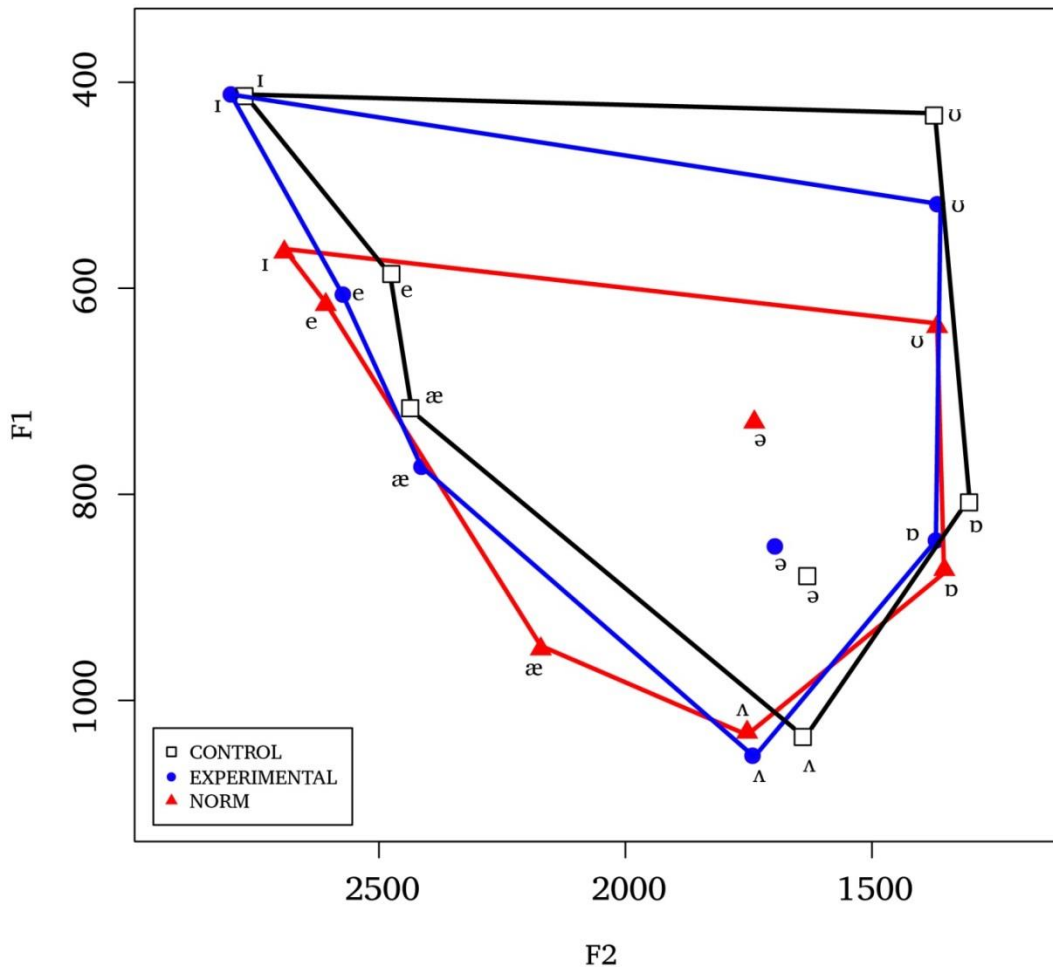


Fig. 26: The vowel spaces of the short monophthongs as produced by the three groups of participants after intervention.

Because of the comparative design of the study, the results of the Experimental and Control group are compared to those of the Norm group. Only the between-group comparisons are presented and discussed in order to illuminate the productions of the two EL2 groups compared to the EL1 group pre- and post-intervention. The first reason for the decision not to do within group comparisons is because the productions of the Norm group changed in the period during which the Experimental group received intervention. This could be due to natural maturation of the young participants' vocal apparatus. The vocal cords of children are shorter and thinner than those of adults (male and female proportions differ as well) (Rietveld & Van Heuven, 2009). In addition, the length of the supra-glottalic vocal tract which

functions as a resonator during speech increases as the child approaches maturity. Therefore, a comparison of the productions of the groups of participants before and after intervention should be coupled with an anatomical study measuring physical change in the participants and relating it to a change in vowel production.

Secondly, no standard formant values of the vowels for either WSAfE in 8 to 10 year olds or for English L2 – Setswana L1 8 to 10 year olds exist. With the formant values of vowels as produced by children changing, and no standard formant values available to compare the current productions against, the only practical and meaningful comparison would be a between-group comparison where the point of departure are the productions by the Norm group. The mean first and second formant frequencies established by this study could be referred to as standard values in future studies.

6.2.3 Discussion of the results of the acoustic analyses of the short monophthongs, between-group comparisons before and after intervention

The short monophthongs as produced by the three groups of participants, pre- and post-intervention, are presented here. The difference in distance between the mean F_1 value of each group's production, and again between the mean F_2 value of each group's production, pre- and post-intervention, was measured using the formulae and calculations explained in Chapter 5.

Table 20: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [ɪ]

Groups compared	Mean F_1 Distances (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	135	153	18	0.14	497	109	-388	0.72
Norm and Control	203	151	-52	0.43	451	81	-370	0.78
Control and Experimental	68	2	-66	0.48	46	28	-18	0.03

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

In terms of the vertical movement of the tongue as depicted by the mean F_1 values, it can be observed that the productions of [ɪ] by the Norm and Experimental groups are further apart by 18 Hz; a deterioration in post-intervention proximity (small effect size of 0.14). One cannot therefore conclude that intervention improved the vertical lingual movement in the Experimental group for the production of [ɪ]. However, both the mean F_1 values in the productions of the Norm and Control groups and the Control and Experimental groups are, post-intervention, moderately closer together by 52 Hz and 66 Hz respectively, and moderate effect sizes of 0.43 and 0.48 respectively (see Chapter 5).

The distance between the mean F_2 values of the Norm and Experimental groups' productions of [ɪ] indicates a large improvement of 388 Hz post-intervention (an effect size of 0.72). Similarly, a large improvement of 370 Hz between the mean F_2 values as produced by the Norm and Control groups can be noted, relating to a large effect size of 0.78. Noting the measurement in distance between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it can be stated that intervention improved the horizontal movement of the tongue of the Experimental

group to more closely approximate the horizontal lingual behaviour of the Norm group. The mean F_2 value in the productions of the Control group however, is also closer to that of the Norm group by 370 Hz. This makes it difficult to state unequivocally that the intervention was responsible for the improved mean F_2 behaviour of the Experimental group during the production of [ɪ]. Even though the distance between the mean F_2 values of the Control and Experimental groups' productions of [ɪ] decreased by 18 Hz post-intervention, this change relates to a negligible improvement in proximity as indicated by an effect size of 0.03.

Table 21: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [e]

Groups compared	Mean F_1 Distances (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	64	10	-54	0.37	6	34	28	0.05
Norm and Control	30	30	0	0.00	50	133	83	0.19
Control and Experimental	34	20	-14	0.08	44	99	55	0.10

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Post-intervention, the difference in distance between the mean F_1 values in the productions of [e] by the Norm and Experimental groups decreased by 54 Hz, indicating a medium effect size of 0.37. This means that post-intervention, the vertical tongue position of the Experimental group is more similar to that of the Norm group than pre-intervention, and that the vertical lingual movement of the Experimental group improved due to intervention. The mean F_1 values of the Norm and Control groups are no further apart or closer together post-intervention than pre-

intervention as indicated by the 0 Hz change in distance. The difference in distance between the mean F_1 values of the Control and the Experimental groups decreased by 14 Hz post-intervention, but with a negligible effect size of 0.08.

The distance between the mean F_2 values on the productions of [e] by the Norm and Experimental groups increased by 28 Hz post-intervention, but with a negligible effect size of only 0.05. This implies that the intervention did not improve horizontal lingual movement of the Experimental group during the production of [e]. Similarly, an increase of 83 Hz, (small effect size of 0.19) in the mean F_2 values can be noted when the Norm and Control groups are compared. Comparing the distance between the mean F_2 values of [e] as produced by the Control and Experimental groups, a 55 Hz deterioration in proximity, relating to a small effect size of 0.10, is noted.

Table 22: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [æ]

Groups compared	Mean F_1 Distances (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	305	177	-128	0.55	136	242	106	0.29
Norm and Control	376	234	-142	0.76	205	265	60	0.18
Control and Experimental	72	57	-15	0.07	69	23	-46	0.10

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Vertical lingual movement during the production of [æ] by the Experimental group improved to such an extent that the distance between the mean F_1 values of the Norm and Experimental group post-intervention is 177 Hz as compared to the pre-intervention 305 Hz. This signifies an improvement of 128 Hz, and an effect size of 0.55, suggesting a change of moderate practical significance. A large effect size of

0.76 improvement in distance is noted in the decrease of 142 Hz in the post-intervention distance between the mean F_1 values of the Norm and Control groups. Although a decrease in the distance between the mean F_1 values of the Norm and Experimental groups were noted post-intervention, the mean F_1 values of the Norm and Control groups were closer together than those of the Norm and Experimental groups post-intervention. The improvement in the difference in distance on the vertical axis between the Norm and Experimental groups can therefore not be ascribed to the intervention received by the Experimental group. The mean F_1 values of the Control and Experimental groups were closer by 15 Hz post-intervention, although the effect size of 0.07 was negligible.

The distance between the mean F_2 values of the Norm and Experimental groups on the productions of [æ] indicates that post-intervention, the mean F_2 value of the Experimental group is further away from that of the Norm group by 106 Hz; relating to a small effect size of 0.29. In the same way, the distance between the mean F_2 values of the Norm and Control groups increased by 60 Hz post-intervention, although not as drastically as for the Norm and Experimental groups. Noting the distance measurement between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it can be stated that intervention did not improve the horizontal movement of the tongue of the Experimental group during the production of [æ]. The distance between the mean F_2 values of the Control and Experimental groups, however, decreased by 46 Hz post-intervention, relating to a small effect size of 0.10.

Table 23: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [ʌ]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	2	23	21	0.11	66	11	-55	0.17
Norm and Control	97	5	-92	0.44	2	113	111	0.35
Control and Experimental	96	18	-78	0.38	68	102	34	0.10

Note: Hz = Hertz (thus frequency measured)
Pre-interv. = pre-intervention Post-interv. = post-intervention

Concerning vertical lingual behaviour as depicted by the mean F_1 values, Table 23 shows that the productions of [ʌ] by the Norm and Experimental groups are further apart post-intervention by 21 Hz, relating to a small effect size of 0.11. One can therefore conclude that intervention did not improve the vertical lingual movement of the Experimental group for the production of [ʌ]. However, both the mean F_1 values of the Norm and Control groups and those of the Control and Experimental groups are closer together post-intervention by 92 Hz and 78 Hz respectively, with moderate effect sizes of 0.44 and 0.38 respectively.

The distance between the mean F_2 values of the Norm and Experimental groups' productions of [ʌ] indicates an improvement of 55 Hz post-intervention. Even though effect size of this change is small (0.17), it can be stated that intervention improved the horizontal movement of the tongue of the Experimental group during the production of [ʌ]. Post-intervention, the distance between the mean F_2 values of the Norm and Control groups and Control and Experimental groups increased by 111 Hz (small effect size of 0.35) and 34 Hz (small effect size of 0.10) respectively.

Table 24: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [ɒ]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	63	28	-35	0.15	27	17	-10	0.04
Norm and Control	169	65	-104	0.52	56	50	-6	0.02
Control and Experimental	105	37	-68	0.27	82	67	-15	0.05

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

The vertical lingual movement of the Experimental group's production of [ɒ] improved to such an extent that the distance between the mean F_1 values of the Norm and Experimental groups post-intervention is 28 Hz in comparison to the pre-intervention difference of 63 Hz, thus a decrease in distance of 35 Hz; relating to a small practical or clinical effect size 0.15. The mean F_1 values of the Norm and Control groups are closer to one another post-intervention by 104 Hz; a moderate effect size of 0.52. Since the mean F_1 values of the Norm and Control groups are closer together than those of the Norm and Experimental groups post-intervention, it cannot be stated that the intervention was responsible for the improvement of the vertical lingual movement of the Experimental group. The post-intervention distance between the mean F_1 values of [ɒ] as produced by the Control and Experimental groups is 68 Hz less than the pre-intervention distance, relating to a small practical effect (effect size 0.27).

The distance between the mean F_2 values of the Norm and Experimental groups' productions of [v] indicated an improvement of 10 Hz, relating to a negligible effect size of 0.04 post-intervention. An improvement in distance between the mean F_2 values of the Norm and Control groups and those of the Control and Experimental groups can be noted as well. The distance between the mean F_2 values of the Norm and Control groups decreased negligibly by 6 Hz post-intervention (effect size 0.02). Noting that the measurement between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention signified a greater decrease in distance than between the Norm and Control groups, but with a negligible effect size in both cases, it can be stated that intervention may have improved the horizontal movement of the tongue of the Experimental group during the production of [v]. The difference in distance between the F_2 values of the Control and Experimental groups decreased by 15 Hz, a negligible effect size of 0.05.

Table 25: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [v]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	184	119	-65	0.37	209	0	-209	0.55
Norm and Control	173	205	32	0.19	193	6	-187	0.45
Control and Experimental	11	86	75	0.41	16	7	-9	0.02

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Post-intervention, the difference in distance between the mean F_1 values of the productions of [u] by the Norm and Experimental groups decreased by 65 Hz, signifying a moderate practical effect size of 0.37. This means that post-intervention, the vertical tongue position of the Experimental group is more similar to that of the Norm group than pre-intervention. This F_1 approximation of the Norm group's production would indicate that the vertical lingual movement of the Experimental group improved due to intervention. The mean F_1 values of the Norm and Control groups are further apart post-intervention, as indicated by the increase of 32 Hz in distance; a small effect size of 0.19. The difference in distance between the mean F_1 values of the Control and the Experimental groups, increased by 75 Hz post-intervention, with a moderate effect size of 0.41.

The distance between the mean F_2 values of the Norm and Experimental groups indicates an improvement of 209 Hz post-intervention, signalling a moderate practical effect of 0.55 during the productions of [u]. Noting the measurement between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it can be stated that intervention was effective in improving the horizontal lingual movement in the Experimental group in the production of [u]. Similarly, an improvement in distance between the mean F_2 values of the Norm and Control groups and the Control and Experimental groups can be noted during the production of this vowel. The distance between the mean F_2 values of the Norm and Control groups decreased by 187 Hz post-intervention, rendering a moderate effect size of 0.45. The distance between the mean F_2 values of [u] as produced by the Control and Experimental groups decreased by only 9 Hz, a negligible effect size of 0.02.

Table 26: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [ə]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	146	121	-25	0.10	103	41	-62	0.24
Norm and Control	17	150	133	0.46	79	107	28	0.10
Control and Experimental	162	29	-133	0.41	24	66	42	0.13

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Post-intervention, the difference in distance between the mean F_1 values in the productions of [ə] by the Norm and Experimental groups decreased by 25 Hz, resulting in a small improvement of the Experimental group's vertical lingual movement towards that of the Norm group's. This indicates that, although only a small effect of 0.10 occurred post-intervention, the vertical tongue position of the Experimental group is more similar to that of the Norm group than it was pre-intervention, possibly due to the effect of intervention. This is further confirmed by noting that the mean F_1 values of the Norm and Control groups are further apart post-intervention as indicated by the increase of 133 Hz in distance, a moderate effect size of 0.46. The difference in distance between the mean F_1 values of the Control and the Experimental groups, decreased moderately by 133 Hz, indicating a moderate effect size of 0.41.

For the production of [ə], the distance between the mean F_2 values of the Norm and Experimental groups indicates an improvement of 62 Hz, although with only a small practical effect of 0.24. Noting the measurements between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it can be stated that

intervention improved the horizontal lingual movement of the Experimental group for the production of [ə]. The distance between the F₂ values of Norm and Control groups increased by 28 Hz post-intervention (a small effect size of 0.10), while that between the Control and Experimental groups increased by 42 Hz (a small effect size of 0.13).

In Table 27, the post-intervention behaviour of the F₁ and F₂ of the Experimental group is summarized. A formant's value is only deemed improved if that of the Control group did not improve more; thus if improvement could be attributed to the intervention.

Table 27: Post-intervention lingual behaviour of the Experimental group in terms of improvement (√) and non-improvement (x) of F₁ and F₂ values, effect sizes included, based on the comparison of distances between mean values of both F₁ and F₂ of the Norm and Experimental groups

Vowel	Post-intervention behaviour	F ₁	Effect size	F ₂	Effect size
[i]	Improvement	x	-	√	L
[e]	Improvement	√	M	x	-
[æ]	Improvement	x	-	x	-
[ʌ]	Improvement	x	-	√	S
[ɒ]	Improvement	x	-	√	N
[u]	Improvement	√	M	√	M
[ə]	Improvement	√	S	√	S
Total number of improvements		3		5	

Note: N = negligible S = small
M = moderate L = large

In general, the results of all comparisons between the three groups were statistically significant ($p < 0.001$). This, however, is the result of the very large sample sizes in the acoustic analyses ($n = 224400$, total pre-and post-intervention). Effect sizes therefore provide a more reliable indication of the magnitude of changes in distance

between F_1 values and again between F_2 values that occurred during pre-intervention and post-intervention measurements. Despite small effect sizes that were sometimes noted, improvement was clinically significant because an improvement of less distance between the formant value of the Norm and Experimental groups is noticeable in the vowel space. This indicates that the productions of the Experimental group were approximating those of the Norm group.

The F_2 behaviour improved in five of the seven vowels and the F_1 behaviour in three of the seven vowels. It could therefore be stated that horizontal lingual adaption seems easier to perceive and to affect than vertical lingual behaviour. It was noted that, in terms of lingual behaviour, the back vowels showed a greater improvement than the front vowels. Both the F_1 and F_2 of the back vowel [u] and central vowel [ə] improved; the only two vowels where improvement in both the F_1 and F_2 occurred. Interestingly, the two higher front vowels [i] and [e], and lower back vowels [ʌ] and [ɒ] seemed to have improved only in either vertical or horizontal movement, but not in both simultaneously. The F_2 of the back vowels showed a greater improvement than that of the front vowels.

Because of the improvement in F_2 values, it could be posited that it is easier to perceive differences in the horizontal movement of back vowels and therefore easier to produce these newly acquired movements. This could have to do with the size and shape of the resonator behind the area of main constriction (see Chapter 4).

6.3 The results of the acoustic analyses of the long monophthongs

6.3.1 The pre-intervention results of the acoustic analyses of the long monophthongs

Table 28 presents the mean formant values and standard deviations of each of the long monophthongs across all three groups before the intervention phase:

Table 28: Mean pre-intervention formant frequencies of the long monophthongs across all three groups

Groups	Vowel	F ₁ (Hz)	F ₂ (Hz)	SD (F ₁)	SD(F ₂)
Norm	[i:]	387	3057	80.30	422.70
	[e:]	580	2657	70.10	272.20
	[a:]	801	1194	147.70	175.60
	[ɔ:]	556	923	91.50	199.40
	[u:]	398	1851	81.30	454.70
	[ɜ:]	585	1930	87.80	338.30
Experimental	[i:]	396	2947	96.60	545.80
	[e:]	630	2400	175.30	602.00
	[a:]	1041	1701	149.60	215.70
	[ɔ:]	708	1216	204.30	181.20
	[u:]	385	1218	87.90	246.00
	[ɜ:]	574	2138	152.40	597.90
Control	[i:]	322	2888	53.40	309.40
	[e:]	546	2620	112.60	349.30
	[a:]	963	1651	149.40	175.90
	[ɔ:]	652	1159	122.70	225.30
	[u:]	347	1168	80.90	277.40
	[ɜ:]	557	2326	105.00	461.00

Note: SD = Standard Deviation

Figure 27 on the next page depicts the vowel spaces occupied by the long monophthongs as produced by all three groups before intervention. The dimensions of the vowel spaces are based on the formant frequencies provided in Table 28.

Mean vowel formant values non-normalised

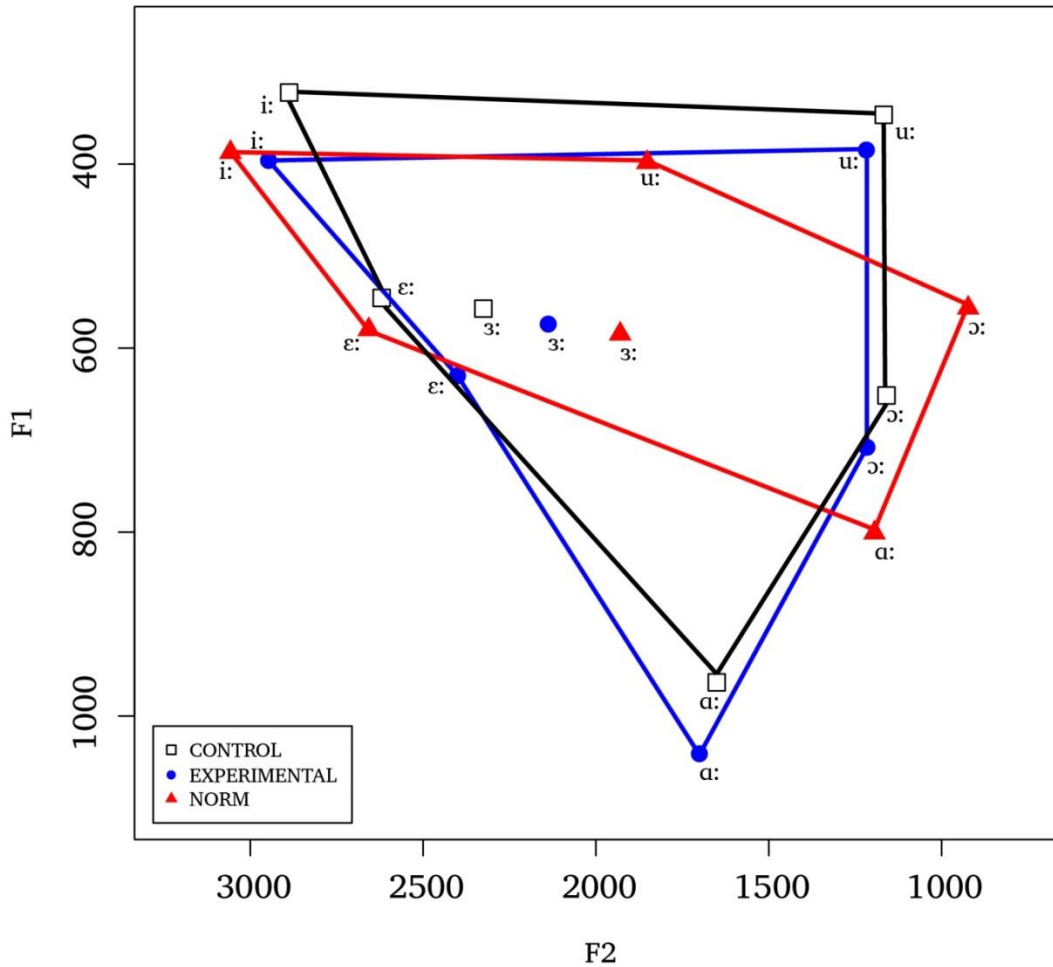


Fig. 27: The vowel spaces of the long monophthongs as produced by the three groups of participants prior to intervention.

6.3.2 The results of the acoustic analyses of the long monophthongs after intervention

Table 29 presents the mean formant values and standard deviations of each of the short monophthongs across all three groups after the intervention phase.

Table 29: Mean post-intervention formant frequencies of the long monophthongs across all three groups

Groups	Vowel	F ₁ (Hz)	F ₂ (Hz)	SD (F ₁)	SD(F ₂)
Norm	[i:]	451	3241	103.20	272.90
	[ɛ:]	636	2562	87.10	372.00
	[ɑ:]	837	1276	105.70	155.70
	[ɔ:]	618	1073	76.40	259.50
	[u:]	472	2096	63.70	401.30
	[ɜ:]	636	1983	81.80	224.30
Experimental	[i:]	390	2933	76.00	305.90
	[ɛ:]	764	2524	190.50	471.80
	[ɑ:]	990	1600	145.60	180.50
	[ɔ:]	734	1195	150.20	143.80
	[u:]	484	1707	194.00	686.30
	[ɜ:]	681	1924	151.50	363.50
Control	[i:]	357	2763	88.80	406.30
	[ɛ:]	635	2484	216.60	457.50
	[ɑ:]	1045	1583	152.60	217.30
	[ɔ:]	711	1205	142.10	195.60
	[u:]	479	1861	223.50	719.70
	[ɜ:]	627	1940	179.00	383.30

Note: SD = Standard Deviation

Figure 28 depicts the vowel spaces occupied by the short monophthongs as produced by all three groups after intervention. The dimensions of the vowel spaces are based on the formant frequencies provided in Table 29.

Mean vowel formant values non-normalised

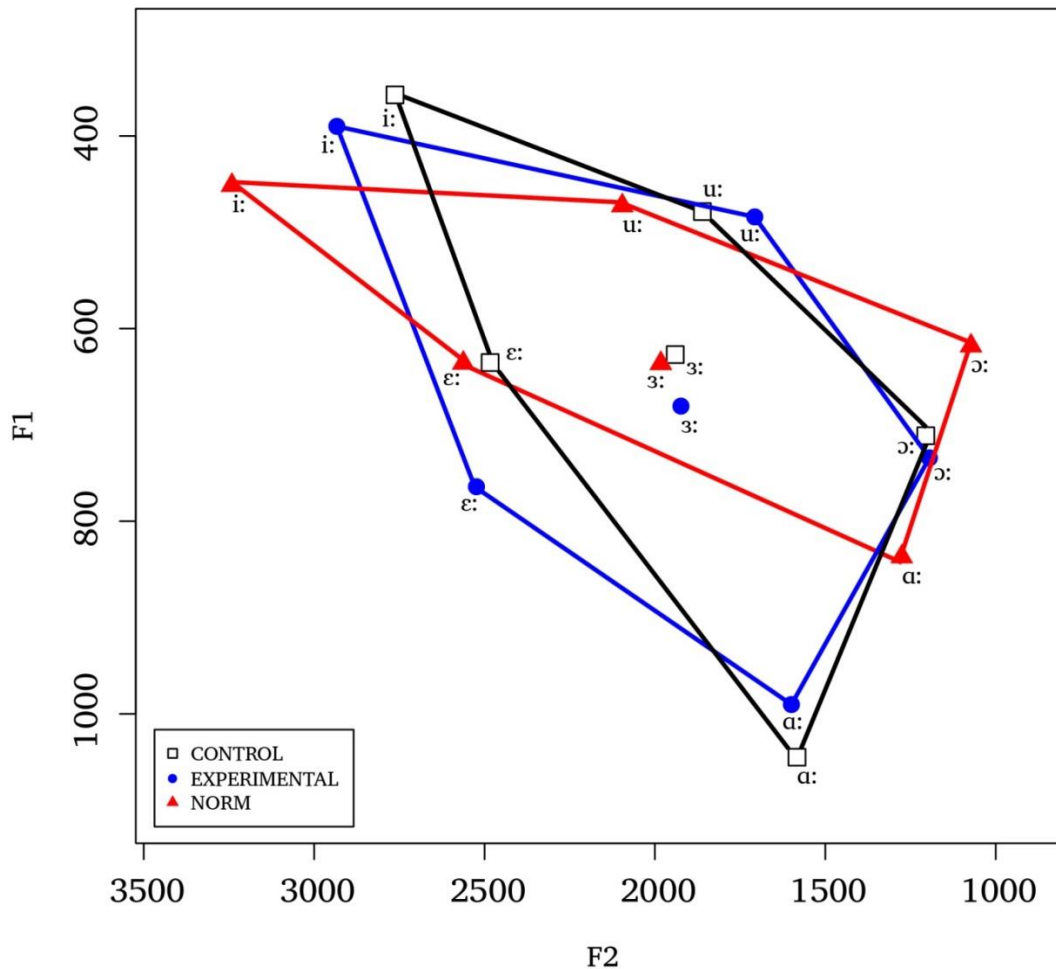


Fig. 28: The vowel spaces of the long monophthongs as produced by the three groups of participants after intervention.

6.3.3 Discussion of the results of the acoustic analyses of the long monophthongs, between-group comparisons before and after intervention

The long monophthongs as produced by the three groups of participants, before and after intervention, are presented in this section. The distance between the mean F_1 values of each production and again between the mean F_2 values of each production were measured using the same formulae and calculations (explained in Chapter 5) that were used in the analyses of the short monophthongs.

Table 30: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [i:]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	9	61	53	0.41	110	308	198	0.35
Norm and Control	65	94	29	0.25	170	479	309	0.61
Control and Experimental	74	33	-41	0.36	60	170	110	0.19

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Regarding the vertical movement of the tongue as depicted by the mean F_1 values of the productions of [i:], Table 30 indicates that the mean formant frequencies of the Norm and Experimental groups are further apart by 53 Hz after intervention. This indicates a deterioration in proximity between the mean F_1 values of these two groups with a moderate effect size of 0.41. Intervention therefore did not improve the vertical lingual movement in the Experimental group. Similarly, the mean formant frequencies of the Norm and Control groups are further apart by 29 Hz after intervention, resulting in a small effect size of 0. The mean values of F_1 for the Control and Experimental groups, however, are closer to one another by 41 Hz after intervention, which signifies a moderate improvement in proximity (effect size 0.36).

The distance between the mean F_2 values of the Norm and Experimental groups' production of [i:] shows no improvement after intervention. In fact, a deterioration with a small effect size of 0.35 in proximity occurred as signified by the 198 Hz difference in mean F_2 values of these two groups' production of [i:]. It can therefore be stated that the intervention did not improve the horizontal movement of the

tongue in the Experimental group. No post-intervention improvement is noticed in the distance between the mean F_2 values of the productions of [i:] by the Norm and Control groups either. An even greater deterioration of 309 Hz (a medium effect size of 0.61), occurred in distance between the mean F_2 values. Post-intervention, the distance between the mean F_2 values of the Control and Experimental groups increased by 110 Hz as well relating to a small effect size of 0.19.

Table 31: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [ɛ:]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	50	128	78	0.39	257	39	-218	0.35
Norm and Control	34	1	-33	0.18	37	79	42	0.08
Control and Experimental	85	129	44	0.18	220	40	-180	0.27

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

The distance between the mean F_2 values of the Norm and Experimental groups shows a decrease of 218 Hz post-intervention in the productions of [ɛ:]. This decrease translates to a small effect size of 0.35. The Experimental group's mean F_2 values approximating those of the Norm group post-intervention, indicates that the Experimental group's horizontal movement of the tongue is more similar to that of the Norm group after intervention. Therefore, it can be stated that the intervention improved the horizontal lingual movement of the Experimental group. This is further confirmed by an increase in distance by 42 Hz, although a negligible effect size of 0.08, between the mean F_2 values of the Norm and Control groups. The distance

between the mean F_2 values of the Control and Experimental groups decreased by 180 Hz. This decrease in distance relates to a small effect size of 0.27.

Table 32: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [ɑ:]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	240	154	-86	0.44	506	324	-182	0.70
Norm and Control	163	208	45	0.23	457	308	-149	0.58
Control and Experimental	77	54	-23	0.11	50	17	-33	0.12

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

The difference in distance between the mean F_1 values of the Norm and Experimental groups' productions of [ɑ:] decreased by 86 Hz after intervention, affecting a moderate effect size of 0.44. This indicates that, post-intervention, the vertical tongue position of the Experimental group is more similar to that of the Norm group than pre-intervention, implying that the vertical lingual movement of the Experimental group improved due to intervention. The mean F_1 values of the Norm and Control groups are further apart post-intervention as indicated by the increase of 45 Hz in distance. This increase in distance constitutes a small effect size of 0.23. The difference in distance between the mean F_1 values of the Control and the Experimental groups decreased by 23 Hz post-intervention, resulting in a small effect size of 0.11.

The distance between the mean F_2 values of the Norm and Experimental groups in the production of [ɑ:] indicates an improvement of 182 Hz post-intervention, suggesting a large practical effect size of 0.70. Noting the measurements between

the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it can be stated that intervention improved the horizontal movement of the tongue in the Experimental group. The distance between the mean F_2 values of the Norm and Control groups decreased by 149 Hz post-intervention, relating to a medium effect size of 0.58. Similarly, the post-intervention distance between the mean F_2 values of [ɑ:] as produced by the Control and Experimental groups decreased by 33 Hz, signifying a small effect size of 0.12.

Table 33: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [ɔ:]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	151	116	-35	0.18	293	122	-171	0.60
Norm and Control	95	93	-2	0.01	236	133	-104	0.33
Control and Experimental	56	23	-33	0.15	57	11	-46	0.17

Note: Hz = Hertz (thus frequency measured)
Pre-interv. = pre-intervention Post-interv. = post-intervention

The vertical lingual movement of the Experimental group's production of [ɔ:] improved to such an extent that the distance between the mean F_1 values of the Norm and Experimental group post-intervention is 116 Hz instead of 151 Hz pre-intervention, therefore a difference of 35 Hz. This relates to a small effect size of 0.18. The decrease in distance between these two groups' mean F_1 values, thus

improving the vertical lingual modification of the Experimental group, could be attributed to the intervention. Both the mean F_1 values of the Norm and Control groups and Control and Experimental groups are also closer to one another post-intervention. The distance between the Norm and Control groups' mean F_1 values is

only 2 Hz, signifying a negligible effect size of 0.01. Post-intervention, the difference in distance on the y-axis between the mean F_1 values of [ɔ:] as produced by the Control and Experimental groups is 33 Hz, resulting in a small effect size of 0.15.

The distance between the mean F_2 values of the Norm and Experimental groups' productions of [ɔ:] indicates an improvement of 171 Hz post-intervention, relating to a medium effect size of 0.60. Noting the measurement between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it could be stated that intervention improved the horizontal movement of the tongue of the Experimental group. An improvement in distance between the mean F_2 values of the Norm and Control groups can be noted as well. The distance between the mean F_2 values of the Norm and Control groups decreased by 104 Hz post-intervention, meaning a small change in proximity, thus a small effect size of 0.33. Similarly, the distance between the mean F_2 values of [ɔ:] as produced by the Control and Experimental groups decreased by 46 Hz. This decrease equals a small change in proximity which relates to a small effect size of 0.17.

Table 34: Between-group comparisons of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [u:]

Groups compared	Mean F ₁ Distance (Hz) and effect size before and after intervention				Mean F ₂ Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	14	12	-2	0.01	634	389	-245	0.37
Norm and Control	52	6	-46	0.25	684	235	-449	0.65
Control and Experimental	38	6	-32	0.14	50	153	103	0.14

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Regarding vertical lingual behaviour as depicted by the mean F₁ values of [u:] when produced by the Norm and Experimental groups, Table 34 shows that these groups are closer to one another post-intervention by 2 Hz, relating to a negligible effect size of 0.01. Post-intervention, the distance between the mean F₁ values of [u:] as produced by the Norm and Control groups are closer to one another by 46 Hz. This decrease in distance translates to a small effect size of 0.25. While the intervention seemed to have improved the vertical lingual movement in the Experimental group, more improvement occurred in the Control group. This indicates that the intervention cannot be cited as reason for the improvement in the distance in mean F₁ values between the Norm and Experimental group. The difference in distance between the mean F₁ values of the Control and Experimental groups are closer by 32 Hz after intervention, signifying a small effect size of 0.14.

The distance between the mean F₂ values of [u:] as produced by the Norm and Experimental groups indicates an improvement of 245 Hz post-intervention. This post-intervention improvement in distance between the mean F₂ values of these two groups signifies a medium change in proximity, thus a medium effect size of 0.37. Post-intervention, the distance between the mean F₂ values of [u:] as produced by the Norm and Control groups decreased by 449 Hz, signifying a moderate effect size of 0.65. Noting the larger improvement in distance between the mean F₂ values of the Norm and Control groups pre- and post-intervention, it cannot be stated that intervention improved the horizontal movement of the tongue in the Experimental

group. The distance between the mean F_2 values of [u:] as produced by the Control and Experimental groups increased by 103 Hz, signifying a small practical significance with an effect size of 0.14.

Table 35: Between-group comparison of the distance between mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of [ɜ:]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	11	45	34	0.19	208	59	-149	0.26
Norm and Control	28	9	-19	0.11	396	42	-354	0.57
Control and Experimental	17	54	37	0.17	188	17	-171	0.25

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

With the mean F_1 values depicting vertical lingual behaviour, it can be observed that the productions of [ɜ:] by the Norm and Experimental groups are further apart post-intervention by 34 Hz, indicative of a small practical significance of 0.19. Intervention therefore did not improve the vertical lingual movement in the Experimental group. The distance between the mean F_1 values of the Norm and Control groups, however, is 19 Hz less after intervention, signifying a small effect size of 0.11. Post-intervention, the mean F_1 values of the Control and Experimental groups are further apart on the y-axis by 37 Hz. This deterioration in proximity relates to a small effect size of 0.17.

The distance between the mean F_2 values of the Norm and Experimental groups' productions of [ɜ:] indicates an improvement of 149 Hz post-intervention. This relates to a small effect size of 0.26. Post-intervention, the distance between the mean F_2 values of [ɜ:] as produced by the Norm and Control groups decreased by 354 Hz, affecting a medium effect size of 0.57. Noting the measurement between the mean

F₂ values of the Norm and Experimental groups pre- and post-intervention, it would seem that the intervention improved the horizontal movement of the tongue in the Experimental group. Greater improvement, however, occurred between the mean F₂ values of the Norm and Control groups, indicating that whatever improvement occurred in the horizontal lingual modification of the Experimental group cannot be attributed to the intervention. The distance between the mean F₂ values of the Control and Experimental groups' productions of [ɜ:] indicates an improvement of 171 Hz post-intervention, relating to a small effect size of 0.25.

In Table 36, the post-intervention behaviour of the F₁ and F₂ of the Experimental group is summarized. A formant's value is only deemed improved if that of the Control group did not improve more; thus if improvement could be attributed to the intervention.

Table 36: Post-intervention lingual behaviour of the Experimental group in terms of improvement (√) and non-improvement (x) of F₁ and F₂ values, effect sizes included, based on the comparison of distances between mean values of both F₁ and F₂ of the Norm and Experimental groups

Vowel	Post-intervention behaviour	F ₁	Effect Size	F ₂	Effect Size
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[i:]	Improvement	X	-	x	-
[ɛ:]	Improvement	X	-	√	S
[ɑ:]	Improvement	√	M	√	L
[ɔ:]	Improvement	√	S	√	M
[u:]	Improvement	X	-	x	-
[ɜ:]	Improvement	X	-	x	-
Total number of improvements		2		3	

Note: N = negligible S = small
M = moderate L = large

In general, similar to the short monophthongs, the results of all comparisons between the three groups were statistically significant ($p < 0.001$). This, however, is the result of the very large sample sizes in the acoustic analyses ($n = 238058$, total pre- and post-intervention). Effect sizes therefore provide a more reliable indication of the magnitude of changes in F_1 and F_2 distances pre- and post-intervention. Despite small effect sizes that were often noted, the improvement was clinically significant because an improvement of shorter distance between the formant values of the Norm and Experimental groups was noticeable in the vowel space. This indicates that the productions of the Experimental group were approximating those of the Norm group.

Once again it was noted that the horizontal modification improved to a greater degree than the vertical modification. It therefore seems that the horizontal lingual modification is easier to change than vertical modification. Interestingly, less improvement on both F_1 and F_2 behaviour could be noted with the long monophthongs in general. Lingual movement did not improve with the two highest vowels [i:] and [u:] and the central vowel [ɜ:]. After intervention, [ɜ:] did not show an improvement in vertical modification. This could be due to the fact that this vowel is very often assimilated to the L1 category of [ɛ]. The L1 influence is therefore still

observable after intervention (James, 1986). Only the two back vowels [ɑ:] and [ɔ:] showed improvement in both the F₁ and F₂ behaviour. F₁ only improved in the production of these two back vowels. In general, it would seem that differences in tongue height are more difficult to distinguish perceptually, and are therefore more difficult to produce.

6.4 The results of the acoustic analyses of the diphthongs

6.4.1 The results of the acoustic analyses of the diphthongs pre-intervention

The following table presents the mean formant values of each of the diphthongs across all three groups:

Table 37: Mean pre-intervention onset and offset formant frequencies of the diphthongs across all three groups

Groups	Diphthong	F ₁ Onset (Hz)	SD	F ₁ Offset (Hz)	SD	F ₂ Onset (Hz)	SD	F ₂ Offset (Hz)	SD
Norm	[eɪ]	653	83.40	507	156.40	2184	456.10	2487	708.90
	[əʊ]	709	122.50	522	98.70	1460	318.70	1407	312.50
	[ʊə]	577	79.70	688	107.90	1453	404.20	1495	246.30
	[ɪə]	509	91.20	642	133.20	2327	720.00	1770	352.30
	[aʊ]	941	278.40	645	244.30	1425	240.10	1019	243.80
	[aɪ]	966	198.70	724	238.70	1434	204.40	1999	409.70
	[ɔɪ]	567	134.10	524	163.40	917	246.30	1339	728.40
Experi- mental	[eɪ]	515	94.60	406	94.50	1988	609.40	2043	817.90
	[əʊ]	583	198.00	416	114.10	1206	209.70	1120	297.10
	[ʊə]	573	232.00	761	257.80	1396	509.70	1411	334.80
	[ɪə]	412	96.30	600	198.10	1935	863.90	1685	489.10
	[aʊ]	958	170.20	802	231.60	1447	213.30	1264	182.70
	[aɪ]	951	185.70	649	280.60	1658	375.10	1918	644.10
	[ɔɪ]	690	147.00	594	222.50	1248	265.10	1773	566.20
Control	[eɪ]	532	90.90	417	131.90	2187	587.00	2293	702.90
	[əʊ]	523	89.70	438	130.50	1182	205.90	1132	287.00
	[ʊə]	492	90.20	631	162.90	1454	502.30	1471	373.90
	[ɪə]	420	134.70	590	141.40	2260	832.20	1894	571.20
	[aʊ]	925	152.80	723	170.90	1500	190.40	1250	175.70

[aɪ]	864	185.30	597	210.80	1637	361.20	1939	613.90
[ɔɪ]	652	122.20	562	130.40	1339	417.20	1913	525.30

In Figure 29, the vowel spaces occupied by the diphthongs as produced by all three groups pre-intervention are depicted, based on the formant frequencies in Table 37.

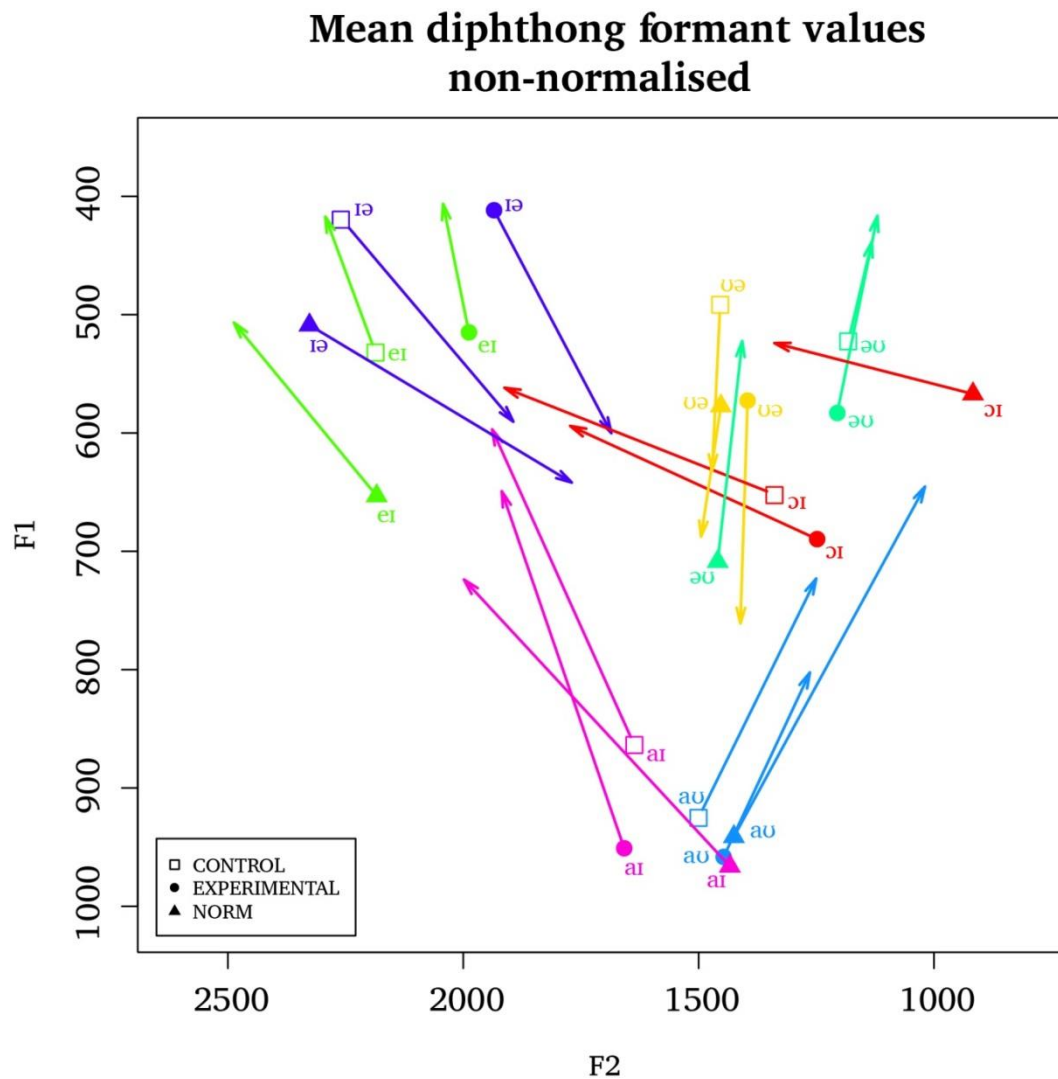


Fig. 29: The vowel spaces of the diphthongs as produced by the three groups of participants prior to intervention.

6.4.2 The results of the acoustic analyses of the diphthongs post-intervention

The following table presents the mean formant values of each of the diphthongs across all three groups:

Table 38: Mean post-intervention onset and offset formant frequencies of the diphthongs across all three groups

Groups	Diphthong	F ₁ Onset (Hz)	SD	F ₁ Offset (Hz)	SD	F ₂ Onset (Hz)	SD	F ₂ Offset (Hz)	SD
Norm	[eɪ]	691	93.90	469	64.40	1754	461.70	1772	475.00
	[əʊ]	787	108.10	536	98.50	1556	157.90	1534	288.30
	[ʊə]	593	111.50	754	173.00	1526	450.30	1562	231.70
	[ɪə]	489	79.10	791	164.30	2001	834.30	1695	247.10
	[aʊ]	1070	167.00	705	146.20	1566	124.70	1262	126.50
	[aɪ]	997	169.40	750	219.40	1535	260.50	1905	537.60
	[ɔɪ]	599	72.50	552	185.00	1123	164.20	1850	630.20
Experi- mental	[eɪ]	604	150.80	426	95.40	1683	516.50	1751	610.10
	[əʊ]	662	206.50	447	137.00	1282	335.70	1168	220.00
	[ʊə]	584	165.10	865	317.90	1412	441.90	1643	394.80
	[ɪə]	439	148.90	849	217.70	1769	582.90	1724	396.10
	[aʊ]	1008	165.20	766	235.10	1481	190.20	1313	210.90
	[aɪ]	1000	165.40	686	260.20	1722	362.90	1849	654.40
	[ɔɪ]	767	180.00	662	239.70	1281	307.90	1703	609.20
Control	[eɪ]	509	91.80	409	135.60	1653	415.40	1704	585.90
	[əʊ]	578	167.80	422	107.20	1267	237.80	1181	218.80
	[ʊə]	573	180.60	816	262.90	1422	391.30	1559	466.20
	[ɪə]	461	235.00	830	268.00	1925	596.80	1793	349.20
	[aʊ]	1006	164.50	748	209.80	1455	175.00	1297	210.30
	[aɪ]	1018	158.00	740	261.00	1693	288.70	1881	584.30
	[ɔɪ]	690	165.70	670	190.40	1267	361.30	1721	313.70

In Figure 30, the vowel spaces occupied by the diphthongs as produced by all three groups post-intervention are depicted, based on the formant frequencies in Table 38.

Mean diphthong formant values non-normalised

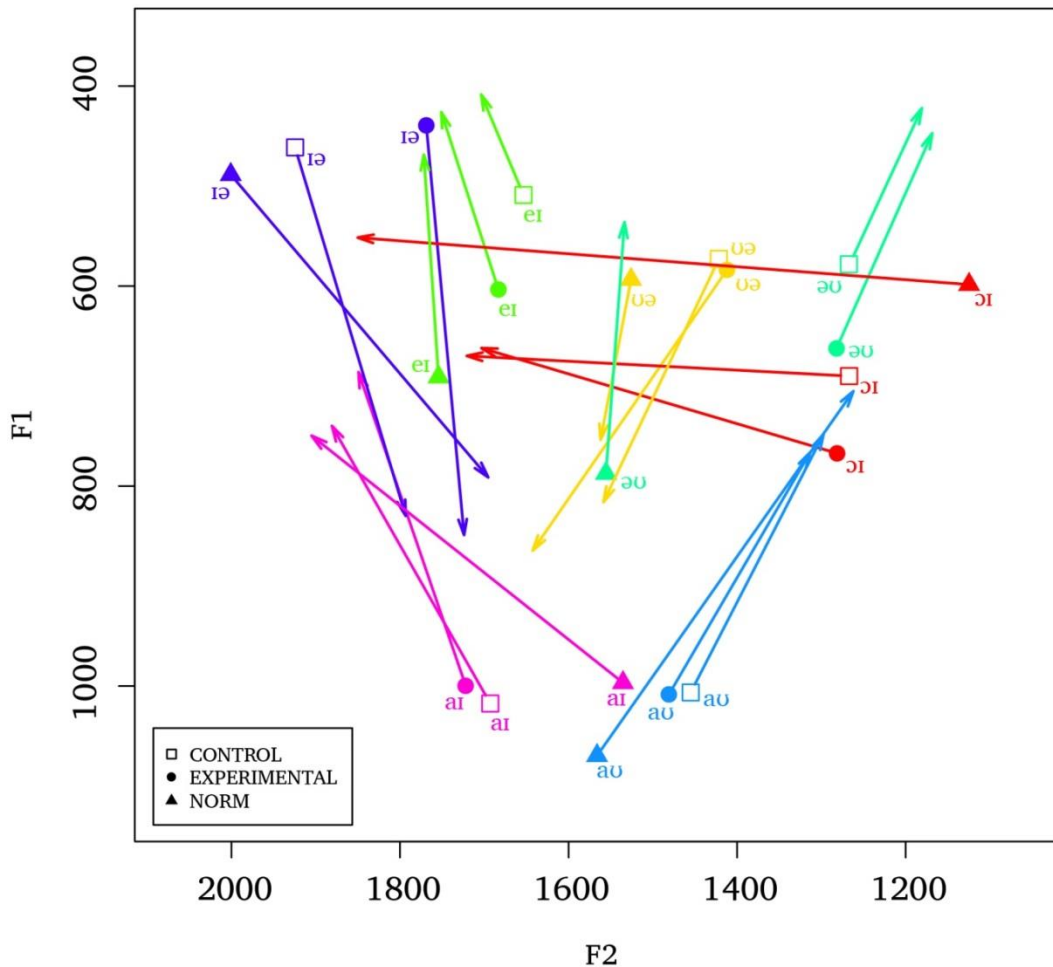


Fig. 30: The vowel spaces of the diphthongs as produced by the three groups of participants after intervention.

6.4.3 Discussion of the results of the acoustic analyses of the diphthongs, pre- and post-intervention between-group comparisons of the onsets and offsets of each diphthong

Since diphthongs are vowel sounds that consist of two vowels in a single syllable, an onset and an offset (Laver, 1994), the results of the diphthongs will be presented divided into onsets and offsets. The distance between the F_1 of each production of the onset, and again between the F_2 of each production of the onset were measured using the same formulae that were used in the analyses of the short and long monophthongs.

Table 39: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention in the production of the onset of [e]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	138	87	-51	0.33	196	71	-125	0.17
Norm and Control	121	182	61	0.48	3	101	98	0.14
Control and Experimental	17	95	78	0.50	198	30	-168	0.22

Note: Hz = Hertz (thus frequency measured)
Pre-interv. = pre-intervention Post-interv. = post-intervention

Post-intervention, the difference in distance between the mean F_1 values of the productions of the onset [e] by the Norm and Experimental groups, decreased by 51 Hz, indicating an improvement, although it has a small practical effect size of 0.33. This means that post-intervention, the vertical tongue position of the Experimental group is more similar to that of the Norm group than pre-intervention. This F_1 approximation of the Norm group's production would indicate that the vertical lingual movement of the Experimental group improved due to intervention. The mean F_1 values of the Norm and Control groups are further apart post-intervention, as indicated by the increase of 61 Hz in distance, a moderate effect size of 0.48. The difference in distance between the mean F_1 values of the Control and the Experimental groups, increased by 78 Hz post-intervention, with a medium effect size of 0.50.

For the production of the onset [e], the distance between the mean F_2 values of the Norm and Experimental groups indicates an improvement of 125 Hz relating to a small practical effect of 0.17. Noting the measurements between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it can be stated that

intervention improved the horizontal lingual movement of the Experimental group for the production of the onset [e]. The distance between the F_2 values of Norm and Control groups increased by 98 Hz, therefore a deterioration post-intervention with a small effect size of 0.14, while that between the Control and Experimental groups decreased by 168 Hz, signifying a small effect size of 0.22.

Table 40: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the offset of [e]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	100	43	-57	0.38	444	21	-423	0.45
Norm and Control	90	60	-30	0.16	194	68	-126	0.14
Control and Experimental	11	18	7	0.04	250	47	-203	0.21

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

The vertical lingual movement of the Experimental group's production of the offset [ɪ] improved to such an extent that the distance between the mean F_1 values of the Norm and Experimental group post-intervention is 43 Hz instead of 100 Hz pre-intervention, therefore a difference of 57 Hz. This relates to a moderate effect size of 0.38. The decrease in distance between these two groups' mean F_1 values, thus improving the vertical lingual modification of the Experimental group, could be attributed to the intervention. The mean F_1 values of the Norm and Control groups are also closer to one another post-intervention. The distance between the Norm and Control groups' mean F_1 values is 30 Hz, signifying a small effect size of 0.16. Post-intervention, the difference in distance on the y-axis between the mean F_1 values of

the offset [ɪ] as produced by the Control and Experimental groups is 7 Hz, resulting in a negligible effect size of 0.04.

The distance between the mean F_2 values of the Norm and Experimental groups' productions of the offset [ɪ] indicates an improvement of 423 Hz post-intervention, a medium effect size of 0.45. Noting the measurement between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it could be stated that intervention improved the horizontal movement of the tongue of the Experimental group. An improvement in distance between the mean F_2 values of the Norm and Control groups can be noted as well. The distance between the mean F_2 values of the Norm and Control groups decreased by 126 Hz post-intervention, meaning a small effect size of 0.14. Similarly, the distance between the mean F_2 values of the offset [ɪ] as produced by the Control and Experimental groups decreased by 203 Hz. This decrease equals a small effect size of 0.21.

Table 41: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the onset of [ɪə]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	97	49	-48	0.31	392	232	-160	0.15
Norm and Control	89	27	-62	0.29	67	76	9	0.01
Control and Experimental	8	22	14	0.06	326	156	-170	0.16

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Regarding vertical lingual behaviour as depicted by the mean F_1 values of the onset [ɪ] when produced by the Norm and Experimental groups, Table 42 shows that these groups are closer to one another post-intervention by 48 Hz, thus signifying a small effect size of 0.31. Post-intervention, the distance between the mean F_1 values of the onset [ɪ] as produced by the Norm and Control groups are closer to one another by 62 Hz. This decrease in distance translates to a small effect size of 0.29. While the intervention seemed to have improved the vertical lingual movement in the Experimental group, more improvement occurred in the Control group. This indicates that the intervention cannot be cited as reason for the improvement in the distance in mean F_1 values between the Norm and Experimental group. The difference in distance between the mean F_1 values of the Control and Experimental groups is more by 14 Hz after intervention, a negligible effect size of 0.06.

The distance between the mean F_2 values of the Norm and Experimental groups decreased by 160 Hz post-intervention in the productions of the onset [ɪ]. This decrease translates to a small effect size of 0.15. The Experimental group's mean F_2 values approximating those of the Norm group post-intervention, indicates that the Experimental group's horizontal movement of the tongue is more similar to that of the Norm group after intervention. Therefore, it can be stated that the intervention improved the horizontal lingual movement of the Experimental group. This is further confirmed by an increase in distance by 9 Hz, in other words, although relating to a negligible effect size of 0.01, between the mean F_2 values of the Norm and Control groups. The distance between the mean F_2 values of the Control and Experimental groups decreased by 170 Hz. This decrease in distance translates to a small effect size of 0.16.

Table 42: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the offset of [ɪə]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	42	58	16	0.06	84	29	-55	0.10
Norm and Control	51	39	-12	0.05	124	98	-26	0.05
Control and Experimental	10	19	9	0.03	208	69	-139	0.21

Note: Hz = Hertz (thus frequency measured)
Pre-interv. = pre-intervention Post-interv. = post-intervention

Post-intervention, the difference in distance between the mean F_1 values of the Norm and Experimental groups' productions of the offset [ə] increased by 16 Hz, which computes to a negligible effect size of 0.06. This means that after intervention, the vertical tongue position of the Experimental group is even less similar to that of the Norm group than before intervention, indicating no improvement in tongue height because of the intervention. The mean F_1 values of the Norm and Control groups are closer after intervention, as indicated by the decrease of 12 Hz in distance, signifying a negligible effect size of 0.05. The difference in distance between the mean F_1 values of the Control and the Experimental groups increased by 9 Hz post-intervention, indicating a deterioration in proximity, but relating to a negligible effect size of 0.03.

The distance between the mean F_2 values of the Norm and Experimental groups' productions of the offset [ə] indicates an improvement of 55 Hz post-intervention, signifying a small effect size of 0.10. Noting the measurement between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it could be

stated that intervention improved the horizontal movement of the tongue of the Experimental group. An improvement in distance between the mean F_2 values of the Norm and Control groups can be noted as well. The distance between the mean F_2 values of the Norm and Control groups decreased by 26 Hz post-intervention, meaning a negligible effect size of 0.05. The distance between the mean F_2 values of the offset [ə] as produced by the Control and Experimental groups decreased by 139 Hz. This decrease relates to a small effect size of 0.21.

Table 43: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the onset of [a]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	15	3	-12	0.05	225	187	-38	0.09
Norm and Control	102	21	-81	0.32	203	157	-46	0.11
Control and Experimental	87	18	-69	0.28	22	29	7	0.02

Note: Hz = Hertz (thus frequency measured)
Pre-interv. = pre-intervention Post-interv. = post-intervention

The vertical lingual movement of the Experimental group's production of the onset [a] improved to such an extent that the distance between the mean F_1 values of the Norm and Experimental groups post-intervention is 3 Hz instead of the pre-intervention difference of 15 Hz, thus a decrease in distance of 12 Hz, relating to a negligible practical or clinical effect size of 0.05. The mean F_1 values of the Norm and Control groups are closer to one another post-intervention by 81 Hz, a small effect size of 0.32. Since the mean F_1 values of the Norm and Control groups are closer together than those of the Norm and Experimental groups post-intervention, it

cannot be stated that the intervention was responsible for the improvement of the vertical lingual movement of the Experimental group. The post-intervention distance between the mean F_1 values of the onset [a] as produced by the Control and Experimental groups is 69 Hz less than the pre-intervention distance, but signifies a small practical effect of 0.28.

The distance between the mean F_2 values of the onset [a] as produced by the Norm and Experimental groups indicates an improvement of 38 Hz post-intervention. This post-intervention improvement in distance between the mean F_2 values of these two groups signifies a negligible effect size of 0.09. Post-intervention, the distance between the mean F_2 values of the onset [a] as produced by the Norm and Control groups decreased by 46 Hz, signifying a small effect size of 0.11. Noting the larger improvement in distance between the mean F_2 values of the Norm and Control groups pre- and post-intervention, it cannot be stated that intervention alone improved the horizontal movement of the tongue in the Experimental group. The distance between the mean F_2 values of the onset [a] as produced by the Control and Experimental groups increased by 7 Hz, signifying a negligible practical significance with an effect size of 0.02.

Table 44: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the offset of [a]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	75	64	-11	0.03	80	56	-24	0.03
Norm and Control	127	10	-117	0.36	60	24	-36	0.05
Control and Experimental	52	54	2	0.00	20	32	12	0.01

Note: Hz = Hertz (thus frequency measured)
Pre-interv. = pre-intervention Post-interv. = post-intervention

Concerning vertical lingual behaviour as depicted by the mean F_1 values, Table 45 shows that the productions of the offset [ɪ] by the Norm and Experimental groups are closer together post-intervention by 11 Hz, although an improvement, it signifies a negligible effect size of 0.03. The mean F_1 values of the Norm and Control groups, however, are closer to one another after intervention by 117 Hz signifying a moderate effect size of 0.36. One may therefore conclude that intervention did not improve the vertical lingual movement of the Experimental group for the production of the offset [ɪ]. The distance between the mean F_1 values of the Control and Experimental groups increased by 2 Hz after intervention, indicating a very small change with no practical effect (effect size is 0.00).

For the production of the offset [ɪ], the distance between the mean F_2 values of the Norm and Experimental groups indicates an improvement of 24 Hz post-intervention relating to a negligible practical effect of 0.03. The distance between the F_2 values of Norm and Control groups decreased by 36Hz post-intervention signifying a negligible effect size of 0.05. Noting the measurements between the mean F_2 values of the

Norm and Experimental groups pre- and post-intervention, and those between the Norm and Control groups pre- and post-intervention, it cannot be stated that intervention improved the horizontal lingual movement of the Experimental group for the production of the offset [ɪ]. The mean values of F_1 for the Control and Experimental groups, however, are closer to one another by 12 Hz after intervention, but relating to a negligible effect size of 0.01.

Table 45: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the onset of [au]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	17	61	44	0.16	22	85	63	0.23
Norm and Control	16	63	47	0.17	75	111	36	0.14
Control and Experimental	33	2	-31	0.13	54	26	-28	0.10

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Regarding the vertical movement of the tongue as depicted by the mean F_1 values of the productions of the onset [a], Table 46 indicates that the mean formant frequencies of the Norm and Experimental groups are further apart by 44 Hz after intervention. This indicates deterioration in proximity between the mean F_1 values of these two groups, although with a small effect size of 0.16. Intervention therefore did not improve the vertical lingual movement in the Experimental group. Similarly, the mean formant frequencies of the Norm and Control groups are further apart by 47 Hz after intervention, resulting in a small effect size of 0.17. The mean values of F_1 for

the Control and Experimental groups, however, are closer to one another by 31 Hz after intervention, which signifies a small effect size 0.13.

The distance between the mean F_2 values of the Norm and Experimental groups in the productions of the onset [a] indicates that post-intervention, the mean F_2 value of the Experimental group is further away from that of the Norm group by 63 Hz. This, however, relates to a small effect size of 0.23. In the same way, the distance between the mean F_2 values of the Norm and Control groups increased by 36 Hz post-intervention; a small effect size of 0.14. Noting the distance measurement between the mean F_2 values of the Norm and Experimental groups, pre- and post-intervention, it can be stated that intervention did not improve the horizontal movement of the tongue of the Experimental group during the production of the onset [a]. The distance between the mean F_2 values of the Control and Experimental groups, however, decreased by 28 Hz post-intervention, resulting in a small effect size of 0.10.

Table 46: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the offset of [au]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	157	61	-96	0.31	244	51	-193	0.70
Norm and Control	78	43	-35	0.13	231	35	-196	0.71
Control and Experimental	79	18	-61	0.20	13	16	3	0.00

Note: Hz = Hertz (thus frequency measured)
Pre-interv. = pre-intervention Post-interv. = post-intervention

Relating to the vertical lingual behaviour as depicted by the mean F_1 values of the offset [ʊ] when produced by the Norm and Experimental groups, Table 47 shows that these groups are closer to one another post-intervention by 96 Hz, relating to a small effect size of 0.31. The intervention can therefore be cited as having improved the vertical lingual movement in the Experimental group in the articulation of this segment of the diphthong [aʊ]. Post-intervention, the distance between the mean F_1 values of the offset [ʊ] as produced by the Norm and Control groups are closer to one another by 35 Hz. This decrease in distance translates to a small effect size of 0.13. The difference in distance between the mean F_1 values of the Control and Experimental groups are closer by 61 Hz after intervention, having a small effect size of 0.20.

The distance between the mean F_2 values of the offset [ʊ] as produced by the Norm and Experimental groups indicates an improvement of 193 Hz post-intervention. This post-intervention improvement in distance between the mean F_2 values of these two groups signifies a large effect size of 0.70. Post-intervention, the distance between the mean F_2 values of the offset [ʊ] as produced by the Norm and Control groups, decreased by 196 Hz, signifying a large effect size of 0.71. Noting the larger improvement in distance between the mean F_2 values of the Norm and Control groups pre- and post-intervention, it cannot be stated that intervention alone improved the horizontal movement of the tongue in the Experimental group. The distance between the mean F_2 values of the offset [ʊ] as produced by the Control and Experimental groups increased by 3 Hz, signifying no practical significance (effect size of 0.00).

Table 47: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the onset of [ɔ]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	123	169	46	0.23	331	157	-174	0.49
Norm and Control	85	92	7	0.03	422	142	-279	0.63
Control and Experimental	37	77	40	0.18	91	14	-77	0.16

Note: Hz = Hertz (thus frequency measured)
Pre-interv. = pre-intervention Post-interv. = post-intervention

The distance between the mean F_1 values of the Norm and Experimental groups' production of the onset [ɔ] shows no improvement after intervention. In fact, a deterioration, with a small effect size of 0.23 in proximity occurred as signified by the 46 Hz difference in mean F_1 values of these two groups' production of the onset [ɔ]. It can therefore be stated that the intervention did not improve the horizontal movement of the tongue in the Experimental group. No post-intervention improvement is noticed in the distance between the mean F_1 values of the productions of the onset [ɔ] by the Norm and Control groups either. Deterioration of 7 Hz with a negligible effect size of 0.03 occurred in the distance between the mean F_1 values. Post-intervention, the distance between the mean F_1 values of the Control and Experimental groups increased by 40 Hz as well. This change in proximity relates to a small effect size of 0.18.

The distance between the mean F_2 values of the Norm and Experimental groups' productions of the onset [ɔ] indicates an improvement of 174 Hz post-intervention, signifying a moderate effect size of 0.49. Post-intervention, the distance between the mean F_2 values of the onset [ɔ] as produced by the Norm and Control groups, decreased by 279 Hz, affecting a medium effect size of 0.63. Noting the

measurement between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it would seem that the intervention improved the horizontal movement of the tongue in the Experimental group. Greater improvement, however, occurred between the mean F_2 values of the Norm and Control groups, indicating that whatever improvement occurred in the horizontal lingual modification of the Experimental group cannot be attributed to the intervention. The distance between the mean F_2 values of the Control and Experimental groups' productions of the onset [ɔ] indicates an improvement of 77 Hz post-intervention, relating to a small effect size of 0.16.

Table 48: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the offset of [ɔ]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	70	111	41	0.14	434	147	-287	0.32
Norm and Control	38	118	80	0.34	573	129	-444	0.55
Control and Experimental	32	8	-24	0.09	140	17	-123	0.17

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Regarding the vertical movement of the tongue as depicted by the mean F_1 values of the productions of the offset [ɪ], Table 49 indicates that the mean formant frequencies of the Norm and Experimental groups are further apart by 41 Hz after intervention. This indicates deterioration in proximity between the mean F_1 values of these two groups, however with a small effect size of 0.14. Intervention therefore did not improve the vertical lingual movement in the Experimental group. Similarly, the mean formant frequencies of the Norm and Control groups are further apart by 80 Hz after intervention, resulting in a small effect size of 0.34. The mean values of F_1 for

the Control and Experimental groups, however, are closer to one another by 24 Hz after intervention, which signifies an improvement in proximity, but relating to a negligible effect size of 0.09.

The distance between the mean F_2 values of the Norm and Experimental groups' productions of the offset [ɪ] indicates an improvement of 287 Hz post-intervention, relating to a small effect size of 0.32. After intervention, the distance between the mean F_2 values of the offset [ɪ] as produced by the Norm and Control groups decreased by 444 Hz, affecting a medium effect size of 0.55. Noting the measurement between the mean F_2 values of the Norm and Experimental groups pre- and post-intervention, it would seem that the intervention improved the horizontal movement of the tongue in the Experimental group. Greater improvement, however, occurred between the mean F_2 values of the Norm and Control groups, indicating that whatever improvement occurred in the horizontal lingual modification of the Experimental group cannot be attributed to the intervention. The distance between the mean F_2 values of the Control and Experimental groups' productions of the offset [ɪ] indicates an improvement of 123 Hz post-intervention, relating to a small effect size of 0.17.

Table 49: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the onset of [əʊ]

Groups compared	Mean F ₁ Distance (Hz) and effect size before and after intervention				Mean F ₂ Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	126	125	-1	0.00	254	274	20	0.05
Norm and Control	186	209	23	0.13	277	288	11	0.03
Control and Experimental	60	84	24	0.10	23	15	-8	0.02

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

After intervention, the difference in distance between the mean F₁ values of the productions of the onset [ə] by the Norm and Experimental groups decreased by 1 Hz, indicating no practical effect (effect size of 0.00). This means that post-intervention the vertical tongue position of the Experimental group, although an extremely small improvement was effected, is more similar to that of the Norm group than prior to intervention. This F₁ approximation of the Norm group's production would indicate that the vertical lingual movement of the Experimental group improved very slightly due to intervention. The mean F₁ values of the Norm and Control groups are further apart post-intervention, as indicated by the increase of 23 Hz in distance, relating to a small effect size of 0.13. The difference in distance between the mean F₁ values of the Control and the Experimental groups, increased by 24 Hz post-intervention, with a small effect size of 0.10.

The distance between the mean F₂ values of the Norm and Experimental groups on the productions of the onset [ə] indicates that post-intervention, the mean F₂ value of the Experimental group is further away from that of the Norm group by 20 Hz,

relating to a negligible effect size of 0.05. Noting the distance measurement between the mean F₂ values of the Norm and Experimental groups, pre- and post-intervention, it can be stated that intervention did not improve the horizontal movement of the tongue of the Experimental group during the production of the

onset [ə]. In the same way, the distance between the mean F_2 values of the Norm and Control groups increased by 11 Hz post-intervention, a negligible effect size of 0.03. The distance between the mean F_2 values of the Control and Experimental groups, however, decreased by 8 Hz after intervention, resulting in a negligible effect size of 0.02.

Table 50: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the offset of [əʊ]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	106	89	-17	0.11	287	365	78	0.20
Norm and Control	84	114	30	0.19	276	353	77	0.20
Control and Experimental	22	25	3	0.02	12	12	0	0.00

Note: Hz = Hertz (thus frequency measured)
Pre-interv. = pre-intervention Post-interv. = post-intervention

Post-intervention the difference in distance between the mean F_1 values of the productions of the offset [ʊ] by the Norm and Experimental groups decreased by 17 Hz, indicating a small practical effect size of 0.11. This means that post-intervention, the vertical tongue position of the Experimental group is more similar to that of the Norm group than pre-intervention. This F_1 approximation of the Norm group's production would indicate that the vertical lingual movement of the Experimental group improved due to intervention. The mean F_1 values of the Norm and Control groups are further apart post-intervention, as indicated by the increase of 30 Hz in distance, signifying a small effect size of 0.19. The difference in distance between the mean F_1 values of the Control and the Experimental groups, increased by 3 Hz post-intervention, with a negligible effect size of 0.02.

The distance between the mean F_2 values of the Norm and Experimental groups on the productions of the offset [ʊ] indicates that post-intervention, the mean F_2 value of the Experimental group is further away from that of the Norm group by 78 Hz, with a small effect size of 0.20. In the same way, the distance between the mean F_2 values of the Norm and Control groups increased by 77 Hz post-intervention, signifying a small effect size of 0.20. Noting the distance measurement between the mean F_2 values of the Norm and Experimental groups, pre- and post-intervention, it can be stated that intervention did not improve the horizontal movement of the tongue of the Experimental group during the production of the offset [ʊ]. The distance between the mean F_2 values of the Control and Experimental groups, however, did not change at all post-intervention as indicated by the 0 Hz and an effect size of 0.00.

Table 51: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the onset of [ʊə]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference	Effect size	Pre-interv.	Post-interv.	Difference	Effect size
Norm and Experimental	5	10	5	0.02	57	114	57	0.09
Norm and Control	86	21	-65	0.38	2	104	102	0.17
Control and Experimental	81	11	-70	0.28	58	10	-48	0.07

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Regarding vertical lingual behaviour as depicted by the mean F_1 values, Table 51 shows that the productions of the onset [ʊ] by the Norm and Experimental groups are further apart post-intervention by 5 Hz, although with a negligible effect size of 0.02. One can therefore conclude that intervention did not improve the vertical lingual movement of the Experimental group for the production of the onset [ʊ]. However, both the mean F_1 values of the Norm and Control groups and those of the Control and Experimental groups are closer together post-intervention by 65 Hz and 70 Hz

respectively, with a moderate effect size of 0.38 and small effect size of 0.28 respectively.

The distance between the mean F_2 values of the Norm and Experimental groups on the productions of the onset [ʊ] indicates that post-intervention the mean F_2 value of the Experimental group is further away from that of the Norm group by 57 Hz. This signifies a negligible effect size of 0.09, however. Noting the distance measurement between the mean F_2 values of the Norm and Experimental groups, pre- and post-intervention, it can be stated that intervention did not improve the horizontal movement of the tongue of the Experimental group during the production of the onset [ʊ]. In the same way, the distance between the mean F_2 values of the Norm and Control groups increased by 102 Hz post-intervention, relating to a small effect size of 0.17. The distance between the mean F_2 values of the Control and Experimental groups, however, decreased by 48 Hz after intervention, resulting in a negligible effect size of 0.07.

Table 52: Between-group comparisons of the distance between the mean F_1 values pre- and post-intervention and mean F_2 values pre- and post-intervention on the production of the offset of [ʊə]

Groups compared	Mean F_1 Distance (Hz) and effect size before and after intervention				Mean F_2 Distance (Hz) and effect size before and after intervention			
	Pre-interv.	Post-interv.	Difference		Pre-interv.	Post-interv.	Difference	

				Effect size				Effect size
Norm and Experimental	73	111	38	0.12	84	81	-3	0.01
Norm and Control	56	62	6	0.02	24	3	-21	0.04
Control and Experimental	130	48	-82	0.22	60	84	24	0.04

Note: Hz = Hertz (thus frequency measured)

Pre-interv. = pre-intervention Post-interv. = post-intervention

Concerning the vertical movement of the tongue as depicted by the mean F_1 values of the productions of the offset [ə], Table 52 indicates that the mean formant frequencies of the Norm and Experimental groups are further apart by 38 Hz after intervention. This indicates deterioration in proximity between the mean F_1 values of these two groups relating to a small effect size of 0.12. Intervention therefore did not improve the vertical lingual movement in the Experimental group. Similarly, the mean formant frequencies of the Norm and Control groups are further apart by 6 Hz after intervention, resulting in a negligible effect size of 0.02. The mean values of F_1 for the Control and Experimental groups, however, are closer to one another by 82 Hz after intervention, which signifies a small effect size of 0.22.

The distance between the mean F_2 values of the offset [ə] as produced by the Norm and Experimental groups indicates an improvement of 3 Hz post-intervention. This post-intervention improvement in distance between the mean F_2 values of these two groups signifies a negligible effect size of 0.01. Post-intervention the distance

between the mean F_2 values of the offset [ə] as produced by the Norm and Control groups, decreased by 21 Hz, relating to a negligible effect size of 0.04. Noting the larger improvement in distance between the mean F_2 values of the Norm and Control groups pre- and post-intervention, it cannot be stated that intervention alone improved the horizontal movement of the tongue in the Experimental group. The distance between the mean F_2 values of the offset [ə] as produced by the Control

and Experimental groups increased by 24 Hz, relating to a negligible practical significance (effect size of 0.04).

In Table 53, the post-intervention behaviour of the F_1 and F_2 of the Experimental group is summarized. A formant's value is only deemed improved if that of the Control group did not improve more; thus if improvement could be attributed to the intervention.

Table 53: Post-intervention lingual behaviour of the Experimental group in terms of improvement (\checkmark) and non-improvement (\times), effect sizes included, based on the comparison of distances between mean values of both F_1 and F_2 of the Norm and Experimental groups: onset and offset of diphthongs

Onset	Offset
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Diphthong	Post-intervention behaviour	F ₁	Effect size	F ₂	Effect size	F ₁	Effect size	F ₂	Effect size
[eɪ]	Improvement	√	S	√	S	√	M	√	M
[ɪə]	Improvement	x	-	√	S	x	-	√	S
[aɪ]	Improvement	x	-	x	-	x	-	x	-
[aʊ]	Improvement	x	-	x	-	√	S	x	-
[ɔɪ]	Improvement	x	-	x	-	x	-	x	-
[əʊ]	Improvement	√	0 ⁹	x	-	√	S	x	-
[ʊə]	Improvement	x	-	x	-	x	-	x	-
Total number of improvements		2		2		3		2	

Note: N = negligible S = small
M = moderate L = large

Once again, similar to the monophthongs, the results of all comparisons between the three groups were statistically significant ($p < 0.001$). This, however, is the result of the large sample sizes in the acoustic analyses ($n = 1677$, total pre- and post-intervention). Effect sizes therefore provide a more reliable indication of the magnitude of practical effects in changes of F₁ and F₂ distances pre- and post-intervention. Despite the small or negligible effect sizes that were frequently noted, the improvement was clinically significant because a shorter distance between the formant values of the Norm and Experimental groups is noticeable in the vowel space. This indicates that the productions of the Experimental group were approaching those of the Norm group, indicating that intervention or additional input is effective in changing the perception and articulation of the EL2 participants.

After intervention, very few improvements in distance between the mean F₁ and F₂ values were noted were the diphthongs are concerned. In some instances, improvements in the Experimental group's productions occurred, but these could not be marked as improvements due to intervention, because the productions of the Control group improved more in that specific instance¹⁰.

⁹ Although an improvement of 1 Hz in mean F₁ value occurred post-intervention, it has no practical effect (effect size 0.00)

¹⁰ This occurrence can be noted with the short and long monophthongs as well. In order not to repeat information, this tendency will be addressed in Section 6.5.

Very similar numbers of improvement in the onsets and offsets of the diphthongs were noted, although more improvement occurred in the offsets of the diphthongs. This same tendency was noted in the number of improvements in the F_1 and F_2 behaviour (see Footnote 9). Interestingly, in contrast to the long monophthongs [i:], [u:] and [ɜ:], and consistent with the short monophthongs [ʊ] and [ə], more improvement in lingual movement occurred with the higher vowels [ɪ], [ʊ], [e] and the central vowel [ə]. These improvements are not consistent, though. [ɪ] would show improvement in both F_1 and F_2 behaviour when occurring as offset in the diphthong [eɪ], but no improvement is noted when [ɪ] occurs as the offset in the production of the diphthongs [aɪ] and [ɔɪ]. Improvement of the F_2 behaviour can be noted when [ɪ] occurs as the onset in [ɪə], though.

This same inconsistency could be noted in the production of [ʊ] and [ə]. No improvement is observed in either the F_1 or F_2 behaviour in the production of [ʊ] when occurring as onset in [ʊə]. When functioning as offset in [aʊ] and [əʊ], improvement in only the F_1 behaviour can be noted. When [ə] occurs as offset in [ɪə], an improvement in F_2 behaviour can be noted, while no improvement in behaviour in either F_1 or F_2 is noted when it functions as offset in [ʊə]. An improvement in F_1 behaviour occurs when this central vowel occurs as the onset of [əʊ].

No improvement in formant behaviour in the productions of the low vowel [a] or mid-low vowel [ɔ] was noted. This is contrary to what was noted in the productions of the low and mid-low long monophthongs [ɑ:] and [ɔ:] which showed improvement in both F_1 and F_2 behaviour, and the mid-low short monophthongs [ʌ] and [ɒ], and low vowel [æ] which showed only improvement in the F_2 behaviour.

These contradictory findings could perhaps be ascribed to the degree of difficulty that accompanies the articulation of diphthongs, the fact that diphthongs do not occur in Setswana, and the relatively short period of intervention that the Experimental group received.

6.5 General discussion of the results of the monophthongs and diphthongs

In general, comparing the characteristics of the short vowels produced by the three groups of participants pre- and post-intervention, various observations can be made. It can be observed that although there was some overlap in vowel space between the three groups, the vowel space of the Norm group differed in size and shape compared to those of the Experimental and Control groups. This could be expected, as the Norm group consisted of EL1 speakers, while EL2 speakers constituted the Experimental and Control groups. For this reason, the difference between the vowel spaces of the Experimental and Control groups was not that extreme.

The space occupied by the vowels of the Norm group was smaller than those occupied by the vowels produced by the Experimental and Control groups. This suggested less horizontal and vertical movement of the tongue during articulation by the Norm group. The tendency of L2 vowel formant frequencies to overshoot the values of the L1 vowels, is confirmed by research by Flege et al. (2003). Post-intervention though, the configuration of the vowel space of the Experimental group was seen to approximate that of the Norm group, indicating that development towards the Norm production is taking place.

In discussing the position of the vowels in the vowel space as produced by the Norm, Experimental and Control groups pre- and post-intervention, reference can be made to cross-language speech perception. As mentioned in Chapter 3, various perceptual theories or models exist that strive to explain the difference in L1 and L2 perception and production. Although advancing one of these theories or models, however, is not part of the aim of this study, the Perceptual Assimilation Model (PAM) (Best, 1994), Native Language Magnet (Polka & Bohn, 1996), and the Speech Learning Model (SLM) (Flege, 1986, 1992, 1995) are deemed relevant to this study and the results of this study will be explained by referring to general ideas advanced by these models.

When comparing the vowel spaces produced by the Norm, Experimental and Control groups pre- and post-intervention, it became clear that there were some vowels that were produced relatively similarly while others showed extensive differences. This could be explained by referring to the influence of the characteristics of the L1

sounds. The central vowel [ə] which does not occur in Setswana could be cited as an example of a new sound that does not occur in the L1 (Flege, 1987). This sound should have been difficult to produce (Oh et al., 2011). Interestingly though, according to the results of this study, this vowel is present in the vowel inventory of the EL2 English participants, even prior to intervention. Therefore, the vowels [ɪ] and [ʊ] could be cited as instances of *new* vowels since they do not occur in Setswana, and were seen as difficult to perceive and produce.

L2 sounds identified as *similar* to L1 sounds are normally allocated to an existing sound category in the L1 (Flege, 1986; 1987; Strange et al., 1998; Best, 1994). An example of *similar* sounds could possibly be WSAfE [e] and Setswana [e] or [ɛ], although acoustic differences were still noted between the productions. These sounds were therefore not seen as *identical* (Flege, 1986). Interestingly, James (1986) makes the observation that since L2 learners make production mistakes with both new and similar sounds, it would seem that they continue to discriminate these L2 sounds in terms of the L1 categories. This tendency could be noted in this study.

Post-intervention, however, it would seem that some of the vowels as produced by the Experimental group moved closer to those of the L1 speakers, meaning that the L2 perception and production of those vowels were approximating those of the L1. In some of the vowels produced by the Experimental group, like [e] and [ʌ], for example, either the F₁ value or the F₂ value approached that of the Norm group post-intervention. This approximation suggested that these participants are in the process of developing new categories for these L2 sounds.

The L1 influence could be seen in the production of the tense short monophthongs [ɪ], [æ] and [ʊ], lying on the perimeter of the vowel space and acting as natural referent vowels that assist the L2 learner to develop vowel perception (Polka & Bohn, 2011). This tendency is confirmed by research by Oh et al. (2011). Pre-intervention, large differences in both F₁ and F₂ values of these vowels as produced by the Norm, Experimental and Control groups were evident. Post-intervention, some horizontal approximation of both the EL2 groups' production of [ɪ] to that of the EL1 group was observable, but vertically both the EL2 groups still produced the [ɪ] in

a very high position, reminiscent of Setswana [i]. The intervention was therefore not enough exposure to assist the Experimental group to form a new category for [ɪ].

Although the same could be said for [ʊ], evidence of the development of a category was noted post-intervention. Comparing the vertical and horizontal lingual movement of the Experimental group, both the F_1 and F_2 values were seen to improve to approach those of the Norm group. This suggests that with training, new categories for L2 sounds can develop.

Before intervention, the low vowel [æ] was produced much higher and slightly more towards the front of the vowel space by the Experimental and Control groups. No improvement of either F_1 or F_2 could be observed in the positioning of this vowel post-intervention. Instead, even post-intervention, this vowel seemed to strive to be in harmony with the mid-low back vowel [ɔ]. This is reminiscent of the vowel harmony found in Setswana vowels where the mid-low front vowel [ɛ] is vertically and horizontally identical to the mid-low back vowel [ɔ]. Studying the position of this vowel in the vowel space, it could therefore be safe to assume that [æ] was assimilated to the L1 category of [ɛ]. Although the production of the EL2 participants could not truly be seen as BSAE, this occurrence is corroborated by research by Van Rooy and Van Huyssteen (2000) which indicates that 47% of Setswana BSAE speakers perceive [æ] as [ɛ].

When studying the vowels [e], [ʌ] and [ɒ], it could be observed that the productions of the Norm, Experimental and Control groups did not differ much pre-intervention. This suggested that these vowels were perceived as similar to corresponding L1 vowels [e], [a] and [ɔ] respectively. Post-intervention, the productions of the Norm and Experimental groups were even closer – on either the F_1 or F_2 – suggesting that development of new categories for these L2 sounds could be in process. L2 vowels that are perceived as similar to corresponding L1 vowels are therefore deemed easier to acquire in the L2 (Baker et al., 2008).

The central vowel [ə] presented an interesting case. Although no central vowel is present in Setswana (Cole, 1955; Le Roux, 2004) or BSAE (Van Rooy, 2004; De

Wet et al., 2007), a central vowel, although low and more towards the back of the vowel space, was present in the pre-intervention productions of the Experimental and Control groups. Post-intervention there was improvement in both F_1 and F_2 of the Experimental group, indicating that a new category was developing, although not identical to that of the Norm group [ə]. This confirms the statement by Mesthrie (2008) that it seems that a second language variety of English approaching WSAfE is developing amongst young African language speakers of English.

Comparing the vowel spaces of the long monophthongs as produced by the three groups of participants prior to intervention, various observations could be made. Firstly, the vowel space of the Norm group clearly resembled that of the WSAfE long monophthongs as depicted in Chapter 4 while those of the two EL2 groups did not. The vowel spaces of the Experimental and Control groups still resembled that of the short monophthongs pre-intervention, which resembled that of Setswana vowels.

A second general observation would be that pre-intervention, the vowel space of the Norm group was much smaller than that of the Experimental and Control groups. Post-intervention, though, the size and shape of the vowel space of both the Experimental and Control groups were seen to approximate that of the Norm group, indicating that development towards the lingual behaviour of the Norm production was taking place.

When comparing the vowel spaces as produced by the EL1 and EL2 groups before intervention, it became clear that the Setswana vowels lying on the perimeter of the vowel space again acted as perceptual magnets or natural referent vowels attracting vowels from the L2 (Kuhl & Iverson, 1995; Polka & Bohn, 2011; Bosch et al., 2000). This implies that L2 speakers do not distinguish length if it does not occur in the L1 (Best & Tyler, 2007). Therefore, L2 speakers often assimilate contrasting L2 vowels (long vs. short vowels) into one vowel which is generally the vowel that occurs in the L1 (Tsukada, 1999). After intervention, it is evident that while some vowels were produced more in line with the Norm productions, others still showed extensive differences. This could once again be explained by referring to the influence of the characteristics of the L1 sounds.

Prior to intervention, [i:], [u:] and [ɑ:] of the Experimental and Control groups did not differ much from the short monophthongs [ɪ], [ʊ] and [ʌ] respectively. This indicates that the EL2 groups did not distinguish between the short and long monophthongs of English (Best & Tyler, 2007).

After intervention, [i:] as produced by the Experimental group, did not show much change in articulation while the Control group showed more of a change in F_1 and F_2 values. This confirmed the theory that the L1 vowels functioning as perceptual magnets have an influence on the perception and articulation of L2 vowels (Polka & Bohn, 2011). No new category for [i:] thus developed post-intervention as this vowel still seemed to be assimilated to the L1 vowel category [ɪ] (Højen & Flege, 2006; Polka & Bohn, 2011).

Interestingly, although the high back vowel [u] is also seen as a natural referent vowel (Polka & Bohn, 1996), a change in the F_1 and F_2 values of the two EL2 groups' production of [u:] could be observed post-intervention in the vowel space. The F_1 of [u:] as produced by the Experimental group was lower post-intervention, approximating the Norm production. The F_2 value increased, indicating that the tongue moved more towards the front post-intervention, approaching the position of the Norm production. Although no statistically significant improvement could be cited (see Table 36), and the influence of the high back vowel [u] as perceptual magnet is still visible, it should be safe to state that a new category could be forming, indicating clinical significance. This is confirmed by the configuration of the vowel space (see Fig. 28).

When studying the position of the low back vowel [ɑ:] in the vowel space of the two EL2 groups, it was clear that the L1 vowel [a] still influenced the perception and articulation of the L2 vowel post-intervention (Polka & Bohn, 2011; James, 1986). However, the F_1 of the Experimental group was lower, thus moving in the direction of the Norm production. The F_1 value of the Control group decreased as well post-intervention. Although the F_2 values of the [ɑ:] as produced by the two EL2 groups indicated that the tongue moved backwards approximating the horizontal behaviour of the Norm group, the horizontal position of both these EL2 productions was still far

from that of the Norm group. Despite the improvement in the lingual behaviour of the Experimental group, the position of [ɑ:] in the vowel space as produced by this group, may still be too far from that of the Norm group to permit the statement that a new category is forming.

The pre-intervention position of the vowel [ɛ:] as produced by the Experimental group was lower and more towards the back than those of the Norm and Control groups. The Experimental group production was thus reminiscent of the Setswana vowel [ɛ]. The same could be said for the [ɔ:]: it was articulated with the tongue in a much lower position than during the Norm production, clearly similar to the Setswana mid-low back vowel [ɔ]. Horizontally, the tongue was more towards the front in the production of the [ɔ:] when comparing the production of the Experimental group to that of the Norm group, and even to that of the Control group.

After intervention, the vertical modification of [ɛ:] of the Experimental group did not improve, but was even lower than before the intervention. This once again indicated that even after intervention, this English vowel was assimilated to the L1 category of [ɛ] (James, 1986). The production of the Control group was very close to that of the Norm group. The horizontal modification of the Experimental group, however, improved to such an extent that it was almost identical to that of the Norm production.

Both the vertical and horizontal lingual modification in the production of [ɔ:] improved after intervention, but the position of this vowel in the vowel space is still not close to that of the Norm group. This once again indicated that the L2 participants still perceived this vowel according to the category of the L1 (Højen & Flege, 2006).

Similar to the short central vowel [ə], the long central vowel [ɜ:] provided material for interesting observations. Firstly, it was interesting that a central vowel is distinguished at all as it does not occur in Setswana (Cole, 1955; Le Roux, 2004) or BSAE (Van Rooy, 2004; De Wet et al., 2007). Secondly, compared to the short vowel [ə], before the intervention the long vowel [ɜ:] was produced much higher and more towards the front by the two EL2 groups. This monophthong thus seemed to be

perceived as close to [ɛ:] and therefore as close to Setswana [ɛ]. This confirmed the statement by Lanham (1982) that this vowel is very often not distinguished from the short vowel [ɛ] by speakers of BSAE. In addition, Van Rooy and Van Huyssteen (2000) determined that 47% of Setswana speakers of BSAE replace [ɜ:] with [ɛ].

After intervention, this vowel as produced by the two EL2 groups was much more central and closer to the production of the Norm group. Although neither the F_1 nor the F_2 of the Experimental group's production improved to such an extent that one can state that the intervention was responsible, an approximation of the Norm group's production seemed to have occurred. The Experimental group's production was still slightly lower than that of the Norm group but that of the Control group was almost identical to that of the Norm. The change in production observable in the vowel space indicated that both EL2 groups seem to be in the process of forming a new category for this sound.

In general, comparing the characteristics of the diphthongs as produced by the three groups of participants before and after intervention, interesting observations could be made. The most obvious was surely that both the EL2 groups distinguished all the diphthongs that the EL1 group did, although differences in quality even after intervention were still observed. The fact that more diphthongs than [ɔɪ] were distinguished by the EL2 participants in this study is contrary to what was found by earlier research concerning BSAE diphthongs (Van Rooy, 2004; Van Rooy & Van Huyssteen, 2000). This again confirms Mesthrie's (2008) statement that the variety of English spoken by young English L2 speakers is not necessarily BSAE, but a second language variety of English that is approaching WSAfE.

Secondly, not much change occurred in the formant behaviour of the diphthongs as produced by the Experimental group after intervention. The reason could be that because diphthongs do not occur in Setswana, the finer aspects of their articulation may not be perceived, and may therefore be difficult to produce (Baker et al., 2008). In order to see more improvement in the articulation of diphthongs, more time will have to be allocated to articulation and perception training.

With most of the diphthongs, before and after intervention, the two EL2 groups' productions are more similar to one another than to the productions of the EL1 group. Despite this, these two groups' diphthongs did not differ that much from the EL1 group's production as would have been expected when recalling the literature on the diphthongs of BSAE (Van Rooy & Van Huyssteen, 2000; De Wet et al., 2007; Louw & De Wet, 2007).

Before intervention, when comparing the productions of the rising diphthong [eɪ] across the three groups of participants, the two EL2 groups' productions were narrower than that of the EL1 group's, thus presenting with a shorter distance between the onset and offset. This is contradictory to what was indicated by Van Rooy and Van Huyssteen (2000) about BSAE diphthongs. In addition to the difference in wideness, the direction of the offset differed as well. The direction of the offset of the two EL2 groups' productions was clearly towards the high front vowel [i], and not towards the [ɪ] as was evident in the production of the EL1 group. This move towards the tense vowel [i] is in line with what was stated concerning rising BSAE diphthongs by Louw and De Wet (2007). The onset of this diphthong, as produced by the two EL2 groups, was also higher than the WSAfE [e], thus reminiscent of the Setswana vowel [e].

After intervention, the productions of the two EL2 groups were still narrower than that of the EL1 group, but clearly not as narrow as to be realised as a single monophthong as suggested for BSAE diphthongs by Louw and De Wet (2007). The production of the Experimental group is wider than before intervention, indicating that the production could be approximating that of the Norm group. The onset [e] in the productions of the two EL2 groups was still higher and more towards the back of the vowel space than that of the EL1 group, although the Experimental group's production was closer to that of the Norm group. The height of the onset as produced by the two EL2 groups, especially in the production of the Control group, was again reminiscent of the mid-high Setswana vowel [e]. This indicates that the L1 still influenced the production of the L2 vowels (James, 1986). The direction of the offset [ɪ] of all three groups is more similar than before intervention, pointing in the direction of a high, but perhaps slightly more central front vowel than [i].

Referring to the centering diphthong [ɪə] prior to intervention, the onset of the productions by the EL2 groups were again higher than that of the EL1 group; thus more towards [i] than towards [ɪ]. This could be attributed to the influence of the perceptual magnet effect of the vowels occurring on the outer parameters of the vowel space of the L1 (Polka & Bohn, 2011). Contradictory to research on the diphthongs of BSAE (Van Rooy & Van Huyssteen, 2000; Louw & De Wet, 2007), both the EL2 groups produced a centralised offset similar to the EL1 group's. In addition, the diphthongs produced by the EL2 groups were not much narrower, if at all, than those of the Norm group.

After intervention, the onsets of all three groups were very similar in height. The onset of the diphthong [ɪə] as produced by the Norm and Control groups was more towards the front of the vowel space than in the production by the Experimental group. Both the EL2 groups produced an offset that was more towards the lower front vowel [æ] or [ɛ] than towards the central vowel [ə]. While the pre-intervention position of the offset did not confirm the statement by Louw and De Wet (2007) that the central vowel is replaced by a lower vowel in BSAE diphthongs, the post-intervention results definitely did. The diphthongs produced by the EL2 groups were not narrower than that of the Norm group, indicating that the quality of the two vowels constituting the diphthong differs enough to label the sound as a diphthong.

Prior to intervention, the onset of the rising diphthong [aɪ] as produced by the Norm group, started clearly at the position of the lowest vowel, with the direction of the offset towards [ɪ]. The onset of the productions of the two EL2 groups was more towards the front and higher, especially that of the Control group. Once again, the direction of the offset of the Norm group was directly towards [ɪ], while those of the EL2 groups pointed in the direction of [i]. This is in line with what Louw and De Wet (2007) stated about rising BSAE diphthongs. All three groups produced this diphthong with a large difference in frequency between the onset and the offset positions, resulting in a production with two clearly distinct vowel qualities.

After intervention, the onset [a] as produced by the Norm group, started more or less at the position of the lowest vowel [a], but slightly higher than the onset of the diphthong [au]. The productions of the two EL2 groups, however, placed the onset more towards the front of the vowel space. The onset produced by all three groups was very similar in height, though, which is in contrast to the productions before intervention. The direction of the offset [ɪ] as produced by the Norm group was more towards the front than those of the two EL2 groups. The direction of the Experimental group's offset was more towards a high front vowel than could be said of those of the Norm and Control groups. Contradictory to what was said about rising diphthongs (Louw & De Wet, 2007), the Norm group's production of this diphthong was still wider than those of the two EL2 groups.

Before intervention, in the EL1 production of the rising diphthong [au], the onset was very close to that of [aɪ], as could be expected. Interestingly, the onset of the productions by the EL2 groups differed from that of [aɪ] however. This diphthong, as produced by the EL1 group, was wider than when produced by the EL2 groups. This is contrary to the statement by Louw and De Wet (2007) claiming that rising diphthongs in BSAE are produced with a tensing of the offset. The gradient of the offset of all three groups was very similar, pointing in the direction of [ɔ], however, or towards a high (more) back vowel [u]. This is in contrast to the direction and position of the offset of [əu] and the onset of [uə]. It would therefore seem that the vowel space was enlarged towards the back when this diphthong was produced.

After intervention, the onset [a] as produced by the two EL2 groups was very similar in height. That of the Norm group was lower. As a result, the diphthong produced by the Norm group was wider than those produced by the two EL2 groups. Once again, this is in contrast to what was stated about rising diphthongs by Louw and De Wet (2007). Interestingly, the productions of [a] by the two EL2 groups were very close to the Norm group's production of [a] as the onset of [aɪ], while the production of the Norm group was not. The direction of the offset [u] was similar in the productions of all three groups, pointing towards [ɔ] or the high back vowel [u].

Large differences were noted between the EL1 and EL2 groups in the pre-intervention onset position of [ɔɪ]. The EL2 groups' onset was much lower than that of the EL1 group. Interestingly, the offsets of the EL2 groups pointed in the direction of [ɪ], and not [i] as was observed with the EL2 productions of [eɪ] and even the onset of [ɪə]. The production of this diphthong by the EL2 groups was much wider than that of the Norm group. This correlates with what was mentioned about rising BSAE diphthongs by Louw and De Wet (2007).

After intervention, substantial differences in the productions of [ɔɪ] were still visible. The onset [ɔ] of this diphthong as produced by the Norm group was much higher than in the productions by the two EL2 groups, and also more towards the back of the vowel space. The Norm group also produced this diphthong much wider than the Experimental and Control groups. Again, this is in contrast to what Louw and De Wet (2007) said about rising diphthongs in BSAE, and once more confirms that the variety of English spoken by these EL2 participants is not BSAE. The offset [ɪ] as produced by the Norm group moved towards [ɪ], while more towards a lower front vowel like [e] or [ɛ] when produced by the Experimental group. The gradient of the offset in the production of the Control group seemed able to converge with that of the Norm group at a point close to [ɪ].

Before intervention, the productions of the narrower diphthong (Louw & De Wet, 2007) [əʊ] by the EL2 groups were very similar but further apart from that of the EL1 group. The Norm group's production was wider than those of the two EL2 groups. The onset of the Norm group was clearly a central vowel, while those of the two EL2 groups were very high and more towards the back. The offset of this diphthong as produced by the EL1 group was more towards the central area of the vowel space while those of the EL2 groups were again more towards the back of the vowel space. This is in line with what Louw and De Wet (2007) observed with BSAE productions of narrow diphthongs like [əʊ].

After intervention, large differences in production were still noted between the articulations of the Norm group on the one hand, and the two EL2 groups on the other. The production of this diphthong by the two EL2 was still very similar. The

onset [ə] of the Norm group was clearly a central vowel, while those of the Experimental and Control groups were not central, but much higher and more towards the back of the vowel space. The onset in the productions of the two EL2 groups was in the vicinity of the vowel [ə]. The diphthong as produced by the Norm group was again wider than when produced by the two EL2 groups, suggesting less difference in quality between the onset and offset. This is consistent with possible BSAE realisation (Van Rooy & Van Huyssteen, 2000; De Wet et al., 2007). The gradient of the offset in the Norm group's production was once again, unexpectedly centralised, while those of the two EL2 groups pointed in the direction of the high back vowel [u].

Referring to the pre-intervention production of the [uə], it was observed that the Experimental group's production was wider than those of the Norm and Control groups. The onset of this diphthong, as produced by all three groups of participants, was more central than during the productions the EL2 productions of [əu]. The offset of the EL1 group was close to the onset of EL1 [əu]. More difference between the productions of these diphthongs by the EL2 groups was noted. The offset of [uə] as produced by the EL1 group was a truly central vowel. That of the Control group was very similar to the production of the Norm group, while the production of the Experimental group was more towards the back of the vowel space and was also lower. This is consistent with what was suggested by Louw and De Wet (2007) concerning BSAE productions of centering diphthongs.

After intervention, the onset [u] as produced by the Norm group was more central than in the productions by the two EL2 groups. The offset as produced by the EL1 group was centralised, as expected. The Experimental group's production was still wider than those of the other two groups, with the gradient of the offset [ə] in the direction of a lower front vowel [æ]. This is consistent with the findings of Louw and De Wet (2007) concerning the centering diphthongs produced in BSAE.

In conclusion, all three the groups of participants' productions of the vowels changed in the period from pre- to post-intervention assessment. The changes observed in the Norm group' productions could be due to natural maturation of the vocal

apparatus that took place in the time between pre- and post-intervention assessment. Focussing on the productions of the two EL2 groups, it can be stated that the intervention given to the Experimental group improved either both the F_1 and F_2 behaviour of some of the vowels, or just the F_1 or the F_2 , or no improvement was visible at all.

Referring to the short and long monophthongs, in the productions of [ʊ], [ə], [ɑ:] and [ɔ:], both the vertical and horizontal movement improved in such a manner that the F_1 and F_2 formant behaviour of Experimental group could be seen to approximate that of the Norm group. Often it was the F_2 that improved, suggesting that it is easier to change the horizontal movement of the tongue.

Other vowels improved in either F_1 or F_2 behaviour only: the F_1 of [e] and [əʊ] improved, while only the F_2 of [ɪ], [ʌ], [ɒ], [ɛ:] and [ɪə] improved. The vowels [æ], [i:], [u:], [ɜ:], [aɪ], [ɔɪ] and [ʊə] as produced by the Experimental group showed no improvement at all. In fact, only in the production of [eɪ] could an improvement in both vertical and horizontal modification of both the onset and offset be observed. It would therefore seem that the intervention was more successful in altering the perception and articulation of the short monophthongs than the long monophthongs and diphthongs. The fact that long monophthongs and diphthongs do not occur in Setswana could be offered as a possible explanation.

In addition to this occurrence, the formant behaviour of F_1 and/or F_2 productions of the Control group sometimes improved (or improved more) while those of the Experimental group did not. The Experimental group improved on 22 occasions compared to the 20 of the Control group. Improvement in the F_1 behaviour of the Control group could be seen in the production of [ɪ], [æ], [ʌ], [ɒ], [ɛ:], [u:], [ɜ:], onset of [ɪə], offset of [ɪə], onset of [aɪ], offset of [aɪ], and in the production of the onset of [ʊə]. Improvement in the F_2 behaviour could be seen in the production of [u:], [ɜ:], the onset of [aɪ], the offset of [aɪ], the offset of [aʊ], the onset of [ɔɪ], the offset of [ɔɪ] and the offset of [ʊə].

The reason for the high rate of improvement in the Control group productions could be that all the participants were taught by English-speaking teachers who have Afrikaans as first language. Although not first language speakers of WSAfE, these teachers do not speak Afrikaans English, but use the extensive vowel system of WSAfE. Despite the high rate of improvement noticed in the Control group, the improvements of the Experimental group is significant since these participants were not all taught by teachers who use the vowel system of WSAfE when speaking English. Only six of the Experimental group participants were taught by these teachers, while nine were taught by BSAE-speaking teachers.

This implies that the intervention received by nine members of the Experimental group was not reinforced on a daily basis in the classes taught by the BSAE-speaking teachers, and that these participants were exposed to formal instruction concerning the more extensive vowel inventory of WSAfE for only the brief period of contact with the therapists, viz. 45 minutes per week. The results confirm the statement by researchers such as Moats (2007) and Trehearne (2011) that young EL2 learners should receive input on the phonological system of the language of learning and teaching through-out the entire school day. Only then will they learn to perceptually discriminate between the various vowels and be able to successfully produce these sounds. In addition, the results of this study support the statement made in Chapter 3 that the teacher provides an important language model to the learners in his/her class (Nel & Müller, 2010). EL2 teachers should therefore be trained in the sound system of English, and be made aware of the importance of their role as language models.

Earlier in this discussion it was noted that early bilinguals find it easier to develop new categories for L2 sounds (Oh et al., 2011). Although the participants in this study can be termed 'early bilinguals' as they are learning the L2 before puberty, many of them have only recently started to acquire English at school, and the input that they receive is not necessarily rich enough to assist them in developing CALP or academic language proficiency needed in the class room. With the closing of the critical period already taking place (Long, 1990; Flege, 1981) or very close at 12 years of age (Scovel, 2000), EL2 learners are left with little time to develop new

categories of L2 sounds. This has an impact on their phonological awareness skills, their subsequent literacy acquisition and academic performance (Seeff-Gabriel, 2003). Training of EL2 learners in discriminating and developing these categories was shown to be successful (Lambacher, Martens, Kakeki, Marasinghe, & Molholt, 2005). The results of this study support the notion of training since new EL2 categories for certain sounds are clearly seen to develop. However, it is only after long-term, extensive exposure to the L2 that separate long term categories for L2 sounds develop (Baker & Trofimovich, 2005). Intensive training in the discrimination and production of the English vowels should therefore commence as early as possible to optimise and accelerate this development.

As discussed in Chapter 3, it is generally accepted that early bilinguals can better establish phonetic categories for the L2 sounds because the L1 does not influence the L2 that much (Kuhl, 2000; Bosch et al., 2000; Baker & Trofimovich, 2005). Many early learners of a L2, however, still produce sounds greatly influenced by the L1 phonetic categories (Asher & Garcia, 1969; Baker et al., 2008; Bosch et al., 2000; Flege et al., 2006). This is clearly true in the case of some of the productions of the EL2 participants in this study.

Teachers, as language models, should be trained and made aware of the need to discriminate the various vowels of English as occurring in the standard variety.

6.6 The results of the test for auditory processing (TAPS-3) pre- and post-intervention

This test was used to assess the auditory processing skills of all three groups of participants. The average baseline age of the participants was 8 years 9 months, with post-intervention outcomes measured approximately five months after the initial tests.

6.6.1 The results of the TAPS-3 total mean standard scores pre- and post-intervention

Two-way ANOVA on the data showed significant main effects of treatment (groups) and time (pre-and post-intervention) for all the TAPS-3, reading and spelling scores. Although interactions between treatment and time were not significant, it was still of interest to examine the individual differences between and within groups. This was done by means of post hoc t-tests, or Wilcoxon rank tests where necessary, with a Bonferroni adjustment of $p < 0.0167$ for significance, thus taking the effect of multiple comparisons into account. These post-hoc comparisons are detailed below.

The following table and graph present the total mean standard scores on the TAPS-3 of all three groups:

Table 54: Mean standard score (SD) of all groups (TAPS-3)

	Norm	Experimental	Control
Pre-intervention	100.25(7.51)	84.60(5.08)	85.13(6.46)
Post-intervention	103.58(5.12)	89.27(5.69)	87.60(6.25)
% Improvement	3.3	5.5	2.9

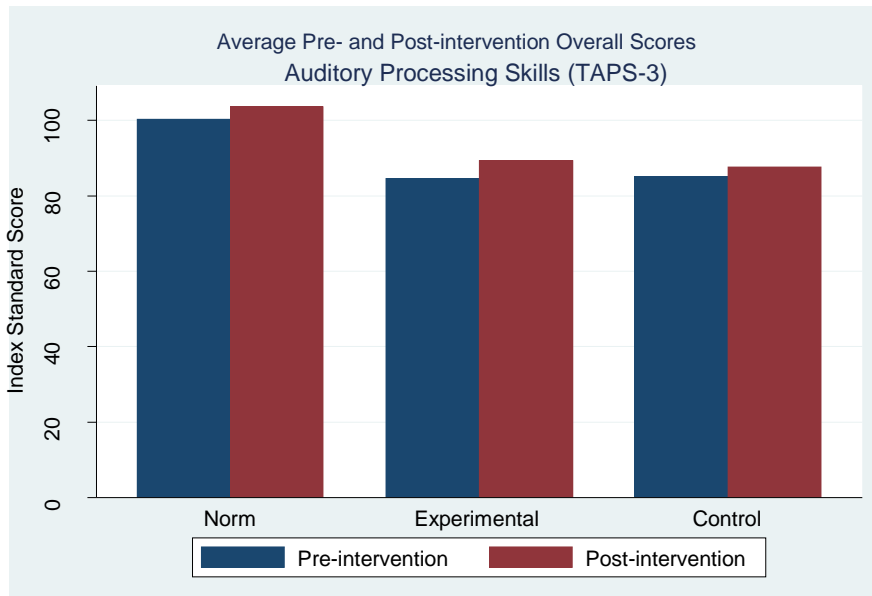


Fig. 31: Average pre- and post-intervention scores of all groups on the TAPS-3.

In testing for differences in the means of the various scores across all three groups, significant differences in the average pre- and post-overall scores ($p < 0.001$) for the TAPS-3 were found.

6.6.1.1 The results of the TAPS-3 between-group comparisons pre- and post-intervention

Table 55 presents the results of the statistical comparisons of the total mean standard scores between groups pre- and post-intervention.

Table 55: Results of t-tests for significant differences in overall scores between groups

Groups compared	Pre-intervention		Post-intervention	
	t-value	p	t-value	p
Norm and Experimental	6.45	< 0.001*	6.79	<0.001*
Norm and Control	5.62	<0.001*	7.13	<0.001*
Control and Experimental	-0.25	0.80	0.76	0.45

* Statistically significant, Bonferroni adjusted

In both pre- and post-intervention comparisons, significant differences were found between the Norm and Experimental groups ($p < 0.001$) and the Norm and Control groups ($p < 0.001$), but not between the Experimental and Control groups. This means that the EL1 learners in the Norm group have better auditory processing skills than the EL2 learners. Such results were expected as both the Experimental and Control groups consist of EL2 learners while EL1 learners constitute the Norm group. Although a significant improvement in the Experimental group was noted post-intervention, the skills level of that group remains significantly different to and below that of the Norm group.

6.6.1.2 The results of the TAPS-3 within group comparisons pre- and post-intervention

Table 56 depicts the results of the statistical comparison between the pre- and post-intervention standard scores within groups.

Table 56: Results of t-tests for significant differences in pre- and post-intervention overall scores within groups

Groups	Pre- vs. Post-intervention	
	t-value	p
Experimental	-3.32	0.01*
Control	-1.98	0.07
Norm	-1.47	0.17

* Statistically significant, Bonferroni adjusted

The paired t-test confirmed no significant differences between pre- and post-intervention results in the total mean standard scores of either the Control ($p=0.07$) or Norm group ($p=0.17$) on the TAPS-3. The paired t-test did, however, confirm a significant difference between pre- and post-intervention results in the total mean standard score of the Experimental group ($p=0.01$), suggesting that they improved from an average of 84.60 to 89.27 on the TAPS-3 as a result of the intervention.

Although there was a significant improvement in the Experimental group's post-intervention scores, it was not enough to reduce the difference between this group and the Norm group significantly. When compared within itself, the Experimental group shows significant improvement. This can imply that the intervention was responsible for the improvement in scores.

6.6.2 The results of the TAPS-3 total mean standard scores on the Phonological Skills sub-tests pre- and post-intervention

Table 57 presents the average standard scores on the Phonological Skills sub-tests of the TAPS-3:

Table 57: Mean standard score (SD) of Phonological skills sub-tests of all participants across all groups

	Norm	Experimental	Control
Pre-intervention	103.08(10.66)	85.93(11.21)	87.47(6.25)
Post-intervention	107.92(5.69)	97.00(10.52)	95.07(10.38)
% Improvement	4.7	12.9	8.7

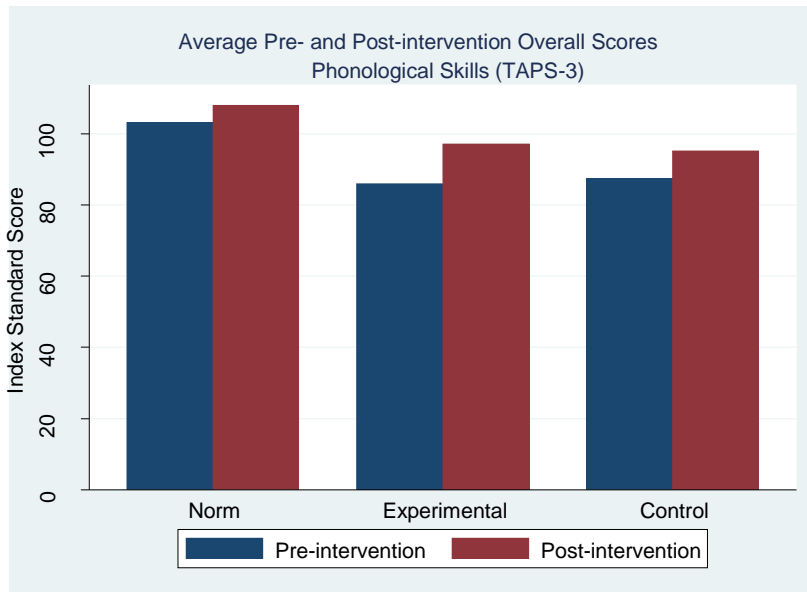


Fig. 32: Average pre- and post-intervention scores of all groups on the Phonological Skills sub-tests of the TAPS-3.

6.6.2.1 The results of the TAPS-3 between-group comparisons on the Phonological Skills sub-tests pre- and post-intervention

In Table 58, the results of the t-tests for significant differences in the mean standard scores on the Phonological Skills sub-tests between groups are portrayed.

Table 58: Results of t-tests for significant differences in Phonological Skills sub-tests between groups

Groups compared	Pre-intervention		Post-intervention	
	t-value	p	t-value	P
Norm and Experimental	4.04	<0.001*	3.23	0.004*
Norm and Control	3.17	0.004*	3.84	<0.001*
Control and Experimental	-0.33	0.744	0.51	0.616

* Statistically significant, Bonferroni adjusted

Significant differences occurred between the Norm and Experimental, and Norm and Control groups both before and after intervention. No significant differences between the Experimental and Control groups were noted pre- or post-intervention.

6.6.2.2 The results of the TAPS-3 within group comparisons on the Phonological Skills sub-tests pre- and post-intervention

The statistical comparison between pre-and post-intervention standard scores on the Phonological Skills sub-tests within all three groups is provided in Table 59.

Table 59: Results of t-tests for significant differences in pre- and post-intervention scores on Phonological Skills sub-tests within groups

Groups	Pre- vs. Post-intervention	
	t-value	P
Experimental	-4.03	0.001*
Control	-2.99	0.01*
Norm	-2.04	0.07

* Statistically significant, Bonferroni adjusted

The paired t-test confirmed significant differences between the pre- and post-intervention results for the Phonological Skills sub-tests of the TAPS-3, for both the Control group ($p=0.01$) and the Experimental group ($p=0.001$).

Although a significant difference indicating a 12.9% improvement in the Experimental group was noted post-intervention, this was not sufficient to reach the Norm group level post-intervention or even pre-intervention (see Table 57). The results of the Control group, however, improved significantly as well (8.7%). Therefore the improvement in the Experimental group cannot be (exclusively) attributed to the intervention these participants received. The Experimental group, however, improved more than the Control group as their pre-intervention score was lower than that of the Control group (see Table 57).

6.6.3 The results of the TAPS-3 mean standard scores on the Word Discrimination sub-test pre- and post-intervention

Table 60 portrays the results of the first of the Phonological Skills sub-tests of the TAPS-3, namely Word Discrimination:

Table 60: Mean standard score (SD) of all participants across all groups on the Word Discrimination sub-test of the TAPS-3

	Norm	Experimental	Control
Pre-intervention	10.08 (2.94)	5.67(3.11)	6.20(2.76)
Post-intervention	10.83(2.33)	9.20(2.78)	8.53(2.17)
% Improvement	7.40	62.40	37.60

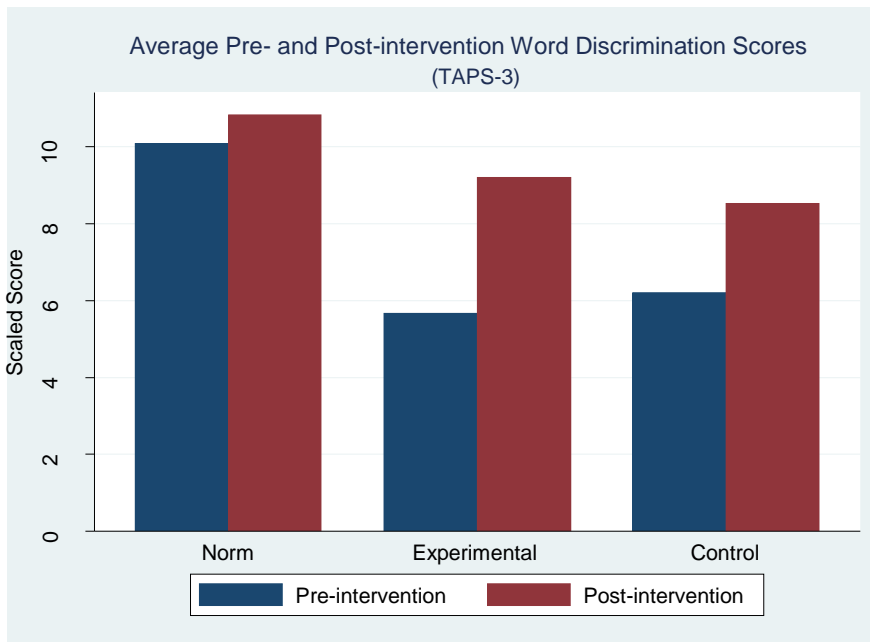


Fig. 33: Average pre- and post-intervention scores of all groups on the Word Discrimination sub-test of the TAPS-3.

6.6.3.1 The results of the TAPS-3 between-group comparisons on the Word Discrimination sub-test pre- and post-intervention

In Table 61, the results of the t-tests for significant differences between groups on the first of the Phonological Skills sub-tests, namely the Word Discrimination sub-test, are portrayed.

Table 61: Results of t-tests comparing groups on Word Discrimination scores

	Pre-intervention	Post-intervention

Groups compared	t-value	P	t-value	p
Norm and Experimental	3.76	<0.001*	1.63	0.12
Norm and Control	3.53	0.002*	2.65	0.01*
Control and Experimental	-0.50	0.62	0.73	0.47

* Statistically significant, Bonferroni adjusted

No significant differences were observed in the post-intervention ($p=0.12$) scores between the Norm and the Experimental groups. This would indicate that the Experimental group improved significantly on this measure, to the extent that no statistically significant difference between them and the Norm group, EL1 speakers, could be observed.

6.6.3.2 The results of the TAPS-3 within group comparisons on the Word Discrimination sub-test pre- and post-intervention

Table 62 presents the results of the statistical comparison between the pre- and post-intervention standard scores within the three groups.

Table 62: Results of t-tests for significant differences in pre- and post-intervention Word Discrimination scores within groups

Groups	Pre- vs. Post-intervention	
	t-value	P
Experimental	-3.11	0.01*
Control	-3.70	0.002*
Norm	-1.09	0.30

* Statistically significant, Bonferroni adjusted

The paired t-test confirmed a significant difference on the Word Discrimination sub-test between pre- and post-intervention results in the Experimental ($p=0.01$) and Control group ($p=0.002$). These groups improved from an average of 5.67 to 9.20, and 6.20 to 8.53 respectively. The Experimental group shows an improvement of 62.4% compared to the 37.6% of the Control group, indicating that the intervention was effective.

Even though the Control group improved significantly from pre- to post-intervention, it remained significantly different from the Norm group ($p=0.01$), unlike the Experimental group (see Table 60).

6.6.4 The results of the TAPS-3 mean standard scores on the Phonological Segmentation sub-test pre- and post-intervention

The results of the second Phonological Skills sub-tests, Phonological Segmentation, are presented in the table below:

Table 63: Mean standard score (SD) of all participants across all groups on the Phonological Segmentation sub-test of the TAPS-3

	Norm	Experimental	Control
Pre-intervention	10.33(3.17)	6.93(3.58)	7.33(3.83)
Post-intervention	11.92(2.57)	10.00(3.09)	9.33(3.04)
% Improvement	15.4	44.3	27.3

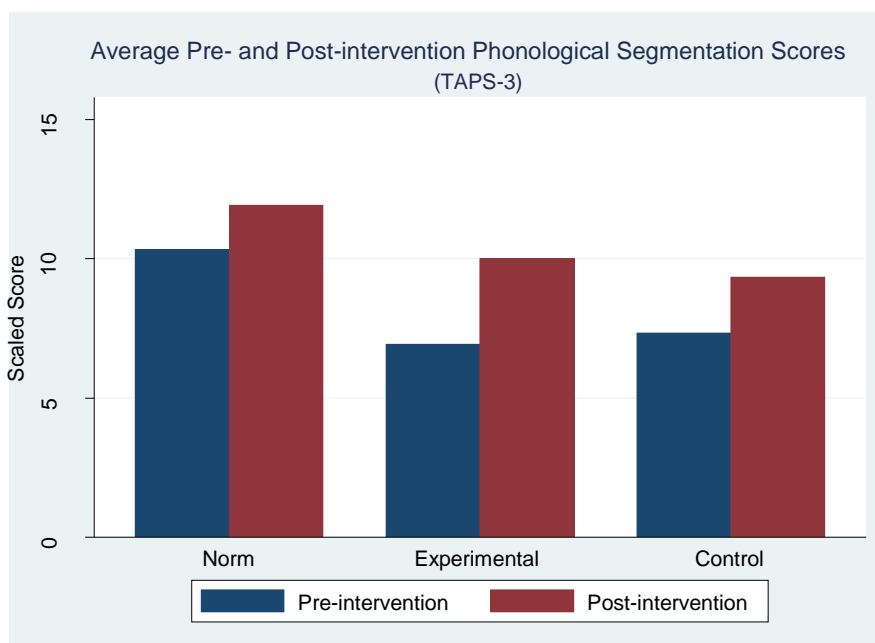


Fig. 34: Average pre- and post-intervention scores of all groups on the Phonological Segmentation sub-test of the TAPS-3.

6.6.4.1 The results of the TAPS-3 between-group comparisons on the Phonological Segmentation sub-test pre- and post-intervention

In Table 64, the results of t-tests testing for significant differences between groups on the Phonological Skills sub-tests, namely the Phonological Segmentation sub-test, are portrayed.

Table 64: Results of t-tests comparing groups on Phonological Segmentation scores

Groups compared	Pre-intervention		Post-intervention	
	t-value	p	t-value	p
Norm and Experimental	2.58	0.016*	1.72	0.10
Norm and Control	2.18	0.04	2.35	0.03
Control and Experimental	-0.30	0.77	0.60	0.56

* Statistically significant, Bonferroni adjusted

Post-intervention scores in the Norm and Experimental groups were not significantly different ($p=0.10$). This would indicate that the Experimental group improved significantly in this measurement, to the extent that no statistically significant difference between them and the Norm group could be observed, suggesting that the intervention was effective.

6.6.4.2 The results of the TAPS-3 within group comparisons on the Phonological Segmentation sub-test pre- and post-intervention

The statistical comparison between pre- and post-intervention standard scores on the second of the Phonological Skills sub-tests, namely the Phonological Segmentation sub-test, is provided in Table 65.

Table 65: Results of t-tests for significant differences in pre- and post-intervention scores on Phonological Segmentation scores within groups

Groups	Pre- vs. Post-intervention	
	t-value	p
Experimental	-3.88	0.002*
Control	-3.09	0.01*
Norm	-2.37	0.04

* Statistically significant, Bonferroni adjusted

The paired t-test confirmed significant improvements in pre- to post-intervention results in phonological segmentation skills in the Experimental and Control groups, but not in the Norm group (Norm $p=0.04$, Experimental $p=0.002$, Control $p=0.01$).

Comparing the scores of the Experimental group pre- and post-intervention, it was noted that these improved significantly in this measurement, to the extent that no statistically significant difference between them and the Norm group could be observed. This indicates that the intervention the Experimental group received was successful in improving the participants' phonological segmentation skills.

6.6.5 The results of the TAPS-3 mean standard scores on the Phonological Blending sub-test pre- and post-intervention

The results of the third Phonological Skills sub-tests, Phonological Blending, are presented in the following table:

Table 66: Mean standard score (SD) of all participants across all groups on the Phonological Blending sub-test of the TAPS-3

	Norm	Experimental	Control
Pre-intervention	11.17(3.24)	8.87(2.45)	8.87(4.02)
Post-intervention	11.75(2.30)	8.93(2.31)	9.07(2.89)
% Improvement	5.2	0.7	2.3

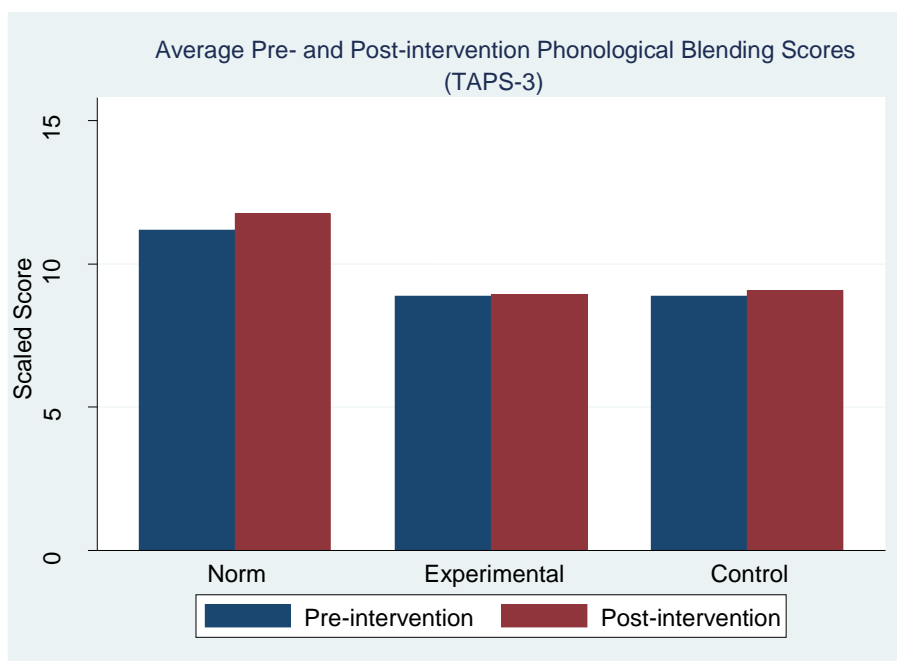


Fig. 35: Average pre- and post-intervention scores of all groups on the Phonological Blending sub-test of the TAPS-3.

6.6.5.1 The results of the TAPS-3 between-group comparisons on the Phonological Blending sub-test pre- and post-intervention

In Table 67, the results of the t-tests for significant differences in the mean standard scores of the Phonological Skills sub-tests between groups are portrayed.

Table 67: Results of t-tests for significant differences in Phonological Blending scores between groups

Groups compared	Pre-intervention		Post-intervention	
	t-value	P	t-value	p
Norm and Experimental	2.10	0.05	3.15	0.004*
Norm and Control	1.61	0.12	2.62	0.01*
Control and Experimental	-0.69	0.49	-0.14	0.89

* Statistically significant, Bonferroni adjusted

No significant differences were noted between the pre-intervention scores of the Norm and the Experimental groups ($p=0.05$), and between the Norm and the Control groups ($p=0.12$), implying these groups had similar levels of phonological blending ability at the start of the study.

Post-intervention results indicate that significant differences exist between the Experimental and Norm groups ($p=0.004$) as well as between the Control and Norm groups ($p=0.01$), largely because of an improvement in the Norm group scores.

6.6.5.2 The results of the TAPS-3 within group comparisons on the Phonological Blending sub-test pre- and post-intervention

Table 68 presents the results of t-tests testing for significant differences in the overall standard scores of the Phonological Skills sub-tests within groups.

Table 68: Results of t-tests for significant differences in pre- and post-intervention Phonological Blending scores within groups

	Pre- vs. Post-intervention	
	t-value	P
Experimental	-0.11	0.91
Control	-0.25	0.81
Norm	-0.76	0.46

Results of the tests confirmed that no significant improvement was noted between pre- and post-intervention within any of three groups. As no significant differences can be observed between the pre-and post-intervention results for the Experimental group, it can be concluded that the intervention had no effect on their phonological blending skills.

6.7 The results of the literacy skills assessment pre- and post-intervention

6.7.1 The results of the reading assessment total mean raw scores of the One-minute Reading Test (Transvaal Education Department, 1987) pre- and post-intervention

The results of the reading skills assessment are provided here. Table 69 presents the average raw scores of all the participants on the reading assessment. In Figure 36 the results of the reading skills assessment are depicted in a bar graph.

Table 69: Average over-all mean raw score (SD) of all participants across all groups on the One-minute Reading Test

	Norm	Experimental	Control
Pre-intervention	84.50(24.36)	38.73(25.84)	43.47(21.67)
Post-intervention	96.67(18.63)	52.60(25.96)	56.13(23.07)
% Improvement	14.4	35.8	29.1

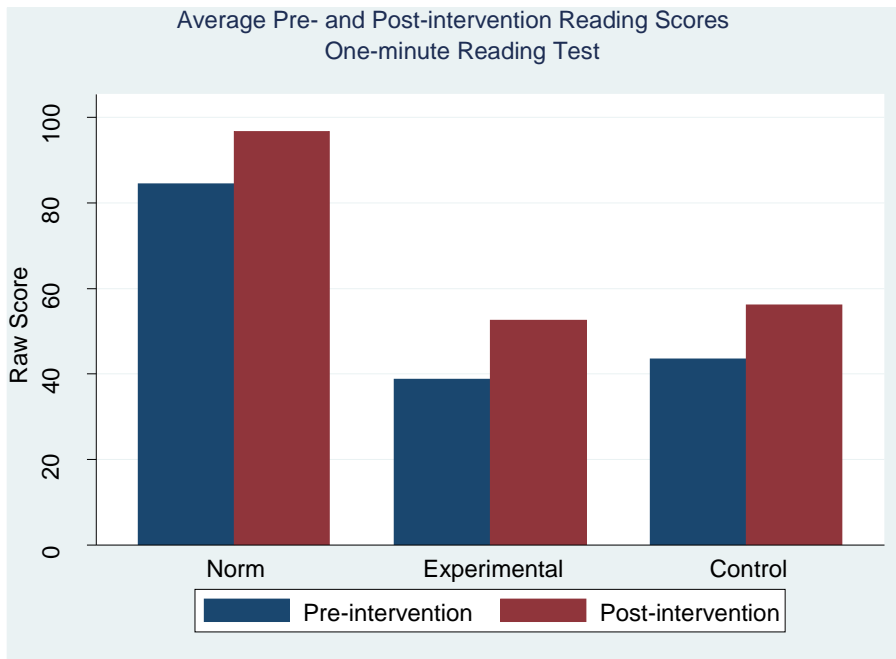


Fig. 36: Average pre- and post-intervention scores of all groups on the One-minute Reading Test.

6.7.1.1 The results of the reading assessment between-group comparisons on the One-minute Reading Test (Transvaal Education Department, 1987) pre- and post-intervention

Table 70 presents the results of the t-tests for significant differences in the mean raw scores on the reading assessment between groups.

Table 70: Results of t-tests for significant differences in reading scores between groups

Groups compared	Pre-intervention		Post-intervention	
	t-value	p	t-value	p
Norm and Experimental	4.69	<0.001*	4.94	<0.001*
Norm and Control	4.63	<0.001*	4.93	<0.001*
Control and Experimental	-0.54	0.59	-0.39	0.70

* Statistically significant, Bonferroni adjusted

Once again, the Experimental and Control groups were found to be significantly different from the Norm group in pre- and post-intervention results. No significant difference between Control and Experimental reading scores were observed (see Table 69). This was to be expected, as the Experimental and Control groups consist of EL2 learners, while EL1 learners constitute the Norm group.

6.7.1.2 The results of the reading assessment within group comparisons on the One-minute Reading Test (Transvaal Education Department, 1987) pre- and post-intervention

The statistical comparison between pre- and post-intervention raw scores on the reading assessment within all three groups is provided in Table 71:

Table 71: Results of t-tests for significant differences in pre- and post-intervention scores on reading assessment within groups

Groups	Pre- vs. Post-intervention	
	t-value	P
Experimental	-8.07	<0.001*
Control	-4.95	<0.001*
Norm	-2.58	0.03

* Statistically significant, Bonferroni adjusted

The paired t-test confirmed significant differences between the pre- and post-intervention results in reading in the Experimental ($p < 0.001$) and Control groups ($p < 0.001$). The Experimental group improved the most in reading, with a 35.8% improvement compared to the 29.1% improvement of the Control group and 14.1% improvement of the Norm group reading scores. The Experimental group thus shows significant improvement in reading abilities which can be attributed to the intervention received.

6.7.2 The results of the spelling assessment total raw mean scores on the UCT Spelling Test (University of Cape Town, 1985) pre- and post-intervention

The mean results of the spelling assessment are presented in Table 72. Figure 37 depicts the mean raw scores of the spelling assessment pre- and post-intervention.

Table 72: Mean raw score (SD) of all participants across all groups on the UCT Spelling Test

	Norm	Experimental	Control
Pre-intervention	34.67(9.00)	16.73(10.69)	18.60(8.54)
Post-intervention	39.50(9.97)	22.00(11.85)	22.80(8.55)
% Improvement	13.9	31.5	22.6

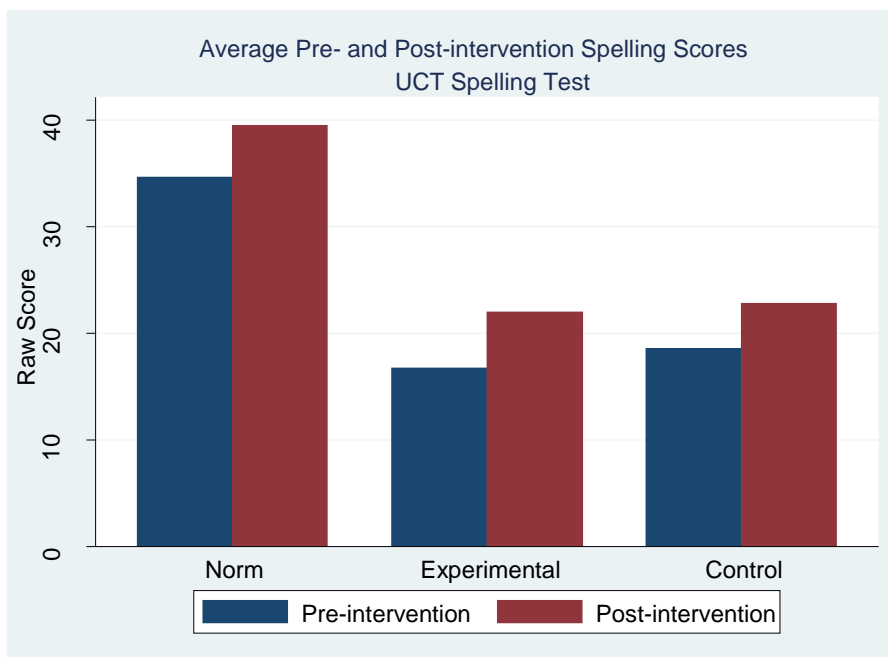


Fig. 37: Average pre- and post-intervention scores of all groups on the UCT Spelling Test.

6.7.2.1 The results of the spelling assessment between-group comparisons on the UCT Spelling Test (University of Cape Town, 1985) pre- and post-intervention

Table 73 presents the results of the t-tests and a Wilcoxon rank test for significant differences in the mean raw scores on the spelling skills assessment between groups.

Table 73: Results of for significant differences in spelling scores between groups

Groups compared	Pre-intervention		Post-intervention	
	z**	p	t-value	p
Norm and Experimental	3.47	<0.001*	4.09	0.004*
Norm and Control	3.77	<0.001*	4.69	<0.001*
Control and Experimental	-1.02	0.31	-0.21	0.83

* Statistically significant, Bonferroni adjusted

** Wilcoxon Rank Test

As with the reading scores, significant differences were observed between the Norm group's pre- and post-intervention spelling scores and that of the Experimental and Control groups. Once again this underlines the similarity of the Experimental and Control groups to each other, and the significant difference in their results compared to Norm group results (see Table 72). This was to be expected as the Experimental and Control groups comprise of EL2 learners, while the Norm group consists of EL1 learners.

6.7.2.2 The results of the spelling assessment within group comparisons on the UCT Spelling Test (University of Cape Town, 1985) pre- and post-intervention

Table 74 presents the results of the t-tests and a Wilcoxon rank test testing for significant differences in the raw scores of the spelling skills assessment within groups.

Table 74: Results of t-tests for significant differences in pre- and post-intervention scores on spelling within groups

Groups	Pre- vs. Post-intervention	
	z**	P
Experimental	-3.37	0.001*
Control	-3.40	0.001*
Norm	-3.03	0.003*

* Statistically significant, Bonferroni adjusted

** Wilcoxon Rank Test

Wilcoxon rank tests confirmed a significant difference in pre- vs. post-intervention results for all three groups (see Table 73). When analysing the spelling scores, the Experimental group once again shows a significant improvement of 31.5% compared to the 22.6% improvement of the Control group and 13.9% improvement of the Norm group. Even after the intervention, however, the Experimental group's spelling skills are still 44% lower than that of the Norm group.

6.8 Discussion of results

The over-all scores on the TAPS-3 indicated that the Experimental group's auditory processing skills improved significantly with intervention. Similarly, the Experimental group's post-intervention phonological awareness skills as assessed by the three Phonological Skills sub-tests of the TAPS-3 showed significant improvement. Despite the significant improvement, this group's scores were still below those of the Norm group, indicating that EL2 learners have severe shortcomings with regards to phonological awareness skills. Educationalists should therefore realise that additional input concerning these skills should receive priority in the foundation phase literacy acquisition syllabus.

The Word Discrimination sub-test determined whether the participants could recognise phonological differences and similarities within word pairs (Martin & Brownell, 2005). The participants had to indicate whether the members of the word pairs were the same or different. For example in the word pair 'miss : mess'. The

word pairs consist of words with different rimes (the remaining section of the syllable or word when the initial consonant or onset is deleted (Cisero & Royer, 1995)), onset and final phonemes. Eleven of the 20 word pairs consist of words in which the vowels differ. Since it has been established that EL2 speakers often find it difficult to distinguish all the vowels and diphthongs of English (Seeff-Gabriel, 2003), the low scores of the L2 learners on the word discrimination task could be due to this.

Another possible reason for the discrepancy in scores between the EL1 and EL2 groups is that proposed by Phillips et al. (2008): word discrimination skills are related to word meaning. It is therefore possible that the L2 participants in this study struggled to recognise the meaning of the words presented and could not discriminate between the words because of meaning loss that occurred. Increasing vocabulary knowledge as part of oral skills is therefore of the utmost importance in the ELoLT environment (Phillips et al., 2008). Lonigan (2007) explains that the more enriched a learner's vocabulary becomes, the more words that share sound components or the more minimal pairs with distinctive sounds will form part of the learners' lexicon. Such an increase will enhance phonological and phonemic awareness abilities (Lonigan, 2007). Interestingly, the L1 group also performed the weakest on this specific sub-test, despite the assumption that this group should have been familiar with the vocabulary and various phonemes contained in the test materials.

The significant increase in post-intervention scores of the Experimental group indicates that additional input such as that described in the intervention plan (Appendices C1 - C3) improves EL2 learners' ability to discriminate between sounds in minimal word pairs. It also suggests that the participants in this group became more aware of the different vowels of English as more than 50% of the test pairs differ because of the vowels being different.

The phonological segmentation tasks of the TAPS-3 do not only focus on syllable deletion, but also on the deletion of phonemes in various positions (Martin & Brownell, 2005). Various researchers agree that segmentation tasks are more difficult than those assessing blending skills (Phillips et al., 2008; Bialystok, 2007;

Cisero & Royer, 1995). Phonological segmentation is an exceptionally sophisticated skill that develops from, or at least in concurrence with, print experiences during the beginning reading phase (Cisero & Royer, 1995). Young learners struggle to realise that words are constructed by different phonemes when they do not have adequate print experience (Melhuish, Phan, Sylva, Sammons, Siraj-Blatchford & Taggart, 2008). In South Africa, many EL2 learners are from a print-deprived environment; both in their L1 and the L2. This could be cited as a reason for the fact that the L1 participants achieved significantly higher pre-intervention scores than their L2 peers. The increase in post-intervention scores of the Experimental group indicates that the input received by this group improved their segmentation skills considerably. The intervention, focussing on input on the phonological system of English, therefore would seem to have increased the Experimental group's awareness of the sounds of English; not only of the vowels but also of the consonants.

The Phonological Blending sub-test requires the participant to blend the phonemes produced in isolation together to form the required word. Blending tasks are deemed easier than segmentation tasks (Phillips et al., 2008; Bialystok, 2007; Cisero & Royer, 1995) and the over-all high scores of all three groups (compared to those of the segmentation tasks) confirm this.

This test is the only sub-test of the TAPS-3 in which the Experimental group did not improve their scores post-intervention. A disturbing occurrence is that although there was no significant difference between the scores of the Norm and the Experimental groups before intervention, a significant difference between these two groups were noted five months later due to improvement of the EL1 learners' phonological blending skills. Since phonological blending is considered to be easier than phonological segmentation, the gap developing between the EL1 and EL2 groups is cause for concern.

The results obtained from the two literacy skills assessments clearly confirm those of other similar assessments discussed in Chapter 2. EL2 learners' literacy skills are far below the level of their EL1 peers. Although an improvement in the reading and spelling abilities of the EL2 Experimental group can be noted after intervention, the

skills levels are still very low. The reasons for this could be the following: Intervention took place only once a week for 45 minutes, instead of additional input being given through-out every day, as suggested by researchers like Moats (2007). She also suggested that if additional input – in addition to quality teaching that should already be presented during the school day – is given to L2 learners, it should be no less than 15 minutes per day.

The CAPS First Additional Language indicates that no time is allocated to Reading and Phonics in Grade R (Government of South Africa, 2011b). Even in Grades 1 to 3 the syllabus allocates very little time to literacy instruction, including phonological awareness skills. The Home Language syllabus proposes that seven to eight hours per week maximum should be allocated to language instruction in general in Grade R (Government of South Africa, 2011b). Five hours per week is allocated to literacy instruction in Grades 1-3. Time allocated to literacy acquisition therefore seems inadequate to assist EL2 learners to master the necessary skills to become literate.

The age at which the L2 learner receives additional input to enhance his/her phonological awareness skills and phonological knowledge of the LoLT is important as well. While in this study the intervention was given in Grade 3, the ideal time for structured literacy instruction is considered to be pre-school (Lessing & De Witt, 2005; Trehearne et al., 2004; Stuart, 1999). Since improvement in the literacy skills of the Experimental group can be noted, it is suggested that much more input concerning the phoneme inventory of the LoLT, phonological awareness skills as well as oral language skills, should be given to EL2 learners in Grade R already in order to assist them in developing sufficient literacy skills.

6.9 Summary

The results pertaining to the main aim of this study indicated that the vowel spaces of the short and long vowels as produced by the EL1 and EL2 participants differed decidedly prior to intervention. As could be expected, this indicates that these groups did not perceive and produce the vowels in the same way. After intervention, the vowel spaces of the Experimental group were seen to approach those of the Norm

group. In the productions of [ʊ], [ə], [ɑ:] and [ɔ:], both the vertical and horizontal lingual movement improved in such a manner that the F₁ and F₂ formant behaviour of the Experimental group could be seen to approximate that of the Norm group. In many cases, however, either the F₁ or the F₂ alone improved. Often it was the F₂ that improved, suggesting that it is easier to change the horizontal movement of the tongue.

Only in the Experimental group's production of the diphthong [eɪ] did improvement in the vertical and horizontal lingual behaviour occur on both the onset and the offset. Although not much improvement was noticed in the lingual behaviour in the Experimental group's production of the other diphthongs, valuable observations were made. Even prior to intervention, no extreme differences between the vowel spaces of the EL1 and EL2 groups were noted when the diphthongs were produced. This indicates that both the EL2 groups distinguish all the diphthongs of English, although the actual quality of some may differ from those produced by the Norm group. This is an interesting occurrence as one would have expected the EL2 groups' productions to have been similar to BSAE diphthong articulation. Clearly, the EL2 productions of the diphthongs confirm earlier research that posits that young first language speakers of African languages are developing a variety of English which is not BSAE, but closer to WSAfE.

The fact that the vertical and horizontal lingual modification did not improve in the productions of all the vowels confirms the statement by researchers that only after long-term, intensive exposure to the L2 separate long term categories for L2 sounds develop. This again reinforces the need for intensive and extensive teaching of the sound system of the language of learning and teaching during the early years of schooling.

Comparing the results of the additional input given to the Experimental and Control groups, it may seem that the Experimental group's perception and articulation of WSAfE vowels did not improve significantly. One has to judge the improvement by keeping the circumstances in mind, however: only six of the participants of the Experimental group were taught by teachers making use of the more extensive

vowel system of WSAfE in their speech. The rest of the participants were taught by teachers speaking BSAE, therefore using a more limited vowel system. This means that not all the participants in the Experimental group were exposed to the vowel system of WSAfE on a daily basis as happened with the Control group who were all taught by teachers using the vowel system of WSAfE. In addition, the Experimental group received intervention weekly for 45 minutes. Given the limited exposure received by the majority of the Experimental group, the improvements that *were* noted, should be seen as significant, especially in a practical sense.

Various researchers have stated that intensive and extensive teaching of the sound system of the language of learning and teaching is necessary during the early years of schooling to make students aware of the qualities of the L2 sounds. The fact that the Control group performed almost as well as the Experimental group again reinforces these statements. Learners should be exposed to activities enhancing their awareness of the L2 sounds through-out the school day, not only once a week, or for very short periods during the day. In addition, the teachers as language models should be aware of the characteristics of the L2 sound systems themselves.

With regards to the sub-aims of supplying measurable information on the phonological awareness skills and literacy skills of EL1 and EL2 learners in the specific age group, assessment results were presented. The over-all scores on the TAPS-3 showed that the Experimental group's auditory processing skills developed significantly with intervention. Likewise, after intervention, the Experimental group's phonological awareness skills as assessed by the three Phonological Skills sub-tests of the TAPS-3, viz. Word Discrimination, Phonological Segmentation and Phonological Blending, displayed significant improvement. Notwithstanding the significant improvement, however, this group's scores were still below those of the Norm group, indicating that EL2 learners have severe deficiencies with regards to phonological awareness skills. Educationalists should therefore realise that explicit teaching of these skills should receive priority in especially the foundation phase, preferably from Grade R.

The results obtained from the reading and spelling skills assessments confirmed that EL2 learners' literacy skills are much lower than those of their EL1 peers. Although an enhancement in the reading and spelling skills of the Experimental group can be noticed after intervention, the level of these skills is still very low. Possible explanations for this could be the limited period of intervention – only once a week for 45 minutes – instead of intensive teaching through-out every day, as suggested by various prominent researchers in the field.

Improvement in the auditory perception and articulation of the vowels of the LOLT was noted by comparing the vowel spaces of the EL1 and especially that of the Experimental group, improvement of the PA skills of the Experimental group was noted, and an improvement in the literacy skills of the Experimental group was noted. These improvements suggest that intervention or additional input concerning the vowel system (and other speechsounds) of the LoLT is beneficial to EL2 learners. It is therefore strongly urged that much more input concerning the phoneme inventory of the LoLT, phonological awareness skills as well as oral language skills, should be given to EL2 learners in Grade R already in order to assist them in developing sufficient literacy skills.

The third sub-aim, namely providing professionals with measurable, acoustic information on the vowel production of both EL1 and EL2 learners in South Africa between the ages of 8 to 10 years in Grade 3, was met as well by providing formant values in tables as well as depicting and comparing the articulation of each group of participants within the vowel space.

Chapter 7

Summary and Conclusive remarks

“It is good to have an end to journey toward, but it is the journey that matters in the end”, Ursula K. le Guin (1929 --).

7.1 Introduction and background to the research project

This final chapter provides a summation of the literature review undertaken, the research method that was utilised in the study, and presents a synopsis of the results obtained. In addition, it concludes with an evaluation of the results and their implications as well as some suggestions for future research.

English has been the preferred medium of instruction in South Africa for many people, both first and second language speakers, since the early 1800's (Niesler et al., 2005; Rasool et al., 2006; De Klerk et al., 2006). English as LoLT became even more desirable during the apartheid era since it was perceived as the language of progress and success (Rasool et al., 2006). Multilingualism and freedom of choice in the educational field was the ideal in a democratic post-1994 South Africa, leading to the progressive language-in-education-policy, namely the LiEP of 1997. This very progressive language policy allows parents and schools to choose the language of instruction they believe would best serve the learners of our country (Probyn et al., 2002). The central principle of the LiEP is to preserve the use of the home language as LoLT during the early school years while giving access to an additional language. This has not necessarily been happening in all schools across the country and in many cases resulted in a lack of control by the various departments of education as well as much confusion and misperceptions amongst parents and teachers alike (Posel & Casale, 2011; Sailors et al., 2007).

Despite the fact that research indicates that especially young learners benefit most from instruction in the home language, parents very often choose English as language of instruction from Grade 1 (or Grade R). An important reason for this choice is that parents see English as an instrument of educational success and

career advancement. Parents also believe that English medium schools are better resourced and have better qualified teachers (Nel, 2004).

In addition to the negative effect that English L2 learning may have on young learners, the LiEP does not specify the amount of time that should be spent on the teaching of an additional language - English in the majority of cases - and does not enforce the implementation of the teaching of it (Government of South Africa, 1997b). This leniency is responsible for many young English L2 learners who switch to English as LoLT in Grade 4 (and sometimes as early as after Grade 1) not being proficient enough in English. Young learners who start learning English in Grade R are not necessarily in a better position: they too have not yet acquired sufficient academic language skills to assist them in the academic environment. The lack of language skills affects the academic achievement and progress of young L2 learners (Prinsloo & Heugh, 2013). Another outcome of the preference for English is that the African languages have not yet acquired the status of LoLT up to Grade 12 level (Barnard, 2010; Foley, 2010).

The Department of Education employed the Revised National Curriculum Statement (NCS) in 2012 (Government of South Africa, 2011b). This document again advocates additive bilingualism by promoting the use of the home language as LoLT during the foundation phase while exposing the learners to an additional language/s. Very little time, however, is allocated to English as additional language during the foundation phase. No time is allocated to English as additional language in Grade R. Even in the syllabus of English as home language little time is allocated to language learning and very little to the teaching of phonics. In addition, no distinction is made between phonics and phonological awareness, with no indication of how much time, if at all, should be spent on teaching phonological awareness skills. This may have a negative impact on the acquisition of English phonology of English L2 learners and in turn affects the development of skills such as phonological awareness and phonics necessary for successful literacy acquisition.

The outcomes of various literacy skills assessments in South Africa indicate that English L2 learners have low literacy proficiency (Howie et al., 2012; Government of

South African, 2013a; 2013c; 2015). Assessments such as the prePIRLS 2011 (Howie et al., 2012) and the Annual National Assessments (ANAs) (Government of South African, 2013a; 2013b; 2013c; 2015) indicate that many Grade 3 learners are not sufficiently literate when starting the intermediate phase in Grade 4. This has a negative effect on their cognitive development and academic progress (Nel, 2004; Seeff-Gabriel, 2003).

Various reasons are quoted for the low levels of literacy skills in South Africa. Factors essential to successful literacy acquisition such as learner factors, home factors and classroom and school factors are cited (Howie et al., 2012).

The previous paragraphs focussed on the English L2 foundation phase learner who is learning through the medium of English. Many foundation phase learners in South Africa, however, do get the opportunity to learn via their home language, but do not perform well during literacy skills assessments such as the prePIRLS 2011 (Howie et al., 2012). One reason for this could be that these learners did not receive quality instruction due to various reasons mentioned in the prePIRLS 2011 (Howie et al., 2012). Another possible reason could be the short time these young learners have to develop the necessary literacy skills in their first language before they have to change to English in Grade 4 (Prinsloo & Heugh, 2013). Immature literacy skills are not always successfully transferred to a new language, especially if there are considerable differences in language structure and phonetic inventory between the two languages.

There is a substantial difference between the vowel inventories of the African languages and that of English (Seeff-Gabriel, 2003). English L2 learners therefore need well-planned, focused input on the vowel system of English to enable literacy acquisition.

7.2 Literacy acquisition, phonological awareness and language acquisition

Language acquisition can be described as an innate ability while literacy acquisition is seen as a learned skill (Sugiura et al., 2011; Stuart, 2006). Literacy acquisition is

said to start very early in life and is improved by good oral language models and input from a stimulating environment. A print-rich environment promotes the child's vocabulary and grammatical skills and stimulates the child's awareness that oral language can be coded into print (Hulit et al., 2011; Cunningham et al., 2009).

Decoding of words is seen as a primary component of reading acquisition, especially during the early stages of literacy acquisition (Geva, 2006b; Lervåg & Aukrust, 2010). To enable the young learner to decode words successfully, he/she must have good phonic skills that depend on phonological awareness skills (Adams et al., 1998, Moats, 2007). Phonological awareness development is analogous to age and also related to working memory (Yeong & Rickard Liow, 2012; Bernthal et al., 2013; Pae & Sevcik, 2011).

Phonological awareness, alphabetical knowledge and phoneme-grapheme coupling knowledge are needed to spell (Caravolas et al., 2001; Quellette & Sénéchal, 2008). The orthography of the target language plays an import role in phoneme-grapheme coupling skills. The more direct or transparent the sound-to-letter coupling system of a language, the easier young learners will learn to spell (Owens, 2012). A language like English with an opaque orthography makes it more difficult for learners to acquire the required spelling skills.

Although literacy acquisition is based on decoding skills, good oral language skills are needed as well (Proctor et al., 2006; Koda, 2007). Oral language skills influence the reading acquisition process (Owens, 2012; Prinsloo & Heugh, 2013, Koda, 2007). Of these, vocabulary skills are of great importance for reading comprehension and fluency (Prinsloo & Heugh, 2013). Oral language skills, though, except perhaps vocabulary skills, are deemed more important to the literacy acquisition process during the later stages of reading than during beginning reading (Geva & Zadeh, 2006; Lervåg & Aukrust, 2010).

Since oral language abilities have an influence on literacy acquisition, the process of language acquisition had to be investigated as well. Language acquisition is described by many referring either to the Nativist approach or Behaviourist approach

(Ambridge & Lieven, 2011; Lane & Molyneaux, 1992). Constructivism, as a more eclectic approach, recognises the influence of both the innate language abilities as well as the influence of the environment shaping and enhancing these natural capabilities (Yule, 2010).

Second language acquisition is usually a more conscious process which entails more formal instruction than the acquisition of a first language and is therefore often referred to as *language learning* (Krashen, 1985). Differences and similarities in the acquisition of the L1 and the L2 are noted. The main difference, having a profound influence on the acquisition process, is seen as the amount of exposure and input that the language learner has (Owens, 2012; Ghazali, 2006; Jordaan, 2011a). Children acquiring their L1 normally receive high volumes of quality language input during the entire day while this is not necessarily the case when learning a L2. Similarities during L1 and L2 acquisition are those of Universal Grammar, developmental sequence and the order of acquisition (Ellis, 1994; Ipek, 2009; Lightbown & Spada, 2006).

Theories employed to explain the process of second language acquisition agree that the sound system and phonology of the first language influence the acquisition of a second language (Davidson, 2011). In second language acquisition, both transfer and interference occur (Gass & Selinker, 2008; Flege, 1979; McCarthy et al., 2013; Bada, 2001). Interference is clearly noticeable in the way that English L2 speakers (African language L1 speakers) reduce the more extensive vowel inventory of English to be more comparable with the smaller inventory of the African languages.

Academic language skills (CALP) form part of language proficiency in the classroom (Seeff-Gabriel, 2003). These skills have a major influence on the educational process. CALP requires higher order cognitive skills, a high level of language proficiency and sufficient vocabulary (Paradis, 2009). BICS on the other hand, are defined as conversational fluency (Jordaan, 2011a) and as such do not provide the learner with sufficient language skills to function in the academic environment.

Although reading acquisition in a second language is regarded as similar to reading acquisition in the first language (Lervåg & Aukrust, 2010), many second language learners often do not have the same phonological awareness skills and vocabulary that the first language learner has (Geva & Zadeh, 2006). Consequently, the L2 reader is often not such a skilled reader. Young L2 learners therefore need explicit teaching of the necessary skills from as early as Grade R in the foundation phase.

Although the skills pertaining to literacy can be taught or enhanced, the attitude of the young learner to successful literacy acquisition is important as well (Howie et al., 2012). Role models in the learner's environment, such as teachers and parents, contribute to positive attitudes and behaviours concerning literacy acquisition (Howie et al., 2012).

Research indicates that various activities should be included in the daily syllabus to enhance the foundation phase learner's phonological awareness skills (Lessing & De Witt, 2005; Trehearne, 2011; Moats, 2007). An activity such as rhyming, for example, contributes to phonological awareness in the sense of sensitising the learner to the sounds of the target language and should therefore be included as early as possible in a foundation phase teaching programme. Although some activities will be more formal, the learner should perceive literacy instruction as fun, and should enjoy it. This will contribute to positive attitudes and behaviours concerning reading and spelling.

Although phonological awareness skills are considered to be of the utmost importance in literacy acquisition, research indicates that young L2 learners also need sufficient knowledge of the other aspects of the grammar of the target language (Geva & Zadeh, 2006; Moats, 2007; Verhoeven, 2007, Duff et al., 2008). This will not only enhance their literacy abilities such as comprehension, but facilitates their abilities to follow oral instruction, process the information received from the teacher, and to express his/her thoughts and ideas. The young EL2 learner, who quite often does not have sufficient language skills, is at a disadvantage in the ELoLT environment. School syllabi should therefore make special provision for the EL2 learner in the EL1 classroom.

7.3 Vowel quality, vowel space, and the vowels of South African English and Setswana

The complete speech production process determines the quality of a vowel (Ladefoged & Johnson, 2011; Rietveld & Van Heuven, 2009). This includes the behaviour of the main articulators, namely the tongue and lips as well as the resonance that is generated by the movements of these organs of speech (Ladefoged & Johnson, 2011; Rietveld & Van Heuven, 2009; Catford, 2001). Lingual and labial behaviour during the articulation of vowels gave rise to the classification of vowels as being 'high front vowels, articulated with lip spreading' or 'low back vowels, articulated with the lips in a neutral position', such as [i] and [ɑ] respectively, for example (Ladefoged & Maddieson, 1996; Van Wyk, 1979). These classifications were used to plot the position of the vowels on a vowel chart. Various researchers concur that although this method of explaining the articulation of vowels is useful and widely used it is not necessarily an accurate depiction of the articulatory vowel space (Ladefoged & Johnson, 2011; Bekker, 2009).

Using acoustically determined formant frequencies to determine the vowel space, however, is a more accurate process (Le Roux, 2004). Lingual movement, however, plays an important role in determining the configuration of the oro-pharyngeal resonance chambers and as such in determining the formant frequencies (Rietveld & Van Heuven, 2009; Catford, 1988). The vertical movement of the tongue is said to determine the values of the first formant or F_1 while the horizontal movement determines that of the second formant or F_2 (Rietveld & Van Heuven, 2009). The vowel space can therefore be discussed in terms of lingual modification, although it is not only lingual behaviour that determines the over-all configuration of the vowel space.

South African English consists of various varieties or dialects; those of L1 speakers as well as L2 varieties (Kamper & Niesler, 2014; Van Rooy & Terblanche, 2010, Mesthrie, 2010). WSAfE is seen as the standard variety as it derives from the white L1 speakers who arrived in the country in the early 1800's (Bekker, 2009; Lass, 1995). One of the L2 varieties of English spoken in South Africa is BSAE. A large

discrepancy in the vowel inventories of these two varieties of SAE can be noted. WSAfE has seven short and six long monophthongs as well as seven diphthongs (Bekker, 2009). BSAE, influenced by the smaller vowel inventory of the African languages, has only six short monophthongs (Van Rooy & Van Huyssteen, 2000; De Wet et al., 2007; Wissing, 2002). Setswana as an African language, for example, has only seven (short) basic vowels, four raised vowels and no diphthongs (Snyman, 1989).

African languages do not have diphthongs, consequently BSAE, being influenced by the African languages, does not distinguish all the diphthongs of English. According to research only one true diphthong, namely [ɔɪ], occurs in BSAE (Van Rooy & Van Huyssteen, 2000). It was noticed when depicting the formants of the diphthongs in the vowel space drawn using F_1 versus F_2 values that [au], however, could be seen as a diphthong as well since the difference in formant frequencies of the start point and end point is large enough.

When comparing the vowels of WSAfE, BSAE and Setswana there is clearly a substantial difference between the vowel spaces of these languages, confirming not only the differences in vowel inventories, but also the perception and production of the vowels of English by L1 speakers of African languages. Such differences influence the acquisition of English by English L2 learners (Seeff-Gabriel, 2003). Educators should be aware of this and should pay attention to perception and articulation training in class.

7.4 Method

The main aim of the current study was to assess the effects of intervention on the auditory perception and articulatory skills of Grade 3 EL2 learners concerning the vowels of English. In order to achieve this, an acoustic phonetic investigation into the differences in vowel space occupied by the English vowels as produced by English L1 and L2 (Setswana L1) speaking learners in Grade 3 was conducted. The vowel spaces of the EL1 and EL2 groups were then compared before and after intervention.

The first sub-aim was to determine the phonological awareness skills of both the EL1 and EL2 participants in this study. The second sub-aim was to supply measurable evidence of the effect of vowel perception and production intervention on the literacy skills of EL2 (Setswana L1-speaking, and taught through the medium of English from Grade 1) learners in Grade 3. Flowing from the results of this investigation, educators and educationalists could be reminded of the importance of and need to focus on the sound system of English in the ELoLT classroom. The third sub-aim was to provide speech-language therapists with measureable acoustic evidence of the differences in the vowel system of English as perceived by the EL1 and EL2 participants in the study. In the process the differences in the vowel systems of Setswana and English were illuminated. This evidence could improve auditory perception and pronunciation intervention materials and methods.

The research design that was utilised was a quasi-experimental design, often used in experimental research with human participants (Mitchell & Jolley, 2013). The study also utilised a comparative design as a Norm group is involved against which the Experimental and Control groups were measured before and after intervention.

The assessment materials consisted of a test for auditory processing skills, the TAPS-3 (Martin & Brownell, 2005), the One-minute Reading Test (Transvaal Education Department, 1987), the UCT Spelling Test (University of Cape Town, 1985) and an age-appropriate word list for recording purposes. After the auditory processing skills and literacy skills were assessed, the participants were required to read the word list containing all the vowels and diphthongs of English. It was found that more than half of the EL2 participants could not read the word list. Picture cards were then designed to elicit the appropriate words.

The participants in the Experimental group received intervention focussed on the vowels and diphthongs of English. This lasted for 12 weeks after which all the assessments done before the intervention were repeated, and participants were recorded saying the words elicited by means of the picture cards.

The results of the assessments were calculated and stored. The recorded words were analysed according to the formant frequencies of the vowel appearing in the word. The F_1 and F_2 frequencies were used to draw a vowel space reminiscent of the traditional vowel chart which was then used to compare the articulation of the various groups of participants pre- and post-intervention.

Based on the comparison of vowel space, as well as the measurement of the distance between the formant frequencies before and after intervention, it could be determined whether intervention concerning the different acoustic qualities and articulatory characteristics of WSAfE vowels improved the auditory discrimination and articulatory abilities of young EL2 participants in the Experimental group. In addition, effect sizes were calculated to conclude whether statistically significant changes occurred in the Experimental group post-intervention.

The results of the TAPS-3 test for auditory processing skills, the One-minute Reading Test, the UCT Spelling Test were compared within and between-groups. Statistical analysis was done to determine whether the intervention resulted in statistically significant improvement of the Experimental group's phonological awareness and literacy skills.

7.5 Results and discussion

The results relating to the main aim of this thesis indicated that there are distinctive differences in the vowel spaces of the short and long vowels as produced by the EL1 and EL2 participants before intervention. This confirms that the EL1 and EL2 participants did not perceive and produce the vowels of English in the same way. Interestingly, in contrast to what is known about BSAE, even prior to intervention both the EL2 groups distinguished and produced a central vowel [ə]. Although the quality was not identical to that of the EL1 group's production of [ə], it can still be identified as a central vowel. After intervention however, the vowel spaces of the Experimental group were seen to approximate those of the Norm group.

After intervention, both the vertical and horizontal lingual movement in the productions of [ʊ], [ə], [ɑ:] and [ɔ:], improved in such a manner that the F₁ and F₂ formant behaviour of the Experimental group could be seen to approximate that of the Norm group. In many cases, however, either only the F₁ or the F₂ improved. The F₂ improved frequently. This suggests that it is easier to change the horizontal movement of the tongue than it is to change the vertical movement.

Only in the Experimental group's post-intervention production of the diphthong [eɪ] did improvement in vertical and horizontal lingual behaviour occur on both the onset and the offset. Although not much improvement after intervention was noticed in the lingual behaviour in the Experimental group's production of the other diphthongs, interesting observations were made. Before intervention, no extreme dissimilarities between the vowel spaces of the EL1 and EL2 groups were observed when the diphthongs were produced. This shows that both the EL2 groups distinguish all the diphthongs of English, although the measurements indicated that the actual quality of some diphthong productions may differ from those produced by the Norm group. This is an interesting occurrence as one expected the EL2 groups' productions to be similar to BSAE diphthong articulation. The results of the analysis of the EL2 productions of the diphthongs confirm previous research that states that young first language speakers of African languages are developing a variety of English which is not BSAE, but closer to WSAfE (Mesthrie, 2008).

This development should not be seen as cancelling the necessity of intervention as described and proposed in this study. One could argue that the fact that young L1 speakers of African languages are developing such a variety of English is because they have the opportunity to be in frequent contact with and communicate freely with EL1 speakers. As it was suggested that awareness of the more extensive vowel system of WSAfE as LoLT will improve EL2 learners' academic skills (Seeff-Gabriel, 2003), it will only benefit EL2 learners if they are assisted to develop this new variety of English, containing more vowels than BSAE, even more rapidly.

The fact that the lingual modification of the Experimental group did not improve in the productions of all the vowels confirms the statement by researchers that only after

continuing, concentrated contact with the L2 separate long-term categories for L2 sounds develop (Baker & Trofimovich, 2005). This once again reinforces the need for intensive and extensive teaching of the sound system of the language of learning and teaching during the early years of schooling (Crawford-Brooke, 2013; Phillips et al., 2008).

Equating the outcomes of the additional input given to the Experimental and Control groups, it may appear if the Experimental group's perception and articulation of WSAfE vowels did not improve significantly. Improvement has to be judged by keeping the conditions in mind, however: only six of the participants of the Experimental group were taught by teachers who used the more extensive vowel system of WSAfE in their speech. The rest of the participants were taught by teachers speaking BSAE, therefore using a more limited vowel system. This means that not all the participants in the Experimental group were exposed to the vowel system of WSAfE on a daily basis as happened with the Control group who were all taught by teachers using the vowel system of WSAfE. In addition, the Experimental group received intervention once a week for 45 minutes, not on a daily basis as suggested by experts such as Moats (2007), Trehearne et al. (2004) and Trehearne (2011). Therefore, given the limited exposure received by the majority of the Experimental group, the improvements that *were* noted, should be seen as significant, especially in a practical sense.

Research indicates that intensive and extensive teaching of the sound system of the language of learning and teaching is necessary during the early years of schooling to make students aware of the qualities of the L2 sounds (Phillips et al., 2008; Lambacher et al., 2005). The fact that the Control group performed almost as well as the Experimental group again reinforces this view. In addition, learners should be exposed to activities improving their awareness of the L2 sounds through-out the school day, not only once a week, or for very brief periods during the day. The influence of the teacher as language role model is also illuminated by these findings concerning the Control group. Therefore, teachers as language models should be aware of the characteristics of the L2 sound systems themselves. They should also realise the importance of teaching learners the characteristics of the L2 sounds.

With regards to the sub-aims of supplying measurable information on the phonological awareness skills and literacy skills of EL1 and EL2 learners in the specific age group, assessment results were illuminating. The over-all standard scores on the TAPS-3 showed that the Experimental group's auditory processing skills developed significantly with intervention. Similarly, the Experimental group's phonological awareness skills as assessed by the three Phonological Skills sub-tests of the TAPS-3 displayed significant improvement after intervention. Aside from the significant improvement, however, this group's scores were still below those of the Norm group, demonstrating that EL2 learners have severe deficiencies with regards to phonological awareness skills. Educationalists should therefore realise that explicit teaching of these skills should receive priority in especially the foundation phase, preferably from Grade R.

The results obtained from the reading and spelling skills assessments (raw scores) confirmed that EL2 learners' literacy skills are much poorer than those of their EL1 peers. Although an improvement in the literacy skills of the Experimental group can be observed after intervention, the level of these skills is still unsatisfactorily low. Probable reasons for this could be the limited period of intervention – only once a week for 45 minutes – instead of intensive teaching through-out every day, as suggested by various prominent researchers in the field (Trehearne et al., 2004; Trehearne, 2011).

The third sub-aim, namely providing professionals with measurable, acoustic information on the vowel production of both EL1 and EL2 learners (Setswana L1) in South Africa between the ages of 8 to 10 years in Grade 3, was met as well by providing formant values in tables as well as depicting and comparing the articulation of each group of participants within the vowel space.

7.6 Limitations and recommendations for future research

A limitation to this study is that it was only carried out in an urban area, where one could expect to see EL2 learners with a better proficiency level in English. In rural areas the differences between EL1 and EL2 should be more prominent. In addition,

the researcher did not have control over new teachers being appointed, classes allocated to different teachers or Experimental group participants being moved to classes taught by teachers who did not speak English as a first language.

Many of the learners in the Control group ended up in classes taught by teachers speaking WSAfE, while many of the Experimental group were assigned to teachers speaking BSAE. This situation could also be cited as the reason why the perception and production of the Control group improved so much when studying the results of the acoustic analysis of the vowels. Were the Experimental group taught by teachers making use of the more extensive vowel inventory of WSAfE, the differences between the Experimental and Control groups could have been more pronounced.

Because of the Experimental group participants being mostly in the classes taught by BSAE-speaking teachers, the intervention given to the Experimental group was not reinforced in class. This once again illustrates the importance of the teacher as language role model.

Another limitation would be that no longitudinal study could be carried out determining how these participants who received the short period of intervention fared academically. Such a study is necessary to see whether the intervention given would have a lasting effect on literacy skills and the resultant academic achievements. In addition, a study like the present one should have been carried out with much larger groups of participants. In that case the results could have been conclusive to the Setswana-speaking areas of the country as a whole.

Recommendations for future research would be that such an investigation should be carried out in the rural areas as well. More participants should be involved. In order to conduct a study with a large number of participants, more speech-language therapists or qualified teachers should become involved in a research project. In addition, teachers should reinforce the intervention given by the researcher(s), giving the participants in the Experimental group optimal input on the vowels of WSAfE. This should include activities that are designed to enhance the L2 learners'

phonological awareness skills. Finally, a longitudinal study should be embarked on, tracking the academic progress of those students who received intervention.

Another recommendation for further study would be that a correlation be done between the vowel quality of individual vowels as produced by EL2 learners post-intervention and their post-intervention phonological awareness skills.

A further suggestion for future research to obtain deeper insight into the effectiveness of perceptual and articulatory intervention would be to analyse the results of the two groups of EL2 learners separately according to whether they were taught by BSAE or WSAfE speaking teachers. The results could then be compared and discussed illustrating the influence of the teacher functioning as a language model in class.

7.7 Final conclusion

This thesis has provided a thorough literature review on topics related to the aims of the research project. It has employed assessment tools used by speech-language therapists to assess levels of phonological awareness skills, reading and spelling abilities. In addition, it has made use of modern acoustic tools to analyse the sound recordings. The statistical analysis was done by an expert, using standard statistical techniques.

At the end of this study, it is clear that many of the EL2 learners of South Africa are in dire need of quality teaching concerning the sound system of English. Although mother tongue education is still deemed the best, it is only best when it is quality education. In the South African context, quality mother tongue education everywhere in all schools may still be a way off in the future. Until then, while many of our country's learners are learning via the medium of a second language, they have to be provided with the best quality teaching in that language. Such teaching should start with intensive training of the sound system of the language of learning and teaching.

Appendices

Appendix A

Ethical Considerations

A1: Declaration of Ethical Intent

RESEARCH PROPOSAL AND ETHICS COMMITTEE (RESPEthics)

FACULTY OF HUMANITIES

UNIVERSITY OF PRETORIA



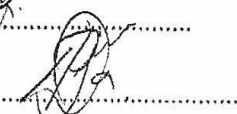
DECLARATION OF ETHICAL INTENT

We declare that we are fully aware of the stance taken by the RESPEthics Committee, Faculty of Humanities, regarding the importance of obtaining informed consent from research participants.

We acknowledge their concerns and reservations regarding the lack of written informed consent documents due to the fact that we deem it impossible to obtain such in the current research project.

We declare that, in the course of the research, we will take due care to protect and safeguard the rights and autonomy of all parties, which includes the participants, the University of Pretoria, RESPEthics, our Department and all outside parties with whom we make contact either physically, verbally or through documents and documentation.

We undertake to be ethical in all our dealings and at all times during the research endeavour.

STUDENT: Maria Le Roux 
SUPERVISOR: Prof. D.J. Prinsloo 
HEAD OF DEPARTMENT: Prof. D.J. Prinsloo 
PROJECT TITLE: An acoustic investigation of English vowels as produced by English L1 and Setswana L1 Foundation Phase learners.



A2: Ethical Clearance: University of Pretoria



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Research Ethics Committee

6 December 2012

Dear Prof Prinsloo

Project: An acoustic investigation of English vowels as produced by English L1 and Setswana L1 foundation phase learners
Researcher: M le Roux
Supervisor: Prof DJ Prinsloo
Department: African Languages
Reference number: 04433565

Further to our letter of approval, please note that this approval will be rescinded should the Department of Education and the schools, respectively, not grant Ms le Roux permission to conduct the research. Proof of these permissions is therefore required.

Sincerely

Prof. Elsabé Taljard
Acting Chair: Research Ethics Committee
Faculty of Humanities
UNIVERSITY OF PRETORIA
e-mail: elsabe.taljard@up.ac.za

Research Ethics Committee Members: Dr L Blokland; Prof M-H Coetzee; Dr JEH Grobler; Prof KL Harris; Ms H Klopper; Prof A Mlambo, Dr C Panebianco-Warrens; Prof J Sharp (Chair); Prof GM Spies; Prof E Taljard ; Dr FG Wolmarans, Dr P Wood

A3: Research Approval: Gauteng Department of Education



GAUTENG PROVINCE

Department: Education
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no. D2013/272

GDE AMENDED RESEARCH APPROVAL LETTER

Date:	1 February 2013
Validity of Research Approval:	4 February 2013 to 27 September 2013
Previous GDE Research Approval letter reference number	D2013/241 (20 Nov 2012)
Name of Researcher:	Le Roux M.
Address of Researcher:	1346 Walter Avenue
	Waverley
	Pretoria
	0186
Telephone Number:	012 420 2381 / 083 566 1065
Fax Number:	012 420 3517
Email address:	mia.leroux@up.ac.za
Research Topic:	An acoustic investigation of English Vowels as produced by English L1 and Setswana L1 Foundation Phase learners
Number and type of schools:	TWO Primary Schools
District/s/HO	Tshwane South, Gauteng North and Tshwane West

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

Making education a societal priority

Office of the Director: Knowledge Management and Research

9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za
Website: www.education.gpg.gov.za

M. Makhado
2013/02/04



The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

1. The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.
2. The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.
3. A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.
4. A letter / document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.
5. The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.
6. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.
7. Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.
8. Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.
9. It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.
10. The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.
11. The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.
12. On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.
13. The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.
14. Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

David Makhado

Dr David Makhado

Director: Knowledge Management and Research

DATE: 2013/02/04

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Office of the Director: Knowledge Management and Research

9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za
Website: www.education.gppg.gov.za



GAUTENG PROVINCE

Department: Education
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no. D2014/311 A

GDE AMENDED RESEARCH APPROVAL LETTER

Date:	27 November 2013
Validity of Research Approval:	10 February to 3 October 2014
Previous GDE Research Approval letter reference number	D2013/272 dated 4 February 2013 and D2013/241 dated 20 November 2012
Name of Researcher:	Le Roux M.
Address of Researcher:	1346 Walter Avenue
	Waverley
	Pretoria
	0186
Telephone Number:	012 420 2381 / 083 566 1065
Fax Number:	012 420 3517
Email address:	mia.leroux@up.ac.za
Research Topic:	An acoustic investigation of English Vowels as produced by English L1 and Setswana L1 Foundation Phase learners
Number and type of schools:	TWO Primary Schools
District/s/HO	Tshwane South

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

Mkhado
2013/12/03

1

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Office of the Director: Knowledge Management and Research

9th Floor, 111 Commissioner Street, Johannesburg, 2001
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Email: David.Mkhado@gauteng.gov.za



The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

1. The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.
2. The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.
3. A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.
4. A letter / document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.
5. The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.
6. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.
7. Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.
8. Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.
9. It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.
10. The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.
11. The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.
12. On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.
13. The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.
14. Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

Dr David Makhado
Director: Education Research and Knowledge Management

DATE: 2013/12/03

2

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Office of the Director: Knowledge Management and Research

9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za

A4: Letters to school principals

School 1:



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

**Department of Communication
Pathology**

**Researcher and Staff member:
Mrs M le Roux**

Personnel number: 04433565

The Principal: Laerskool

Dear Mr

This letter is a request for permission from you and the relevant authorities that I may include selected participants from amongst the learners of this school in this research study. The University of Pretoria and the Gauteng Department of Education gave permission for this study to be conducted and relevant evidence thereof is available should you require this.

Title of the study:

An acoustic investigation of English vowels as produced by English L1 and Setswana L1 foundation phase learners.

Purpose of the study:

In fulfilment of the requirements for the degree DLitt. I am expected to complete a research study. The main aim of this study is to do an acoustic phonetic investigation into the difference in vowel space occupied by the English vowels as produced by English first language and English second language (Setswana first language speaking) foundation phase learners, specifically eight to ten year old boys. By comparing the vowel space pre- and post-intervention of English second

language learners, one can determine whether additional input - for the purpose of my study the input will be in the form of intervention - will improve the auditory perception and articulation skills of English second language (Setswana first language speaking) learners in the English Language of Learning and Teaching (LoLT) classroom.

Procedure:

In the case of your consent, the following procedures will take place:

- Parents of all participants will receive consent letters.
- Participants will receive letters of consent with a picture of a 'happy' face and a 'sad' face. When the learner no longer wants to participate, he can point to/show the sad face and the session will be terminated.

Group 1: English L1 learners: (Learners from another primary school)

- In order to compare the auditory perception and articulatory skills of the English L1 and L2 learners, I need to establish the norm by assessing the skills of 15 English L1 eight to ten year old male learners.
 - The auditory perception of the selected participants will be assessed by means of a non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
 - Participants will write a standardised spelling test.
 - Participants' reading skills will be assessed.
 - Audio recordings will be made of the participants reading a word list of English words three times (on different days in the same week) to establish a baseline. The results of the analysis of these recordings will function as the norm for auditory perception and articulatory skills of eight to ten year old male English L1 learners.
 - At the end of the period of intervention received by the experimental group, the participants' auditory perception skills will be re-assessed by

the TAPS-3. The participants will be required to read the same word list again while being recorded. These recordings will again be analysed.

- Participants' reading skills will be re-assessed.
- Participants will again write a standardised spelling test.

Group 2: English L2 (Setswana L1) learners: (From your school)

- The auditory perception of 15 selected English L2 (Setswana L1) eight to ten year old male learners will be determined by using the non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
- Participants will write a standardised spelling test.
- Participants' reading skills will be assessed.
- Audio recordings will be made of the participants reading a word list of English words three times (on different days in the same week) to establish a baseline. These recordings will be analysed.
- The participants of this group will receive auditory perception training (grapheme-phoneme coupling and vowel discrimination) which includes production training and written exercises (phoneme-grapheme coupling). The auditory perception and articulation intervention will be provided by supervised speech-language therapy students from the Department of Communication Pathology at the University of Pretoria.
- At the end of the period of intervention received by this group, the participants' auditory perception skills will be re-assessed by the TAPS-3. The participants will be required to read the same word list again while being recorded. These recordings will again be analysed.
- Participants' reading skills will be re-assessed.
- Participants will again write a standardised spelling test.
- Probes will be done on a monthly basis to determine whether progress takes place.

Group 3: English L2 (Setswana L1) learners: Control group: (From your school)

- The auditory perception of 15 selected English L2 (Setswana L1) eight to ten year old male learners will be determined by using the non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
- Participants will write a standardised spelling test.
- Participants' reading skills will be assessed.
- Audio recordings will be made of the English L2 (Setswana L1) participants reading a word list of English words three times (on different days in the same week) to establish a baseline. These recordings will be analysed.
- The control group will not receive additional input in the form of intervention. Should the results of this study indicate that additional input is beneficial the parents of the control group can request similar intervention for the same time span.
- After a period of time during which Group 2 will have received additional input in the form of intervention, the participants' auditory perception skills will be re-assessed by using the TAPS-3 and will write a standardised spelling test again. The participants will be required to read the same word list again while being recorded. These recordings will again be analysed.
- Participants' reading skills will be re-assessed.

Risks and discomfort:

No risks are involved in participating. The tests will not take long and the word list is not too long as I have tried to keep the words to the minimum. The amount of time required from all participants will be kept to a minimum.

Implications for the school:

- The undertaking of the researcher is that the amount of time required from all participants will be kept to a minimum.

- Initially, a consultation with the class teacher and perhaps departmental head will take place. This should not take more than 20-30 minutes.
- The recording of the 30 participants will be done in accordance with the school/teacher's preference.
- It is estimated that the recordings should not take more than three hours per group. The researcher is willing to comply as far as possible with times that would suit the teacher and the school.
- Intervention by the students will take place once a week for 45 minutes. At this stage of the study it is foreseen that the duration of the intervention will be about 12 weeks.

Benefits:

- The results of the TAPS-3 and spelling test will be made available to the parents of all groups of participants should they request it.
- The participants of Group 2 stand to benefit the most: The participants' English auditory perception and articulatory skills should improve in such a manner that it should improve their English academic proficiency and may improve their overall academic performance.
- The general population of learners stand to benefit from the enhanced input at completion of this research project. Learners in the control group may be able to benefit from the enhanced protocol at completion of this study.

Participants' rights:

All participation is voluntary. The participants may withdraw from the study at any time. The participants and educators will be informed of the results of the study, should they require that.

Confidentiality:

Identifying information of all educators and participants will be kept confidential by the researcher and the promoter. No personal information will be disclosed.

For any enquiries, please feel free to contact the following persons:

Researcher: Mia le Roux

(0835661065/012 420 2381)

(mia.leroux@up.ac.za)

Promoter: Prof. D. J. Prinsloo

(danie.prinsloo@up.ac.za)

Head: Department of African Languages

Prof. M.J. Mojalefa

(jerry.mojalefa@up.ac.za)

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux (Researcher)



Prof. D. J. Prinsloo (Promoter)



Prof. M.J. Mojalefa (Head: Department of African Languages)

Letter of consent:

Hereby I, as principal of Laerskool....., give consent for learners of this school to participate in this study. I understand what is expected from the learners and will comply with the requirements.

Signed at _____ on the _____ day of
_____ 2013.

Signature



School 2:

Faculty of Humanities

Department of Communication Pathology

**Researcher and Staff member:
Mrs M le Roux**

Personnel number: 04433565

The Principal: Primary

Dear Sir

This letter is a request for permission from you and the relevant authorities that I may include selected participants from amongst the learners of this school in this research study. The University of Pretoria and the Gauteng Department of Education gave permission for this study to be conducted and relevant evidence thereof is available should you require this.

Title of the study:

An acoustic investigation of English vowels as produced by English L1 and Setswana L1 foundation phase learners.

Purpose of the study:

In fulfilment of the requirements for the degree DLitt, I am expected to complete a research study. The main aim of this study is to do an acoustic phonetic investigation into the difference in vowel space occupied by the English vowels as produced by English first language and English second language (Setswana first language speaking) foundation phase learners, specifically eight to ten year old boys and girls, thus learners in Grade 3. By comparing the vowel space pre- and post-intervention of English second language learners, one can determine whether additional input - for the purpose of my study the input will be in the form of intervention - will improve the auditory perception and articulation skills of English second language (Setswana first language speaking) learners in the English Language of Learning and Teaching (LoLT) classroom.

For this comparative study, I need to establish the norm auditory perception and articulation of English vowels as experienced by 15 eight to ten year old English first language (mother-tongue) learners. I would therefore like to request permission to record 15 the participants while they read a specific word list.

Procedure:

In the case of your consent, the following procedures will take place:

- Parents of all participants will receive consent letters.
- Participants will receive letters of consent with a picture of a 'happy' face and a 'sad' face. When the learner no longer wants to participate, he can point to/show the sad face and the session will be terminated.

Group 1: English L1 learners: (..... primary): (From your school)

- In order to compare the auditory perception and articulatory skills of the English L1 and L2 learners, I need to establish the norm by assessing the skills of 15 English L1 eight to ten year old participants (Group 1).
 - The auditory perception of the selected participants will be assessed by means of a non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
 - Participants will write a standardised spelling test.
 - Participants' reading skills will be assessed.
 - Audio recordings will be made of the participants reading a list with English words three times (on different days in the same week) to establish a baseline. The results of the analysis of these recordings will function as the norm for auditory perception and articulatory skills of eight to ten year old English L1 learners in the Tshwane area.
 - At the end of the period of intervention received by the experimental group, the participants' auditory perception skills will be re-assessed by the TAPS-3. The participants will be required to read the same word

list again while being recorded. These recordings will again be analysed.

- Participants will again write a standardised spelling test.
- Participants' reading skills will be re-assessed.

Risks and discomfort:

No risks are involved in participating. The tests will not take long and the word list is not too long as I have tried to keep the words to a minimum. The amount of time required from all participants will be kept to a minimum.

Implications for the school:

- The undertaking of the researcher is that the amount of time required from all participants will be kept to a minimum.
- Initially, a consultation with the class teacher and perhaps departmental head will take place. This should not take more than 20 -30 minutes.
- The recording of the 15 participants will be done in accordance with the school/teacher's preference.
- It is estimated that the recordings should not take more than three hours. The researcher is willing to comply as far as possible with times that would suit the teacher and the school.

Benefits:

- The results of the TAPS-3 and spelling test will be made available to the parents of all participants should they request it.
- The general population of learners stand to benefit from the enhanced input at completion of this research project.

Participants' rights:

All participation is voluntary. The participants may withdraw from the study at any time. The participants and educators will be informed of the results of the study, should they require that.

Confidentiality:

Identifying information of all educators and participants will be kept confidential by the researcher and the promoter. No personal information will be disclosed.

For any enquiries, please feel free to contact the following persons:

Researcher: Mia le Roux

(0835661065/012 420 2381)

(mia.leroux@up.ac.za)

Promoter: Prof. D. J. Prinsloo

(danie.prinsloo@up.ac.za)

Head: Department of African Languages

Prof. M. J. Mojalefa

(jerry.mojalefa@up.ac.za)

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux (Researcher)



Prof. D. J. Prinsloo (Promoter)



Prof. M.J. Mojalefa (Head: Department of African Languages)

Letter of consent:

Hereby I, as principal of **Primary** give consent for learners of this school to participate in this study. I understand what is expected from the learners and will comply with the requirements.

Signed at _____ on the _____ day of
_____ 2013.

Signature



School 3:

Faculty of Humanities

**Department of Speech-Language Pathology
and Audiology**

**Researcher and Staff member:
Mrs M le Roux**

Personnel number: 04433565

The Principal: Primary School

Dear Mr

This letter is a request for permission from you and the relevant authorities that I may include selected participants from amongst the learners of this school in this research study. The University of Pretoria and the Gauteng Department of Education gave permission for this study to be conducted and relevant evidence thereof is available should you require this.

Title of the study:

An acoustic investigation of English vowels as produced by English L1 and Setswana L1 foundation phase learners.

Purpose of the study:

In fulfilment of the requirements for the degree DLitt. I am expected to complete a research study. The main aim of this study is to do an acoustic phonetic investigation into the difference in vowel space occupied by the English vowels as produced by English first language and English second language (Setswana first language speaking) foundation phase learners, specifically eight to ten year old boys and girls. By comparing the vowel space pre- and post-intervention of English second language learners, one can determine whether additional input - for the purpose of my study the input will be in the form of intervention - will improve the auditory perception and articulation skills of English second language (Setswana first language speaking) learners in the English Language of Learning and Teaching (LoLT) classroom.

Procedure:

In the case of your consent, the following procedures will take place:

- Parents of all participants will receive consent letters.
- Participants will receive letters of consent with a picture of a 'happy' face and a 'sad' face. When the learner no longer wants to participate, he can point to/show the sad face and the session will be terminated.

Group 1: English L1 learners: (Learners from another primary school)

- In order to compare the auditory perception and articulatory skills of the English L1 and L2 learners, I need to establish the norm by assessing the skills of the English L1 learners who act as participants.
 - The auditory perception of the selected participants will be assessed by means of a non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
 - Participants will write a standardised spelling test.
 - Participants' reading skills will be assessed.
 - Audio recordings will be made of the participants reading a word list with English words three times (on different days in the same week) to establish a baseline. The results of the analysis of these recordings will function as the norm for auditory perception and articulatory skills of the English L1 participants.
 - At the end of the period of intervention received by the experimental group, the participants' auditory perception skills will be re-assessed by the TAPS-3. The participants will be required to read the same word list again while being recorded. These recordings will again be analysed.
 - Participants will again write a standardised spelling test.
 - Participants' reading skills will be re-assessed.

Group 2: English L2 (Setswana L1) learners: (From your school)

- The auditory perception of the selected English L2 (Setswana L1) learners will be determined by using the non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
- Participants will write a standardised spelling test.
- Participants' reading skills will be assessed.
- Audio recordings will be made of the participants reading a word list with English words three times (on different days in the same week) to establish a baseline. These recordings will be analysed.
- The participants of this group will receive auditory perception training (grapheme-phoneme coupling and vowel discrimination) which includes production training and written exercises (phoneme-grapheme coupling). The auditory perception and articulation intervention will be provided by supervised speech-language therapy students from the Department of Speech-Language Pathology and Audiology at the University of Pretoria.
- At the end of the period of intervention received by this group, the participants' auditory perception skills will be re-assessed by the TAPS-3. The participants will be required to read the same word list again while being recorded. These recordings will again be analysed.
- Participants will again write a standardised spelling test.
- Participants' reading skills will be re-assessed.
- Probes will be done on a monthly basis to determine whether progress takes place.

Group 3: English L2 (Setswana L1) learners: Control group: (From your school)

- The auditory perception of the selected English L2 (Setswana L1) learners who act as participants will be determined by using the non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
- Participants will write a standardised spelling test.

- Participants' reading skills will be assessed.
- Audio recordings will be made of the English L2 (Setswana L1) participants reading a word list of English words three times (on different days in the same week) to establish a baseline. These recordings will be analysed.
- The control group will not receive additional input in the form of intervention. Should the results of this study indicate that additional input is beneficial the parents of the control group can request similar intervention for the same time-span.
- After a period of time during which Group 2 will have received additional input in the form of intervention, the participants' auditory perception skills will be re-assessed by using the TAPS-3 and will write a standardised spelling test again. The participants will be required to read the same word list again while being recorded. These recordings will again be analysed.
- Participants' reading skills will be re-assessed

Risks and discomfort:

No risks are involved in participating. The tests will not take long and the word list is not too long as I have tried to keep the words to the minimum. The amount of time required from all participants will be kept to a minimum.

Implications for the school:

- The undertaking of the researcher is that the amount of time required from all participants will be kept to a minimum.
- Initially, a consultation with the class teacher and perhaps departmental head will take place. This should not take more than 20-30 minutes.
- The recording of the selected participants will be done in accordance with the school/teacher's preference.
- It is estimated that the recordings should not take more than three hours per group. The researcher is willing to comply as far as possible with times that would suit the teacher and the school.

- Intervention by the students will take place once a week for 45 minutes. At this stage of the study it is foreseen that the duration of the intervention will be about 12 weeks.

Benefits:

- The results of the TAPS-3 and spelling test will be made available to the parents of all groups of participants should they request it.
- The participants of Group 2 stand to benefit the most: The participants' English auditory perception and articulatory skills should improve in such a manner that it should improve their English academic proficiency and may improve their overall academic performance.
- The general population of learners stand to benefit from the enhanced input at completion of this research project. Learners in the control group may be able to benefit from the enhanced protocol at completion of this study.

Participants' rights:

All participation is voluntary. The participants may withdraw from the study at any time. The participants and educators will be informed of the results of the study, should they require that.

Confidentiality:

Identifying information of all educators and participants will be kept confidential by the researcher and the promoter. No personal information will be disclosed.

For any enquiries, please feel free to contact the following persons:

Researcher: **Mia le Roux**

(0835661065/012 420 2381)

(mia.leroux@up.ac.za)

Promoter: **Prof. D. J. Prinsloo**

(danie.prinsloo@up.ac.za)

Head: Department of African Languages

Prof. D. J. Prinsloo

(danie.prinsloo@up.ac.za)

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux (Researcher)



Prof. D. J. Prinsloo (Promoter)



Prof. D. J. Prinsloo (Head: Department of African Languages)

Letter of consent:

Hereby I,, as principal of Primary School, give consent for learners of this school to participate in this study. I understand what is expected from the learners and will comply with the requirements.

Signed at _____ on the _____ day of
_____ 2014.

Signature

A5: Letter to school governing bodies



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities

**Department of Speech-Language Pathology
and Audiology**

**Researcher and Staff member:
Mrs M le Roux**

Personnel number: 04433565

The chairperson of the School Governing Body (SGB):

Dear Sir/Madam

This letter is a request for permission from you that I may include selected participants from amongst the learners of this school in this research study. The University of Pretoria and the Gauteng Department of Education gave permission for this study to be conducted and relevant evidence thereof is available should you require this.

Title of the study:

An acoustic investigation of English vowels as produced by English L1 and Setswana L1 foundation phase learners.

Purpose of the study:

In fulfilment of the requirements for the degree DLitt, I am expected to complete a research study. The main aim of this study is to do an acoustic phonetic investigation into the difference in vowel space occupied by the English vowels as produced by English first language and English second language (Setswana first language speaking) foundation phase learners, specifically eight to ten year old boys and girls, thus learners in Grade 3. By comparing the vowel space pre- and post-

intervention of English second language learners, one can determine whether additional input - for the purpose of my study the input will be in the form of intervention - will improve the auditory perception and articulation skills of English second language (Setswana first language speaking) learners in the English Language of Learning and Teaching (LoLT) classroom.

Procedure:

In the case of your consent, the following procedures will take place:

- Parents of all participants will receive consent letters.
- Participants will receive letters of consent with a picture of a 'happy' face and a 'sad' face. When the learner no longer wants to participate, he can point to/show the sad face and the session will be terminated.

Group 1: English L1 learners: (Learners from Primary)

- In order to compare the auditory perception and articulatory skills of the English L1 and L2 learners, I need to establish the norm by assessing the skills of the English L1 learners who act as participants in Grade 3.
 - The auditory perception of the selected participants will be assessed by means of a non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
 - Participants will write a standardised spelling test.
 - Audio recordings will be made of the participants reading a word list with English words three times (on different days in the same week) to establish a baseline. The results of the analysis of these recordings will function as the norm for auditory perception and articulatory skills of the English L1 participants.
 - At the end of the period of intervention received by the experimental group, the participants' auditory perception skills will be re-assessed by the TAPS-3. The participants will be required to read the same word

list again while being recorded. These recordings may/will again be analysed.

- Participants will again write a standardised spelling test.

Group 2: English L2 (Setswana L1) learners: (Learners from Primary)

- The auditory perception of the selected English L2 (Setswana L1) participants in Grade 3 will be determined by using the non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
- Participants will write a standardised spelling test.
- Audio recordings will be made of the participants reading a list of English words three times (on different days in the same week) to establish a baseline. These recordings will be analysed.
- The participants of this group will receive auditory perception training (grapheme-phoneme coupling and vowel discrimination) which includes production training and written exercises (phoneme-grapheme coupling). The auditory perception and articulation intervention will be provided by supervised speech-language therapy students from the Department of Speech-Language Pathology and Audiology at the University of Pretoria.
- At the end of the period of intervention the participants' auditory perception skills will be re-assessed by the TAPS-3. The participants will be required to read the same word list again while being recorded.

These recordings will again be analysed. During the period of intervention, probes may be done on a monthly basis to establish whether progress is being made.

- Participants will write a standardised spelling test again.
- Probes will be done on a monthly basis to establish whether progress takes place.

Group 3: English L2 (Setswana L1) learners: Control group: (Learners from Primary)

- The auditory perception of the selected English L2 (Setswana L1) participants in Grade 3 will be determined by using the non-invasive language test, viz. the TAPS-3 (Test for Auditory-Perceptual Skills Third Edition).
- Participants will write a standardised spelling test.
- Audio recordings will be made of the English L2 (Setswana L1) participants reading a word list of English words three times (on different days in the same week) to establish a baseline. These recordings will be analysed.
- The control group will not receive additional input in the form of intervention. Should the results of this study indicate that additional input is beneficial the parents of the control group can request similar intervention for the same time-span.
- After a period of time during which Group 2 will have received additional input in the form of intervention, the participants' auditory perception skills will be re-assessed by using the TAPS-3 and will write a standardised spelling test again. The participants will be required to read the same word list again while being recorded. These recordings will again be analysed.

Risks and discomfort:

No risks are involved in participating. The tests will not take long and the word list is not too long as I have tried to keep the words to the minimum. The amount of time required from all participants will be kept to a minimum.

Implications for the school:

- The undertaking of the researcher is that the amount of time required from all participants will be kept to a minimum.
- Initially, a consultation with the class teacher and perhaps departmental head will take place. This should not take more than 20 - 30 minutes.
- The recording of the participants per group will be done in accordance with the school/teacher's preference.

- It is estimated that the recordings should not take more than three hours per group. The researcher is willing to comply with times that would suit the teacher and the school.
- Intervention by the students will take place once a week for 45 minutes. At this stage of the study it is foreseen that the duration of the intervention will be about 12 weeks.

Benefits:

- The results of the TAPS-3 and spelling test will be made available to the parents of all groups of participants should they request it.
- The participants of Group 2 stand to benefit the most: The participants' English auditory perception and articulatory skills should improve in such a manner that it should improve their English academic proficiency and may improve their overall academic performance.
- The general population of learners stand to benefit from the enhanced input at completion of this research project. Learners in the control group may be able to benefit from the enhanced protocol at completion of this study.

Participants' rights:

All participation is voluntary. The participants may withdraw from the study at any time. The participants and educators will be informed of the results of the study, should they require that.

Confidentiality:

Identifying information of all educators and participants will be kept confidential by the researcher and the promoter. **No personal information will be disclosed.**

For any enquiries, please feel free to contact the following persons:

Researcher: Mia le Roux

(0835661065/012 420 2381)

(mia.leroux@up.ac.za)

Promotor: Prof. D. J. Prinsloo

[\(danie.prinsloo@up.ac.za\)](mailto:danie.prinsloo@up.ac.za)

Head: Department of African Languages

Prof. D. J. Prinsloo

[\(danie.prinsloo@up.ac.za\)](mailto:danie.prinsloo@up.ac.za)

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux (Researcher)



Prof. D. J. Prinsloo (Promotor)



Prof. D. J. Prinsloo (Head of Department: African Languages)

Letter of consent:

Hereby I,, as chairperson of the School Governing Body (SGB), give consent for learners of this school to participate in this study. I understand what is expected from the learners and will encourage all involved with the research project to comply with the requirements.

Signed at _____ on the _____ day of _____ 201_.

Signature

A6: Letters to Heads of Foundation Phase



School 1:

Faculty of Humanities
Department of Speech-Language
Pathology and Audiology

Dear Madam

For the purpose of my research as explained earlier, I need to make recordings of 15 English second language speakers (Setswana first language speaking): boys and girls, aged eight to ten, in Grade 3. All participants must be in the same class. Would you kindly select the participants you believe will deliver the best data for the study? In addition to the requirements above, I would like to point out that the participants should have no hearing, speech or cognitive disabilities.

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux

(Researcher)



Prof. D. J. Prinsloo

(Promoter)



Prof. M. J. Mojalefa

(Head of Department: African Languages)

Letter of consent:

Hereby I, as Departmental Head of the Foundation Phase, give consent for learners of this school to participate in this study. I understand what is expected from the learners and will encourage all involved with the research project to comply with the requirements.

Signed at _____ on the _____ day of
_____ 201_.

Signature

School 2:



Faculty of Humanities
Department of Speech-Language
Pathology and Audiology

Dear Madam

For the purpose of my research as explained earlier, I need to make recordings of 15 English mother-tongue speakers: boys and girls, aged eight to ten, in Grade 3. All participants must be in the same class. Would you kindly select the participants you believe will deliver the best data for the study? In addition to the requirements above, I would like to point out that the participants should have no hearing, speech or cognitive disabilities.

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux (Researcher)



Prof. D. J. Prinsloo (Promoter)



Prof. M. J. Mojalefa (Head of Department: African Languages)

Letter of consent:

Hereby I, as Departmental Head of the Foundation Phase, give consent for learners of this school to participate in this study. I understand what is expected from the learners and will encourage all involved with the research project to comply with the requirements.

Signed at _____ on the _____ day of _____ 201_.

Signature

School 3:

Faculty of Humanities
Department of Speech-Language
Pathology and Audiology

Dear Madam

For the purpose of my research as explained earlier, I need to make recordings of 15 English second language speakers (Setswana first language speaking): boys and girls, aged eight to ten, in Grade 3. All participants must be in the same class. Would you kindly select the participants you believe will deliver the best data for the study? In addition to the requirements above, I would like to point out that the participants should have no hearing, speech or cognitive disabilities.

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux (Researcher)



Prof. D. J. Prinsloo (Promoter)



Prof. D. J. Prinsloo (Head of Department: African Languages)

Letter of consent:

Hereby I, as Departmental Head of the Foundation Phase, give consent for learners of this school to participate in this study. I understand what is expected from the learners and will encourage all involved with the research project to comply with the requirements.

Signed at _____ on the _____ day of
_____ 201_.

Signature

A7: Letters of consent to parents

Norm Group:



Faculty of Humanities
Department of Speech-Language
Pathology and Audiology

Dear Parent

I am a doctoral student in the Department of African Languages at the University of Pretoria and a lecturer in the Department of Speech-Language Pathology and Audiology at the same University. The title of my study is: *An acoustic investigation of English vowels as produced by English L1 and Setswana L1 foundation phase learners.*

The main aim of this study is to do an acoustic phonetic investigation into the difference in vowel space occupied by the English vowels as produced by English first language and English second language (Setswana first language speaking) foundation phase learners. I would like to ask your child to participate as part of the **Norm group** (Group 1) for this study. By comparing the vowel space pre- and post-intervention of English second language learners, one can determine whether additional input - for the purpose of my study the input will be in the form of intervention - will improve the auditory perception and articulation skills of English second language (Setswana first language speaking) foundation phase learners in the English Language of Learning and Teaching (LoLT) classroom. In order to execute this study, it is necessary to determine a norm for auditory perception and articulation of English vowels as perceived and articulated by English first language speakers.

Procedure:

- Parents and participants will receive consent letters. (Please complete on last page of this letter)

- Early in the new school year, the auditory perception of the selected participants will be assessed by means of a non-invasive language test, viz. the TAPS-3 (Test of Auditory-Perceptual Skills Third Edition). This will be done by supervised speech-language therapy students from the Department of Speech-Language Pathology and Audiology at the University of Pretoria, at school, during school hours.
- At the same time, audio recordings will be made of the participants reading a word list three times (on different days of the same week). These will be analysed. Learners will be requested to read the word list again later in the year.
- Participants will write a standardised spelling test.
- Participants' reading abilities will be assessed by a standardised test.
- Participants will re-write a standardised spelling test later in the year.
- Participants' reading abilities will be re-assessed by a standardised test later in the year.

Risks and discomfort

There are no risks or discomfort involved in the study.

Benefits

The results of the TAPS-3 and spelling test will be made available to the parents should they request it. The general population of learners stand to benefit from the enhanced input at completion of this research project.

Participants' rights

- All participation is voluntary. The participants may withdraw at any time. Participants will receive letters of consent with a picture of a 'happy' face and a 'sad' face. When the learner no longer wants to participate, he can point to/show the sad face and the session will be terminated.
- All information used will be treated as confidential and no names and any other identifying information will be revealed. The data collected during the

study will be accessible to the researchers and involved supervisors. According to the University's policy, all data will be stored in the archives of the University of Pretoria for a period of 15 years for future research purposes.

The participants are free to contact the researchers and/or supervisors at any time if any doubts or enquiries might arise. The research results will finally be published as a research report and be accessible in the library at the University of Pretoria. We can be contacted at the following numbers for further information: Cell: 0835661065 (Mia le Roux) or E-mail: mia.leroux@up.ac.za or danie.prinsloo@up.ac.za.

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux (Researcher)



Prof. D. J. Prinsloo (Promoter)



Prof. M. J. Mojalefa (Head: Department of African Languages)

Letter of consent: (Group 1)

Hereby we,, as parents/guardians of
..... give consent for our child to
participate in this study. We understand what is expected from our child and will
comply with the requirements.

Signed at _____ on the _____ day of
_____ 201_.

Signature

Experimental Group:

Faculty of Humanities
Department of Speech-Language
Pathology and Audiology

Dear Parent

I am a doctoral student in the Department of African Languages at the University of Pretoria and a lecturer in the Department of Speech-Language Pathology and Audiology at the same University. The title of my study is: *An acoustic investigation of English vowels as produced by English L1 and Setswana L1 foundation phase learners.*

The main aim of this study is to do an acoustic phonetic investigation into the difference in vowel space occupied by the English vowels as produced by English first language and English second language (Setswana first language speaking) foundation phase learners. I would like to ask your child to participate as part of the **Experimental group** (Group 2) for this study. By comparing the vowel space pre- and post-intervention of English second language learners, one can determine whether additional input - for the purpose of my study the input will be in the form of intervention - will improve the auditory perception and articulation skills of English second language (Setswana first language speaking) foundation phase learners in the English Language of Learning and Teaching (LoLT) classroom. The experimental group will receive auditory perception and articulation training (grapheme-phoneme coupling and vowel discrimination) which includes production training and written exercises (phoneme-grapheme coupling).

Procedures:

- Parents and participants will receive consent letters. (Please complete on last page of this letter)
- Early in the new school year the auditory perception of the selected participants will be assessed by means of a non-invasive language test, viz. the TAPS-3 (Test of Auditory-Perceptual Skills Third Edition).

This will be done by supervised speech-language therapy students from the Department of Speech-Language Pathology and Audiology at the University of Pretoria, at school, during school hours.

- At the same time, the English articulatory skills of the control group participants will be determined and evaluated by analysis of voice recordings. The participants will be asked to read a word list three times (on different days in the same week).
- Participants will write a standardised spelling test.
- Participants' reading skills will be assessed by a standardised test.
- Intervention will take place for 45 minutes on a weekly basis for no less than 12 weeks. The experimental group will receive auditory perception and articulation training (grapheme-phoneme coupling and vowel discrimination) which includes production training and written exercises (phoneme-grapheme coupling). The auditory perception and articulation intervention are provided by supervised speech-language therapy students from the Department of Speech-Language Pathology and Audiology at the University of Pretoria.
- The auditory perception and articulatory skills of the participants will be re-evaluated after a certain period of intervention to determine whether these skills concerning English improved after intervention. The auditory perception skills of the participants will be re-assessed by using the TAPS-3 (Test of Auditory-Perceptual Skills Third Edition). The articulatory skills of the participants will be re-evaluated by analysis of voice recordings made of participants reading the same word list.
- Participants will re-write a standardised spelling test.
- Participants' reading skills will be re-assessed by a standardised test.

Risks and discomfort

There are no risks or discomfort involved in the study.

Benefits

The participants' English auditory perception and articulatory skills should improve in such a manner that it should improve their English academic proficiency.

The Participant's rights

- The participants will be free to withdraw their consent or terminate their participation at any time during the study without incurring any penalties or negative consequences. The child is also free to indicate his willingness to participate. This will be done by showing him two pictures, one with a 'happy' face, the other with a 'sad' face. When he no longer wants to participate, he can point to the sad face and the session will be terminated.
- All information used will be treated as confidential and no names and any other identifying information will be revealed. The data collected during the study will be accessible to the researchers and involved supervisors. According to the University's policy, all data will be stored in the archives of the University of Pretoria for a period of 15 years for future research purposes.

The participants are free to contact the researchers and/or supervisors at any time if any doubts or enquiries might arise. The research results will finally be published as a research report and be accessible in the library at the University of Pretoria. We can be contacted at the following numbers for further information: Cell: 0835661065 (Mia le Roux) or E-mail: mia.leroux@up.ac.za or danie.prinsloo@up.ac.za.

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux

(Researcher)



Prof. D. J. Prinsloo (Promoter)



Prof. D. J. Prinsloo (Head: Department of African Languages)

Letter of consent: (Group 2)

Parents/Guardians:

Hereby we,, as parents/guardians of
..... give consent for our childto
participate in this study. We understand what is expected from our child and will
comply with the requirements.

Signed at _____ on the _____ day of
_____ 201_.

Signature



Control Group:

Faculty of Humanities
Department of Speech-Language
Pathology and Audiology

Dear Parent

I am a doctoral student in the Department of African Languages at the University of Pretoria and a lecturer in the Department of Speech-Language Pathology and Audiology at the same University. The title of my study is: *An acoustic investigation of English vowels as produced by English L1 and Setswana L1 foundation phase learners*. I would like to ask your child to participate as part of the **Control group** (Group 3) for this study. A group of participants (Group 1) - English L1 speakers - will be selected from another school. Another group of participants will be selected from the same class as your child. This group will also be Setswana first language speakers (Group 2). The auditory perception of the participants in all three groups will be tested. Participants from all three groups will be recorded while reading an English word list. The recordings will be analysed. The data gathered from the recordings of the different groups will be compared. The participants in Group 2 will receive intervention from speech-language therapy students from the Department of Speech-Language Pathology and Audiology at the University of Pretoria. After a certain period of intervention, new recordings will be made of all the groups. The data from Group 2 (who received intervention) will be measured against the data gathered from the control group who (initially) did not receive intervention.

The main aim of this study is to do an acoustic phonetic investigation into the difference in vowel space occupied by the English vowels as produced by English first language and English second language (Setswana first language speaking) foundation phase learners. By comparing the vowel space pre- and post-intervention of English second language learners, one can determine whether additional input - for the purpose of my study the input will be in the form of intervention - will improve the auditory perception and articulation skills of English second language (Setswana first language speaking) foundation phase learners in the English Language of Learning and Teaching (LoLT) classroom. The experimental group will receive

auditory perception and articulation training (grapheme-phoneme coupling and vowel discrimination) which includes production training and written exercises (phoneme-grapheme coupling). Should the results of the study indicate that learners do benefit from the intervention, your child, as part of the control group, may also receive the intervention, should you request it.

Procedures (Control group):

- Parents and participants will receive consent letters. (Please complete on last page of this letter)
- Early in the new school year the auditory perception of the selected participants will be assessed by means of a non-invasive language test, viz. the TAPS-3 (Test of Auditory-Perceptual Skills Third Edition). This will be done by supervised speech-language therapy students of the Department of Speech-Language Pathology and Audiology at the University of Pretoria, at school, during school hours.
- Participants will write a standardised spelling test.
- At the same time, the English articulatory skills of the control group participants will be determined and evaluated by analysing voice recordings. The participants will be asked to read a word list three times (on different days in the same week). Learners will be requested to read the word list again later in the year.
- Probes will be done on a monthly basis to determine whether progress takes place.
- Participants' reading skills will be assessed by a standardised test.
- Later in the year, the auditory perception of the participants will be re-assessed by using the TAPS-3 (Test of Auditory-Perceptual Skills Third Edition). The articulatory skills of these participants will be re-evaluated by analysis of voice recordings made of the participants reading the same word list. The results will be compared with that of Group 2, who received intervention.

- Participants will again write a standardised spelling test.
- Participants' reading skills will be re-assessed by a standardised test.

Risks and discomfort

There are no risks or discomfort involved in the study.

Benefits

The general population of learners stand to benefit from the enhanced input at completion of this research project. Learners in the control group may be able to benefit from the enhanced protocol at completion of this study. Should the results of this study indicate that English second language learners do benefit from the intervention, your child, as part of the control group, may also receive the intervention, should you request it.

The Participant's rights

- The participants will be free to withdraw their consent or terminate their participation at any time during the study without incurring any penalties or negative consequences. The participant is also free to indicate his willingness to participate. This will be done by showing him two pictures, one with a 'happy' face, the other with a 'sad' face. When he no longer wants to participate, he can point to the sad face and the session will be terminated.
- All information used will be treated as confidential and no names and any other identifying information will be revealed. The data collected during the study will be accessible to the researchers and involved supervisors. According to the University's policy, all data will be stored in the archives of the University of Pretoria for a period of 15 years for future research purposes.

The participants are free to contact the researchers and/or supervisors at any time if any doubts or enquiries might arise. The research results will finally be published as a research report and be accessible in the library at the University of Pretoria. We can be contacted at the following numbers for further information: Cell: 0835661065 (Mia le Roux) or E-mail: mia.leroux@up.ac.za or danie.prinsloo@up.ac.za.

Your participation will be greatly appreciated.

Yours sincerely



Mia le Roux

(Researcher)



Prof. D. J. Prinsloo

(Promoter)



Prof. D. J. Prinsloo

(Head: Department of African Languages)

Letter of consent: (Group 3)

Parents/Guardians:

Hereby we,as parents/guardians of
..... give consent for our child to participate in this study.
We understand what is expected from our child and will comply with the
requirements.

Signed at _____ on the _____day of
_____ 201_.

Signature

A8: Letter of consent to participants



Faculty of Humanities
Department of Speech-Language
Pathology and Audiology

Dear _____

I am Mia le Roux. You are going to do some reading and spelling activities and play fun games, for 45 minutes every week, with some of my students. We will ask you to read a list of words which we will record. If you do not enjoy it, you do not have to do it anymore. You can show us the face-cards when you enjoy it or when you do not want to play anymore. At the end of the year, we will ask you to read the list of words again while we record you. You will also write a spelling test and do a reading test.

OPTION		MARK
1. Yes I want to play		
2. No, I do not want to play		

Signature of learner

.....

Date



A9: Letters of research approval from schools



School 1:



Established 1981
Website: www.glenstantia.co.za
E-mail: glenstan@mweb.co.za

Glenstantia Primary School

Anton van Wouw Street
Constantia Park
P O Box 33383
Glenstantia 0010
Tel: (012) 998-6116/7193
Fax: (012) 998-7252

14 November 2013

Ms Mia le Roux
Department of Speech-Language Pathology & Audiology
University of Pretoria

Dear Ms le Roux

RESEARCH STUDY: AN ACOUSTIC INVESTIGATION OF ENGLISH VOWELS AS PRODUCED BY ENGLISH L1 AND SETSWANA L1 FOUNDATION PHASE LEARNERS

Thank you for your request to include Glenstantia Primary School in the above study. The School Management Team of Glenstantia Primary School has given their approval and your request will now be submitted to the School Governing Body for approval.

We understand what is expected from the learners and will comply with the requirements.

H P J Pretorius
PRINCIPAL



Established 1981
Website: www.glenstantia.co.za
E-mail: glenstan@mweb.co.za

Glenstantia Primary School

Anton van Wouw Street
Constantia Park
P O Box 33383
Glenstantia 0010
Tel: (012) 998-6116/7193
Fax: (012) 998-7252

25 February 2014

Ms Mia le Roux
Department of Speech-Language Pathology & Audiology
University of Pretoria

Dear Ms le Roux

**RESEARCH STUDY: AN ACOUSTIC INVESTIGATION OF ENGLISH VOWELS AS PRODUCED BY ENGLISH
L1 AND SETSWANA L1 FOUNDATION PHASE LEARNERS**

Your request to conduct research at Glenstantia Primary School was discussed at the School Governing Body Meeting held on 24 February 2014. The School Governing Body hereby gives consent for learners of this school to participate in this study.

We understand what is expected from the learners and will comply with the requirements.

M I Qwelane
CHAIRMAN
SCHOOL GOVERNING BODY



School 2:




LAERSKOOL LINDOPARK PRIMARY

24 Carnation Street
Lindopark, Pretoria, 0186
Tel : 012 800 1608 / 4785
Fax : 012 800 4785 / 086 580 2899 / 086 508 4655

Posbus / PO Box 15402
Lynn East, 0039
E-pos / E-mail:
lindiesprimary@gmail.com

Hereby I, J.J. van Keenen, as principal of Lindopark Primary School,
give consent for learners of this school to participate in this study. I understand what
is expected from the learners and will comply with the requirements.

Signed at Pretoria on the 16 day of
January 2014


Signature





LAERSKOOL LINDOPARK PRIMARY

24 Camation Street
Lindopark, Pretoria, 0186
Tel : 012 800 1608 / 4785
Fax : 012 800 4785 / 086 580 2899 / 086 508 4655

Posbus / PO Box 15402
Lynn East, 0039
E-pos / E-mail:
lindiesprimary@gmail.com

Hereby I, S. Shawe, as chairperson of the School Governing Body (SGB), give consent for learners of this school to participate in this study. I understand what is expected from the learners and will encourage all involved with the research project to comply with the requirements.

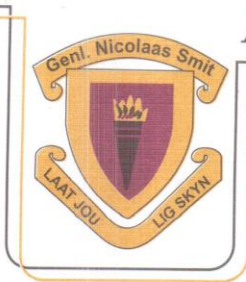
Signed at Pta on the 16 day of January 2014

pp. [Signature]
Signature





School 3:



Laerskool Generaal Nicolaas Smit

H.v/Cnr. Bremer & Pretoria St/Str 945, Claremont, Pretoria, Tshwane, Gauteng
Pösbüs / PO Box 48746, Hercules 0030
Tel: (012) 377-0389 / 379-2232, Faks: 377-2442
Verwysingsnr./Reference No: GDO/GDE: 915025 (230888)
Email: nicsmitlaer@mweb.co.za

January 2013

Mrs M le Roux

Hereby the school governing body and principal of Laerskool Generaal Nicolaas Smit give Mrs M le Roux (Department of Communication Pathology – University of Pretoria) and two students permission to include selected participants from amongst the learners of our school in a research study. We acknowledge the fact that the University of Pretoria and the Gauteng Department of Education gave permission for this study to be conducted.

We understand what is expected from the learners and will comply with the requirements.

Mr SC Sealie
Principal

Mr J Kruger
Chairperson SGB



Appendix B

Elicitation materials

**B1: Word list designed for recording and subsequent analysis purposes
(Original list, abandoned after Experimental and Control group participants struggled to read the words.)**

Short Monophthongs:

KIT: [ɪ]

it (initial)

hit (after /h/)

chick (before palato-alveolar)

DRESS: [e]

ten

bed

head

TRAP: [æ]

tan

bad

had

STRUT: [ʌ]

bus

but

bun

LOT: [ɒ]

hot

lot

stop



FOOT: [ʊ]

look

book

foot

Long Monophthongs:

FLEECE: [i:]

feet

beat

cheek

GOOSE: [u:]

food

goose

moon

NURSE: [ɜ:]

were

hurt

bird

THOUGHT: [ɔ:]

chalk

horse

talk

BATH: [ɑ:]

staff

class



ask

SQUARE: [ɛə]

care

hair

air

Diphthongs:

FACE: [eɪ]

play

face

stay

GOAT: [əʊ]

goat

soap

home

NEAR: [ɪə]

beer

here

dear

CURE: [ʊə]

sure

cure

poor

PRICE: [aɪ]

child

try

buy

CHOICE: [ɔɪ]

boy

toy

joy

MOUTH: [aʊ]

out

cow

how

WEAK VOWELS

lettER: [ə]

paper

sugar

letter

Minimal pairs

[ʌ] versus [ɑ:] and

[æ] versus [e]

must

sat

mast

set

duck

pack

dark peck

tusk pen

task pan

much bad

march bed

bun land

barn lend

[ɜ:] versus [e:] and [ɪ] versus [i:]

her sick

hair seek

heard lick

head leak

were chick

where cheek

burnt hip

bent heap

burst it

best eat



bird

hit

bed

heat

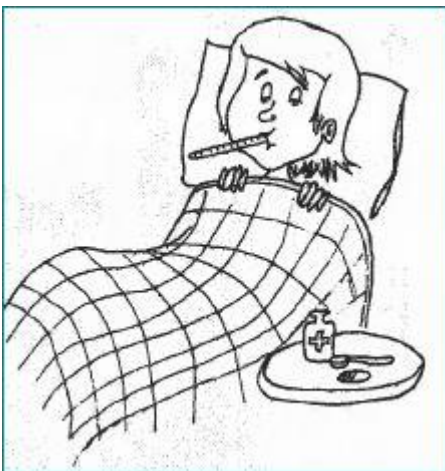
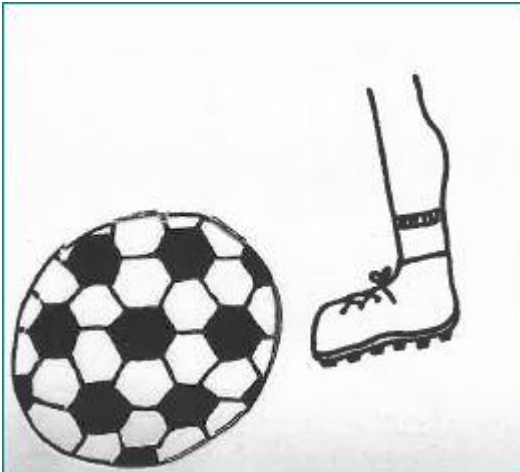
B2: Word list read by Norm group and elicited from Experimental and Control groups by means of picture cards

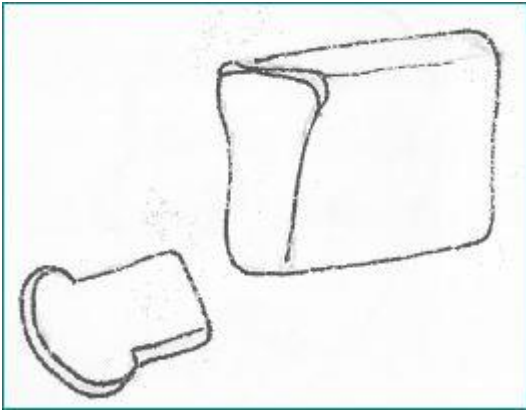
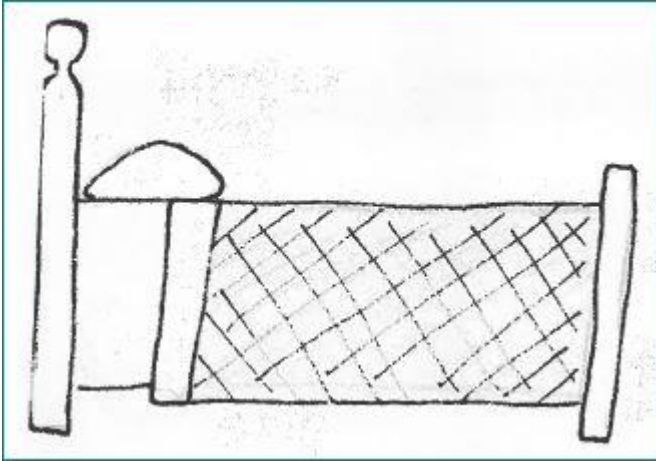
chick	bed	cat	bus	mop	book
kick	bread	fan	one	pot	foot
sick	ten	sad	sun	sock	hook
feet	shoe	bird	fork	bath	bear
sheep	blue	nurse	four	car	chair
teeth	spoon	shirt	horse	grass	square
case	bone	beer	cure	fly	boy
rain	ghost	ear	poor	knife	toy
space	soap	hear	sure	white	coin
brown	father				
cow	mother				
house	sister				

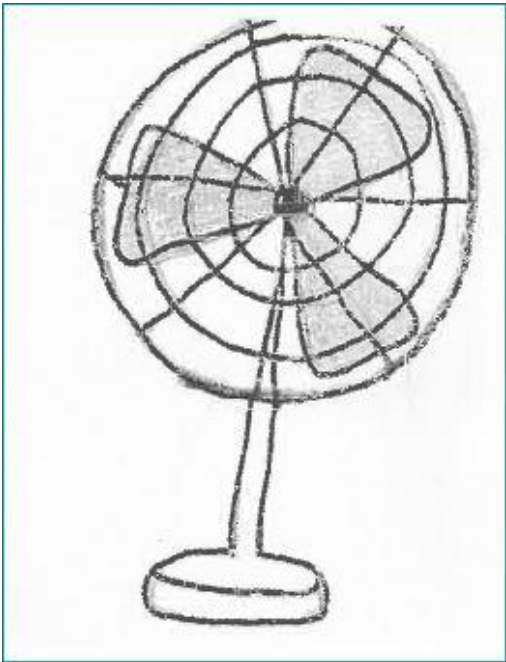
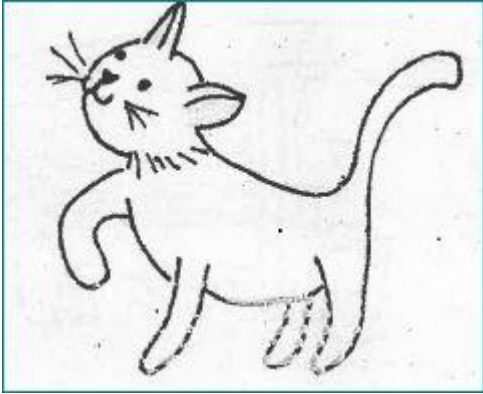
Minimal pairs:

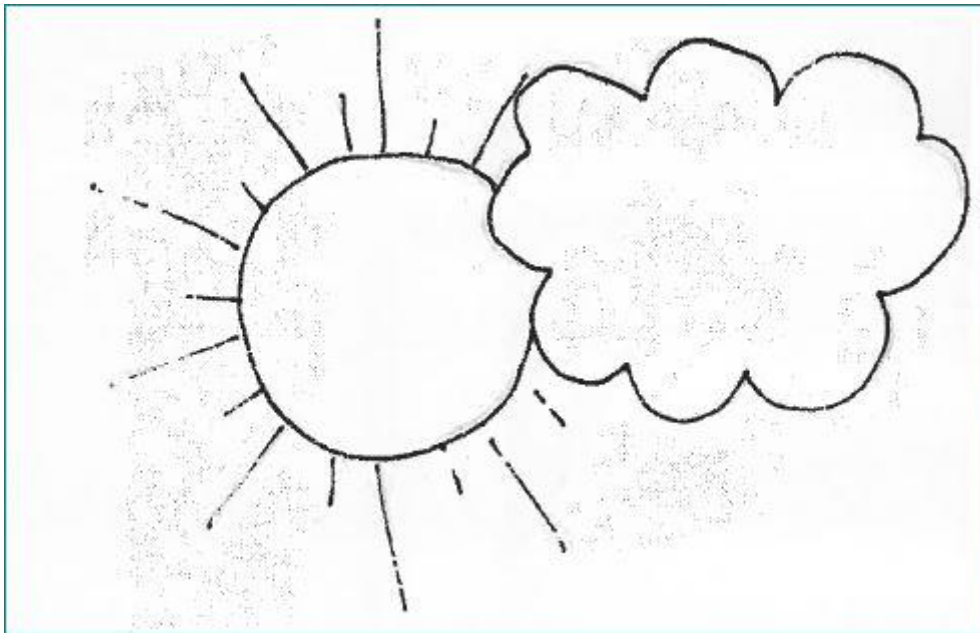
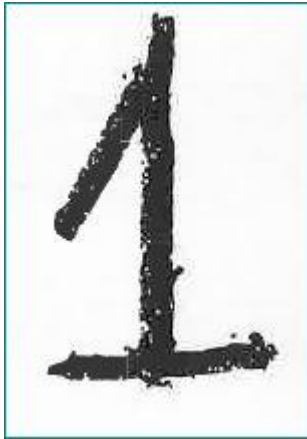
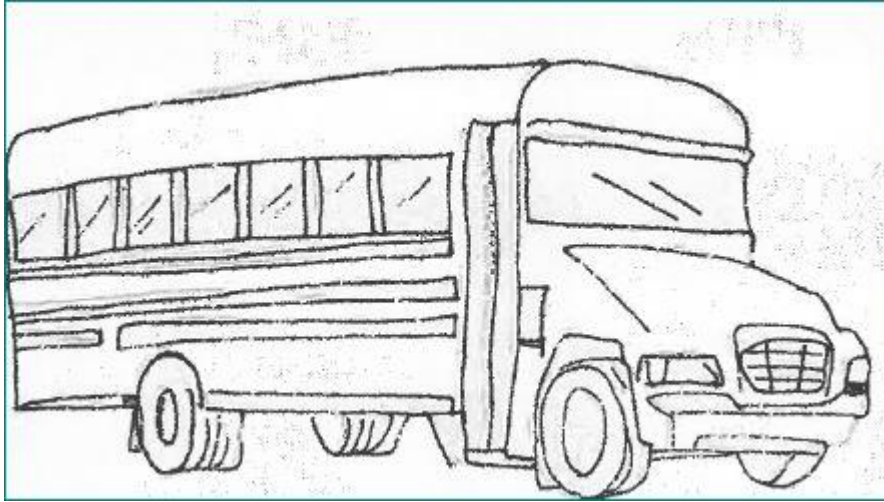
chick : cheek	duck : dark
sick : seek	bun : barn
bird : bed	man : men
heard : head	pan : pen

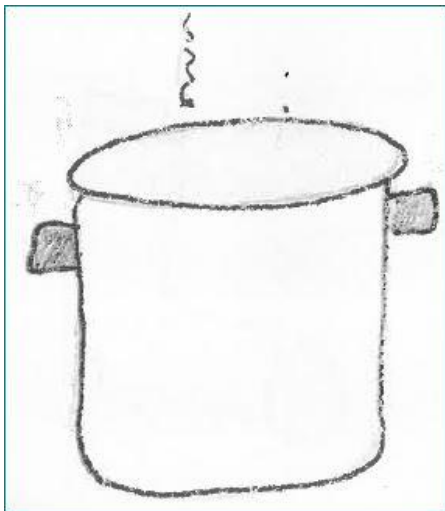
B3: Picture cards

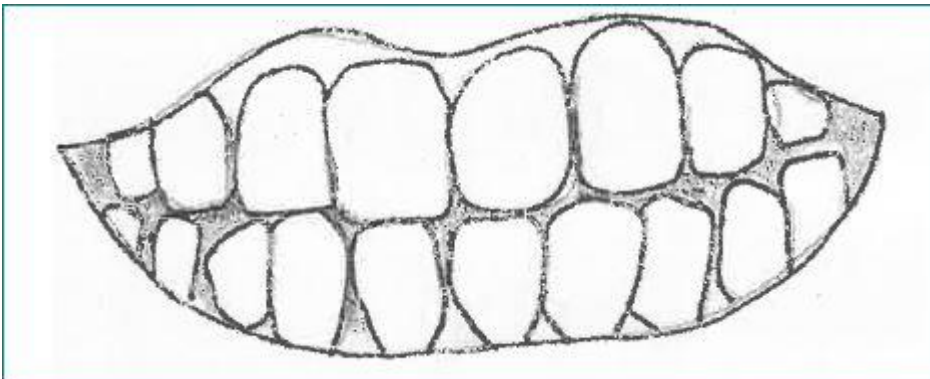
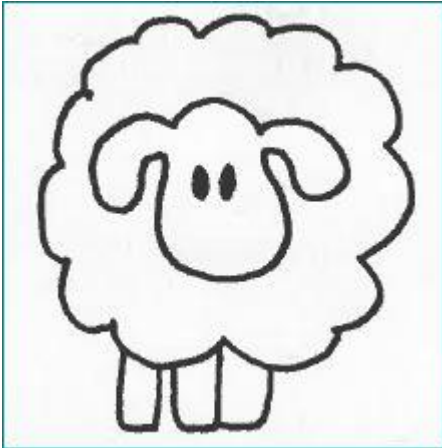
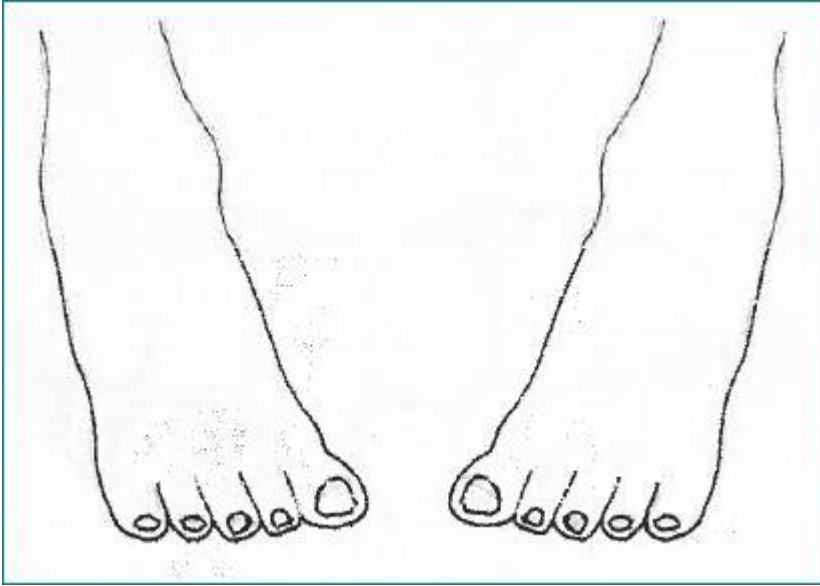


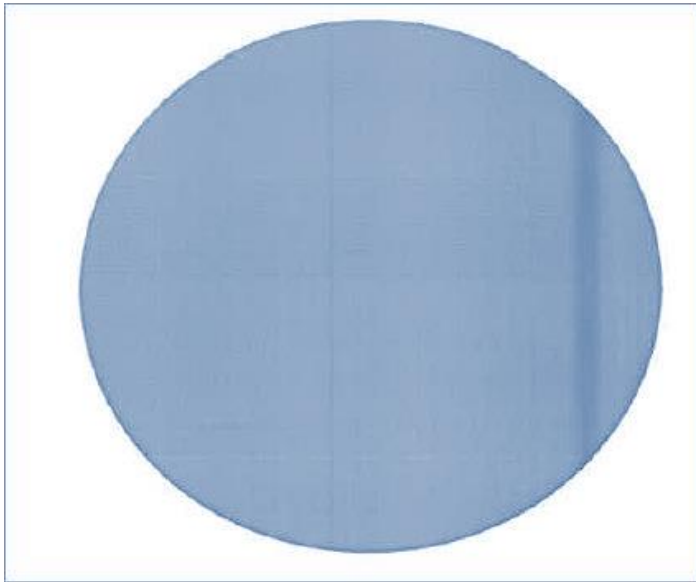
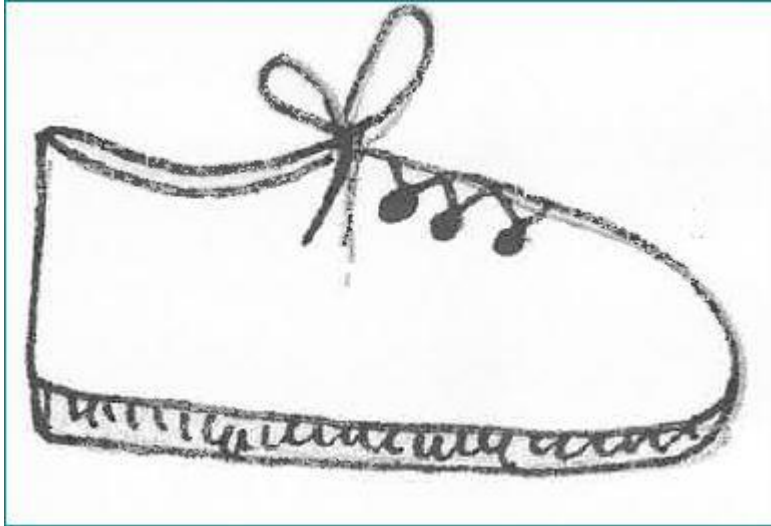


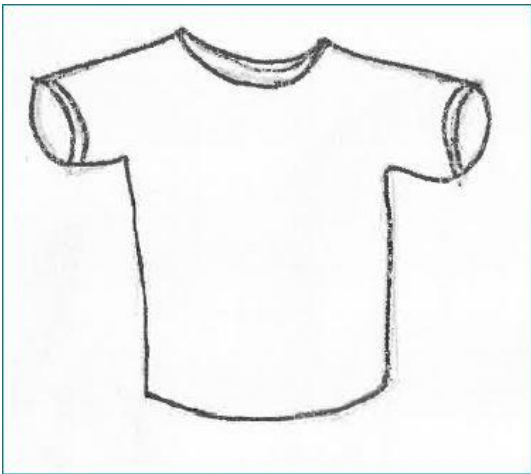
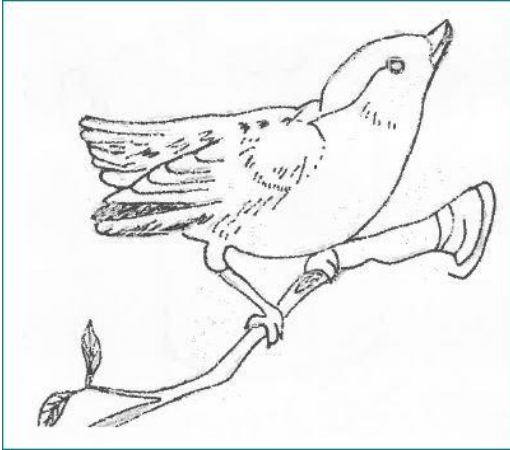


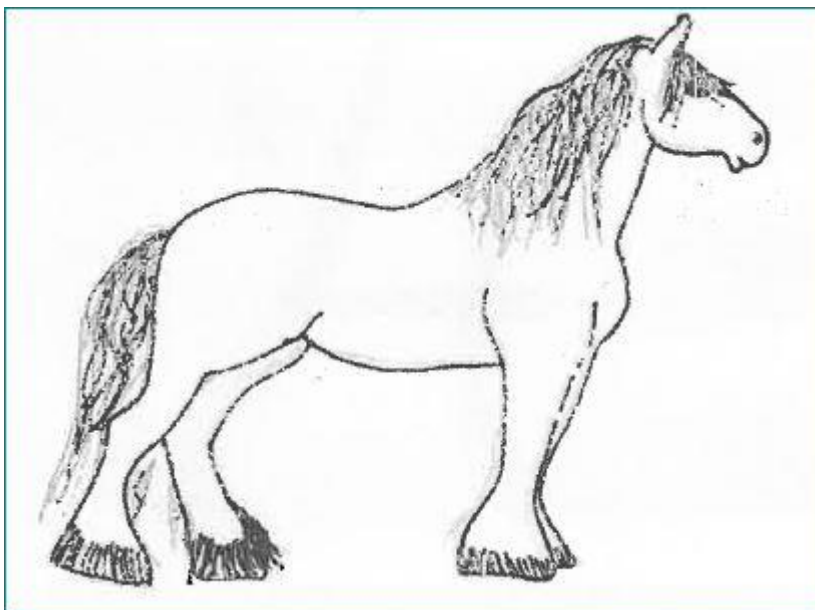
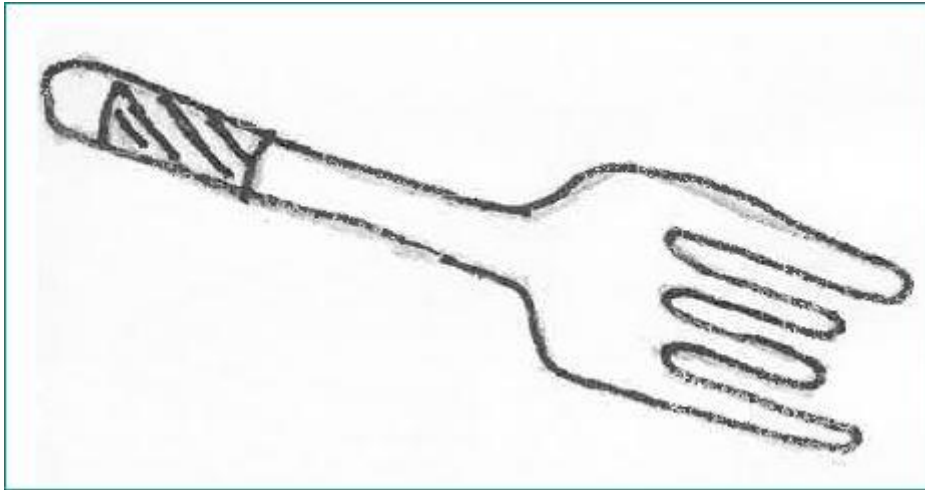


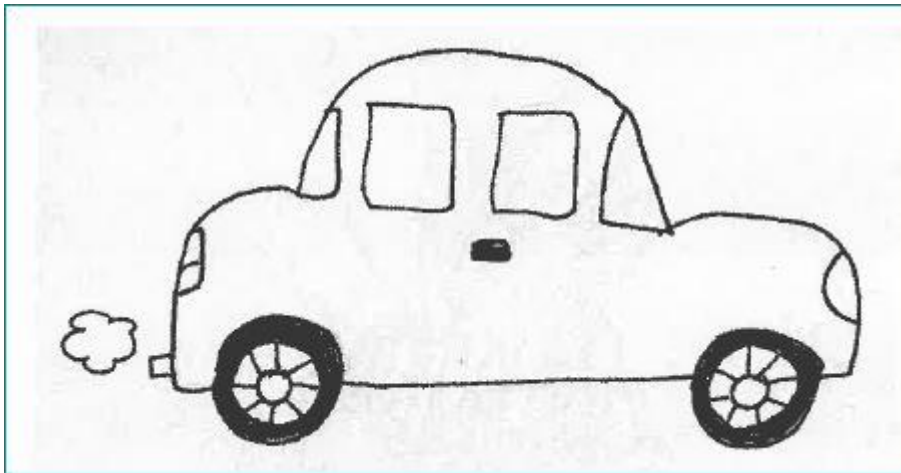
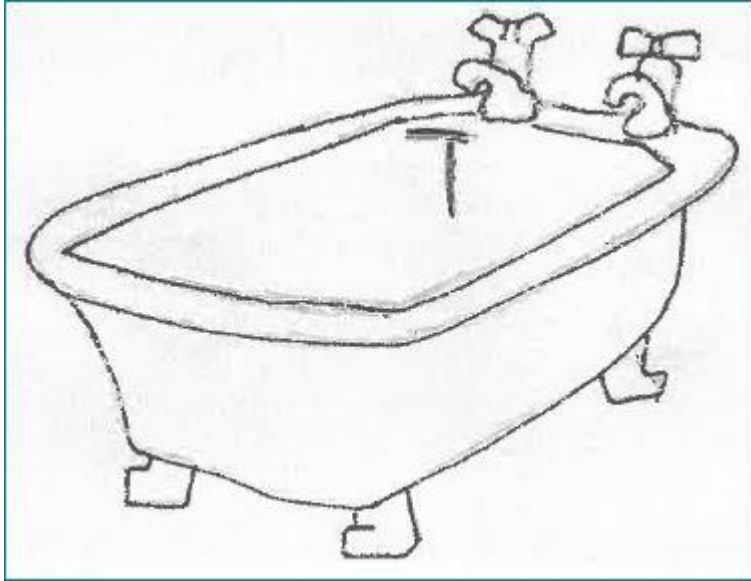


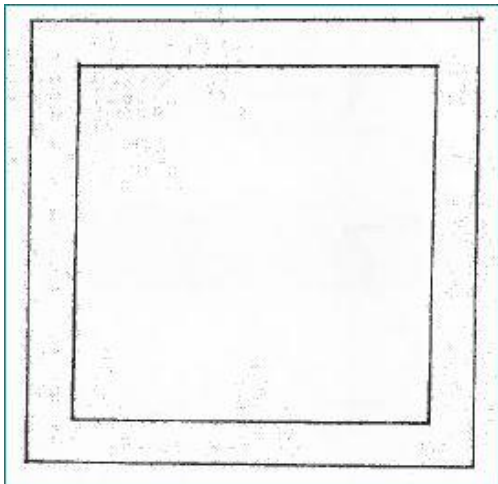
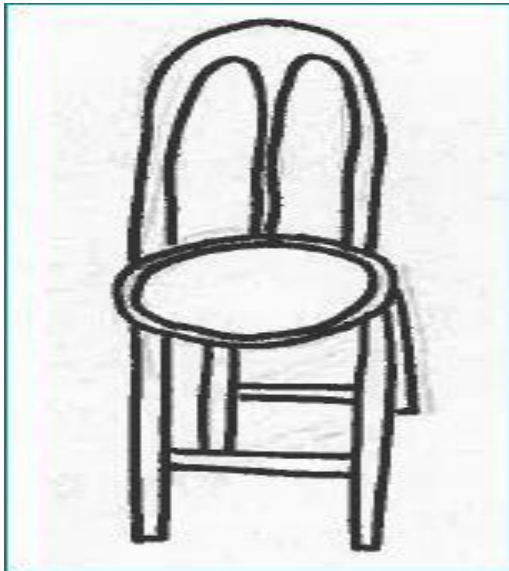


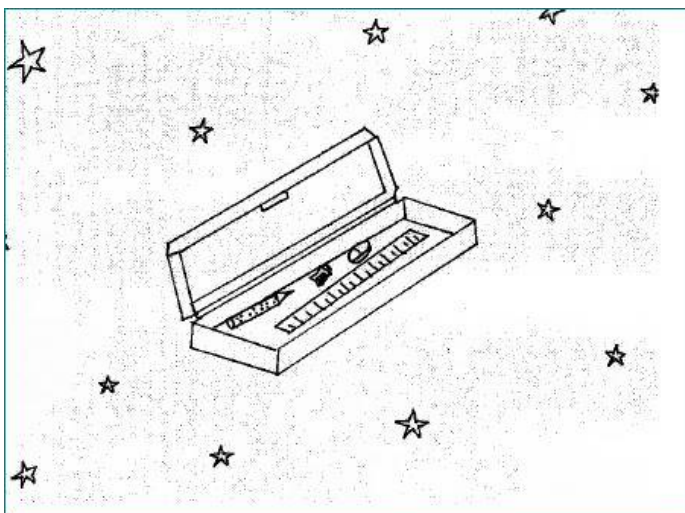
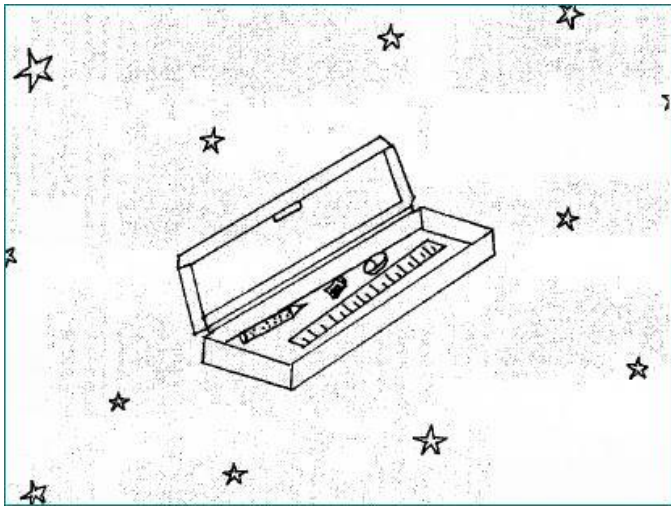


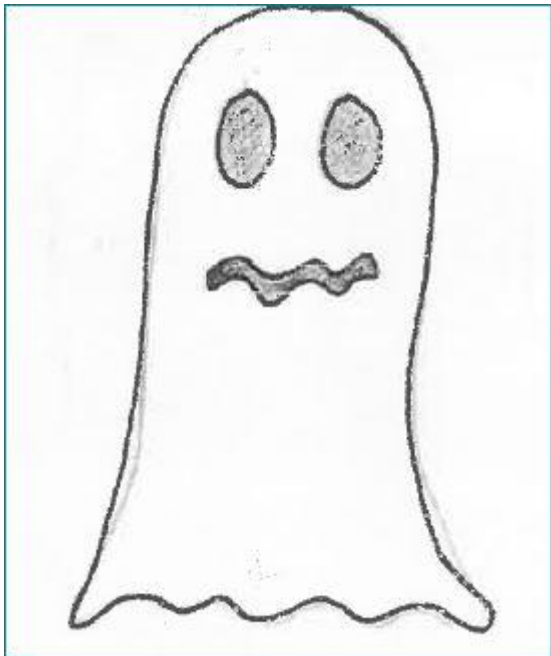
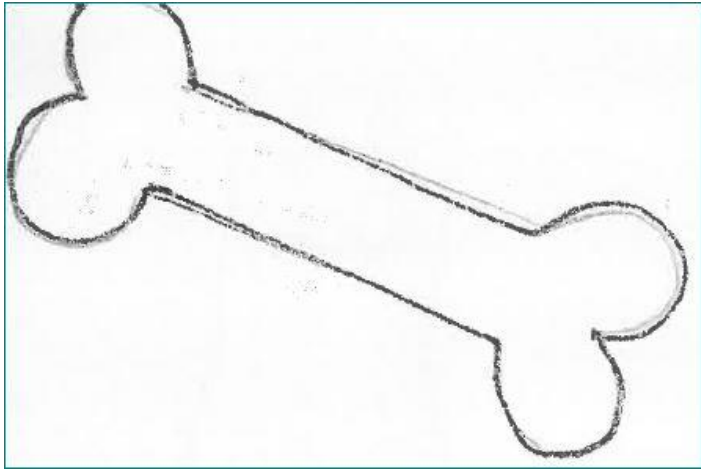


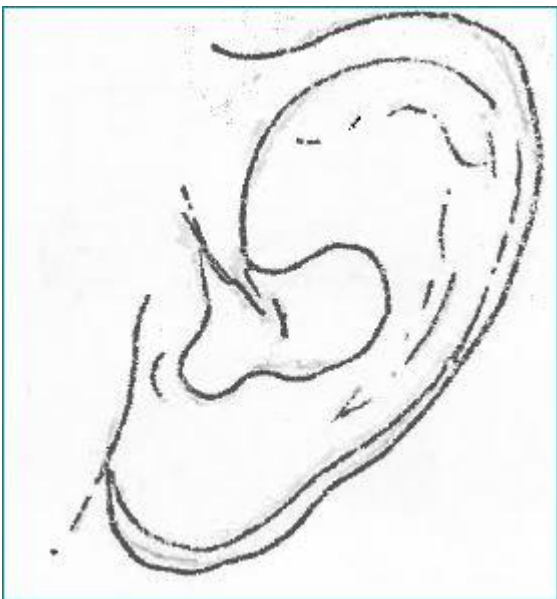
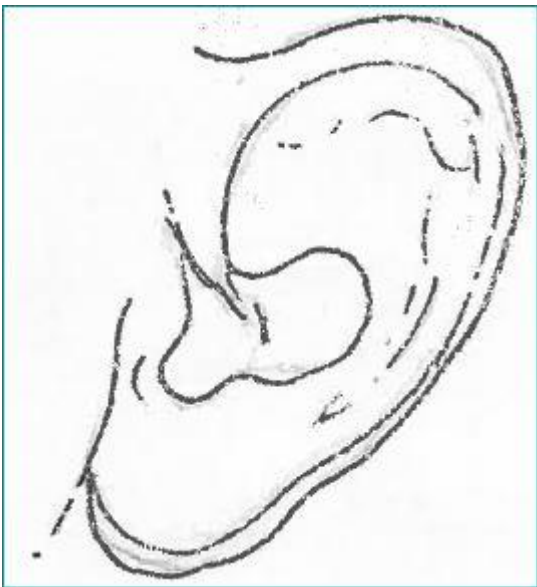
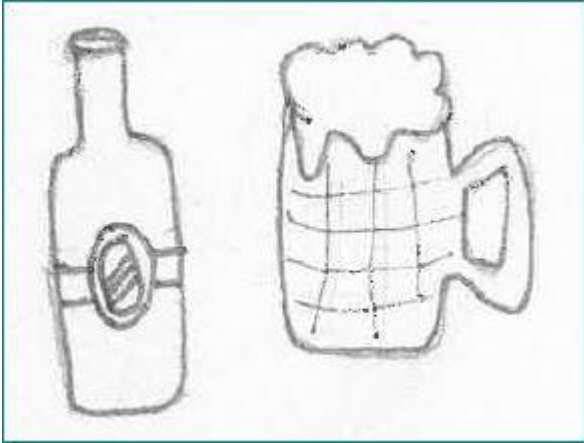


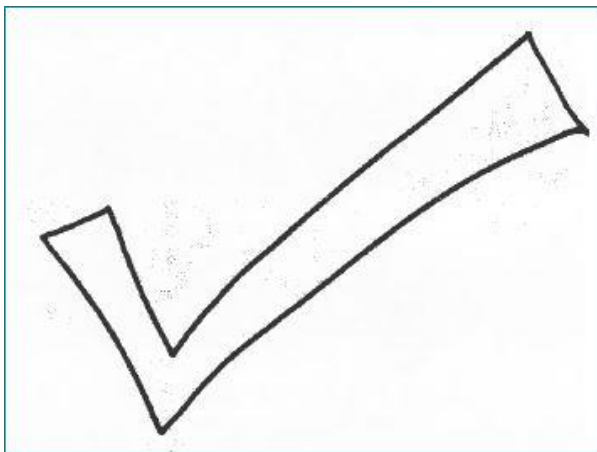


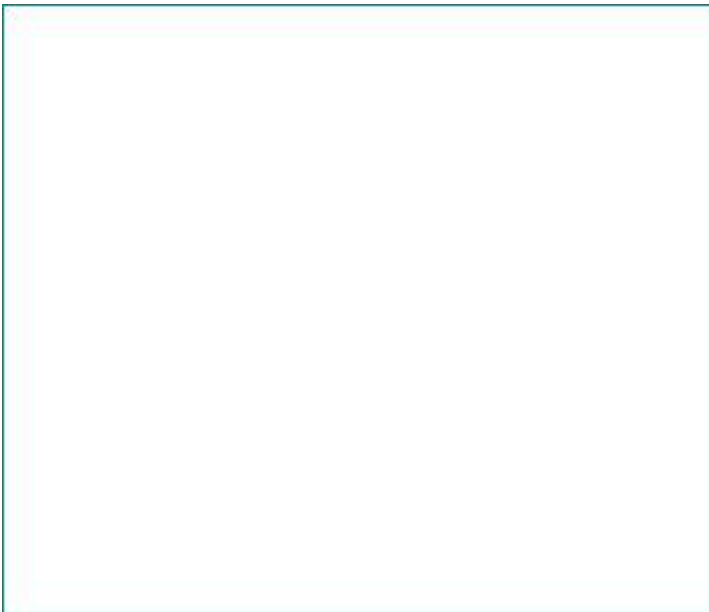
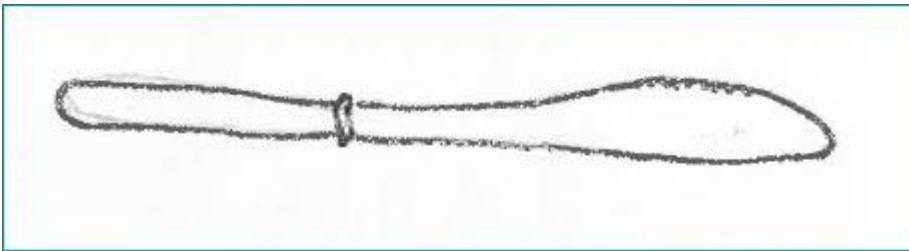
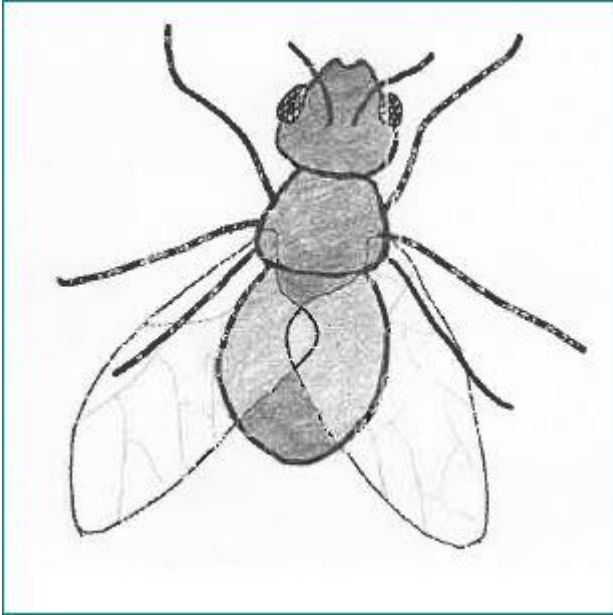


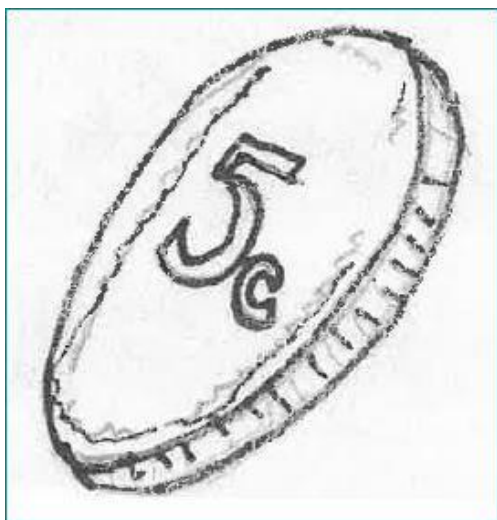


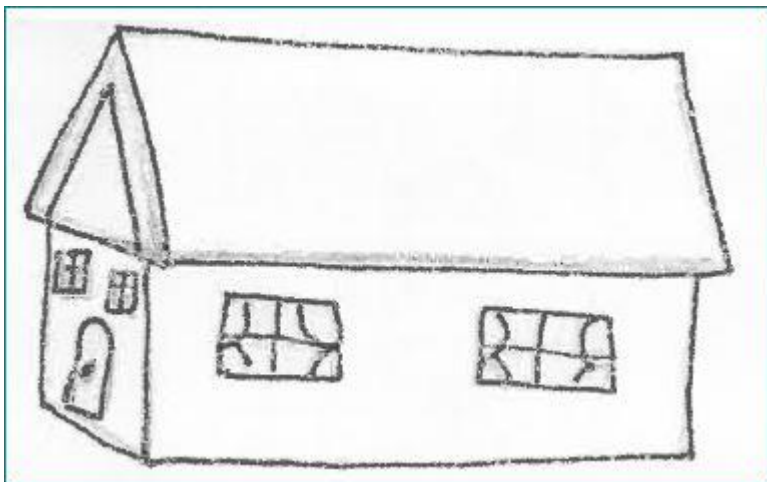
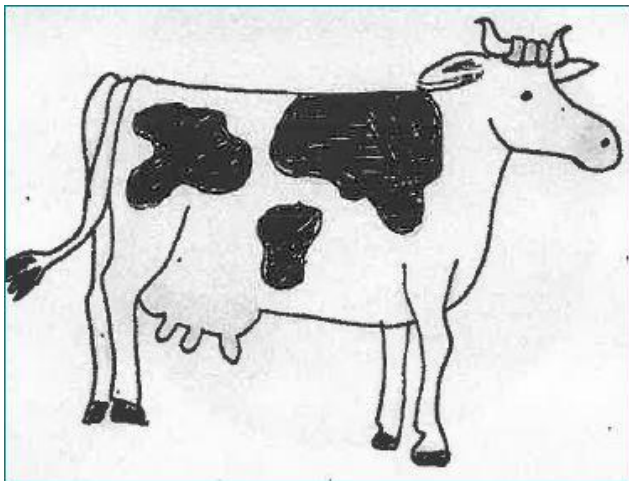
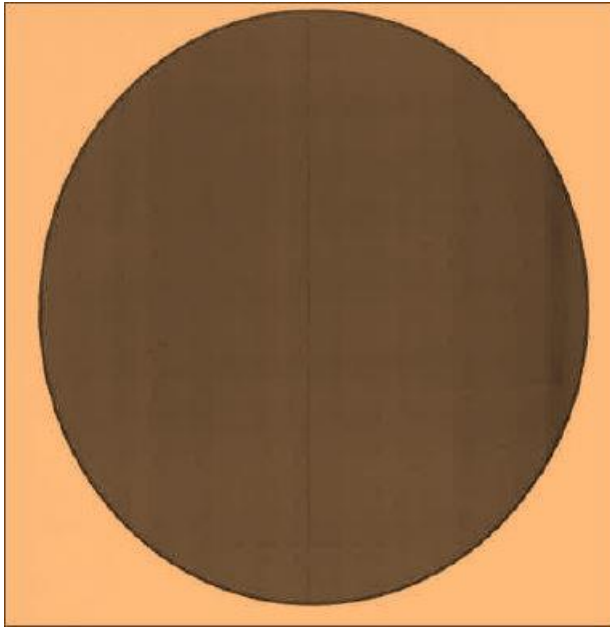




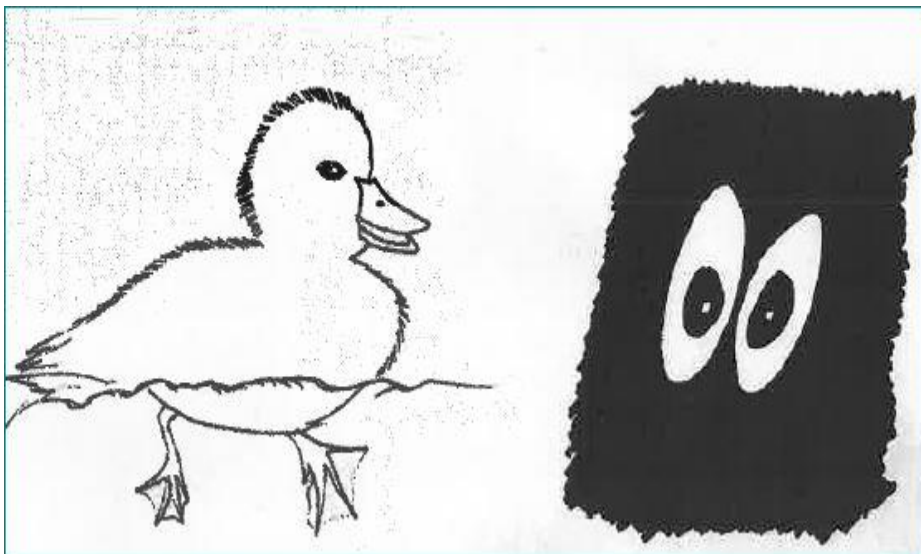
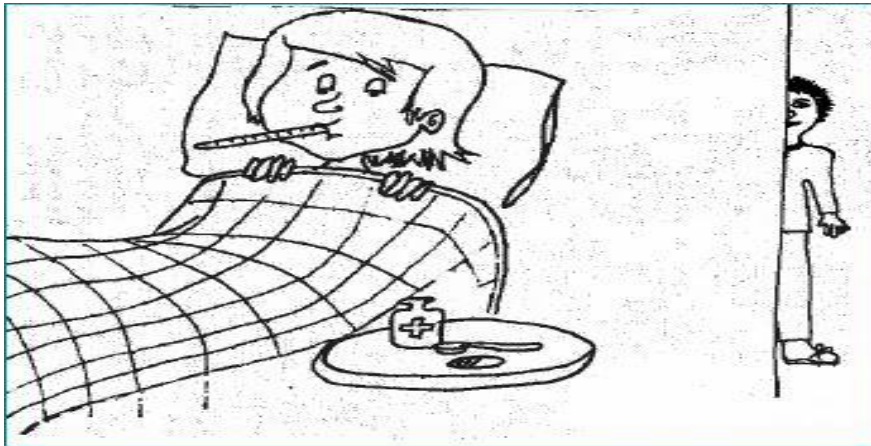
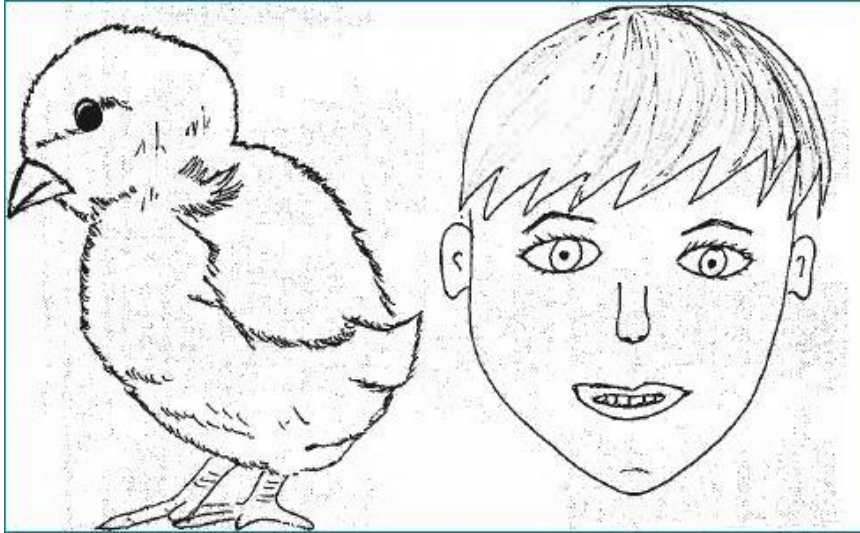


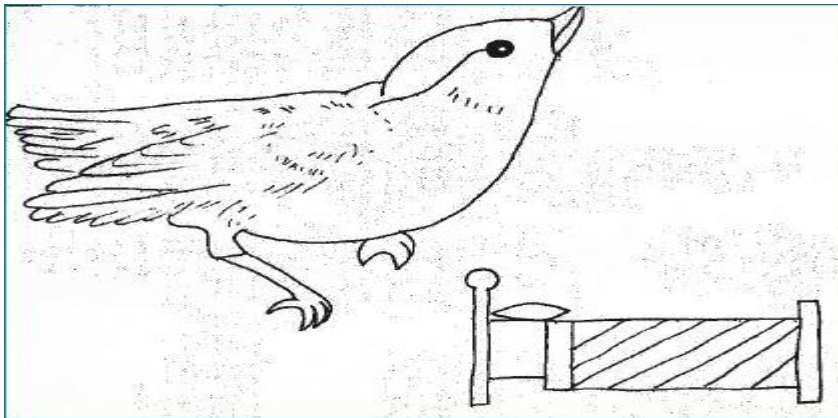
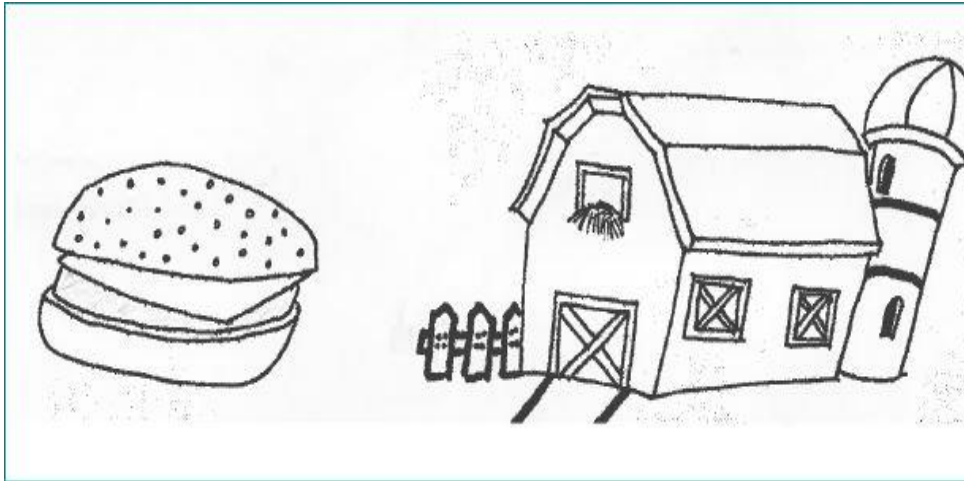


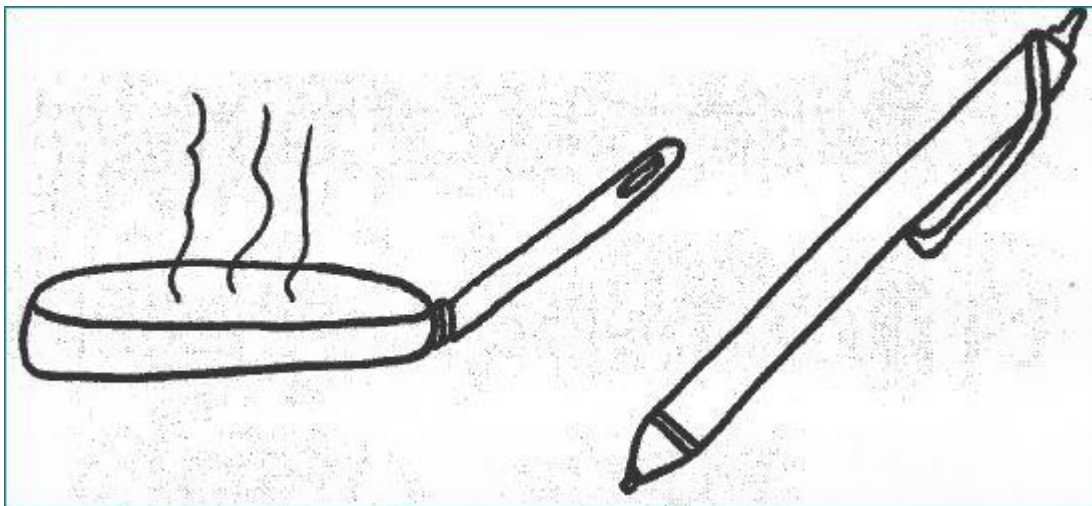
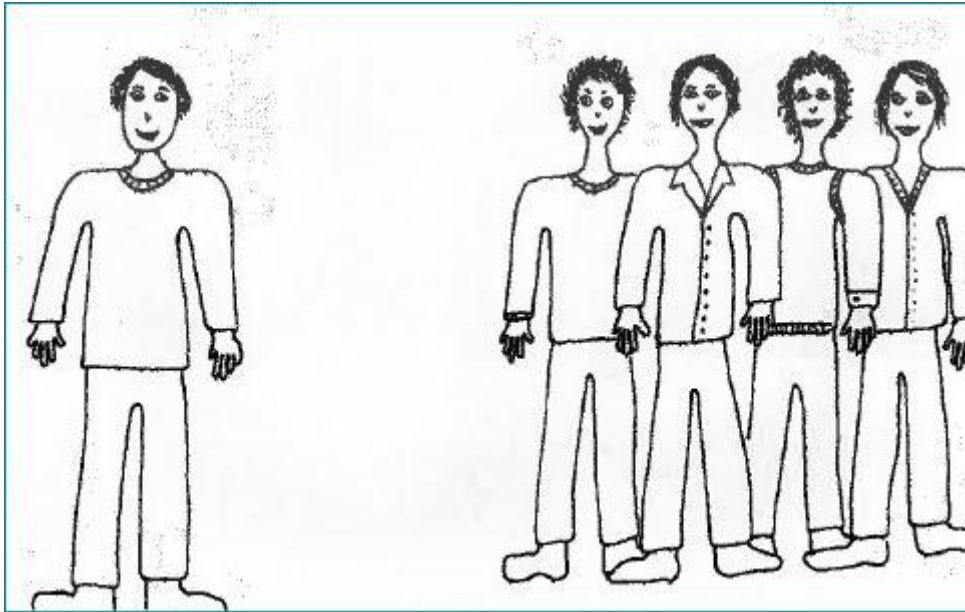












Appendix C

Intervention

C1: Intervention plan

Minutes	Category	Description	Instructions given
1 to 5	Introduction of sound and identification	<p><i>Introduction:</i> The vowel sound was introduced by a researcher. The participants were then encouraged to state words containing the sound.</p> <p><i>Identification:</i> The target vowel was produced in isolation by the researcher. An explanation of the movement and configuration of the oral structure – especially vertical and horizontal movement of the tongue - during production was provided.</p>	<p>Today's sound is (produce sound). When I say the sound, my tongue does this (describe sound in terms of vowel production dimensions). When we write the sound it looks like this (give all possible written representations of sound).</p>
6 to 12	Auditory discrimination	<p><i>Auditory Discrimination:</i> The researcher produced a series of ten vowel sounds, five of which were the target sound. The participants were expected to clap when they perceived the target sound. No real words were used for this task due to the limited availability of monosyllabic words containing the target vowel in English.</p>	<p>I want you to listen carefully. I am going to say 10 sounds. I want you to listen out for this sound (produce target sound). Whenever you hear it, I want you to clap your hands.</p>
13 to 19	Production training: Isolation	<p><i>Imitation:</i> The researcher produced the sound in isolation. Real-time Spectrum Vs 2.6 (Huckvale, 2013) was used as visual reinforcement of production as the wave produced by each vowel is different. The researcher would create a wave of the vowel sound in isolation, and then allow the participant to attempt one. Visual and auditory similarities were then discussed with the participant and where necessary, the participant would repeat the sound with modifications. Using visual reinforcement is an integral part of skill acquisition as it enables participants to focus on movement outcomes (the sound produced) as a result of behaviour of the oral structures. Production in isolation took place in the form of block practice; a high number of repetitions of the same exercise.</p>	<p>I am going to say a sound and I want you to listen carefully (produce sound). Now look at the computer. This is what my voice looks like when I say the sound. I am going to say it again, and then you can see what it looks like. I would like you to try and when you get it right, it will look like mine at the top. Now you try. (Participant attempts production. Therapist comments on horizontal and vertical modification of the tongue, labial</p>



			modification, and assists participant to modify the lingual and labial behaviour during the production of each vowel.)
20 to 27	Production training: nonsense syllables	Once the production in isolation has been mastered, the complexity of the phonetic environment is increased to nonsense syllables. Two-syllable CVCV nonsense words were used. They contained either one or both of the target sounds of the session. Ten of these nonsense syllable words were used in each session.	Now we are going to play a game. I am going to say some words, but they don't mean anything. I want you to use the sounds we worked on today and copy me as best you can. (Use nonsense words produced by the Speech Motor Learning (SML) Programme (Van der Merwe, 2011), make use of modelling to correct where needed and positive verbal reinforcement for correct productions. (Participant attempts production. Therapist comments on height and horizontal modification of the tongue, as well as labial modification, and assists participant to modify the lingual behaviour during the production of each vowel.)
28 to 35	Phoneme-grapheme coupling: Reading	<i>Reading:</i> Ten flashcards printed in Junior font were used for each vowel sound. Where possible, all possible orthographic configurations were represented. Where ten appropriate words were not available, only five words were used. The participant was asked to read the word, breaking it into its constituent sounds when they	I am going to show you 10 flash cards, one at a time. I would like to you try and read the word before you hear this sound (ring bell). When the bell goes, I will tell you what the



	<p>struggled. The researcher would guide the productions and draw the participant's attention to the auditory feedback of the word once it is read. This was repeated until all ten words could be read.</p>	<p>word is and then we will go on to the next word.</p>
<p>36 to 45 Phoneme-grapheme coupling: Spelling</p>	<p><i>Spelling:</i> A list of ten words containing all possible orthographic representations of the target sounds was used. When two vowels were presented in one session, a vertical line was ruled down the centre of the page being used in the workbook. Each side was designated for a specific vowel sound. The various orthographic representations were written in the workbook prior to the session. The researcher read a word, providing it in isolation and within a sentence. The participants had to identify the target sound and the side it belonged on. The participants were then asked to identify the individual sounds within the word and the orthography of the sounds. The researcher guided participants with questions such as, "Do you think that is the right way to write that sound?" when the spelling was incorrect.</p>	<p>Over here I have some cards with the different ways we can write it when a sound sounds like this (produce target sound). I am going to say a word and I want you to tell me on which side of the page it goes. Then we will decide what sounds belong in that word and write it together.</p>

C2: Words used during intervention

[ɪ]	[ʌ]	[æ]	[e]	[ɒ]	[aɪ]	[aʊ]	[ʊə]	[i:]	[o:]
Reading									
chill	honey	mat	egg	knot	tie	allow	purely	sheet	stalk
miss	luck	man	neck	fox	dry	bowed	mural	me	storm
bill	lull	bat	said	slot	light	owl	assure	believe	torn
bin	rub	map	cleanse	knob	flight	foul	tourist	cheese	oar
tin	trust	cat	mending	gone	like	crown	neural	donkey	autumn
fin	fuss	pan	yes	hop	blind	now		wheat	board
list	swan	sad	dressing	stop	height	loud		athlete	yawn
limb	won	can	hem	job	child	doubt		receive	door
fit	flood	fat	spend	wad	rhyme	mouse		feed	ball
knit	son	hat	spread	swan	shining	plough		knead	fought
Spelling									
bit	thud	hand	step	hot	guy	how	tour	clean	draw
win	must	chat	deck	odd	spike	clown	pure	speed	straw
spin	scrub	ran	messing	scoff	mild	shout	fury	treat	walk
fist	suck	brand	lead	what	fight	cloud	rural	fleet	wall
pill	pun	spank	again	shot	tight	down	curious	she	pork
kiss	stun	sack	friend	rob	lie	out		key	form
spit	truck	flap	press	frog	shy	round		thief	floor
chin	dull	ant	bending	knock	style	howling		these	roared
din	ton	pants	speck	shock	mining	crowd		freeze	naughty
Jill	blood	tanning	when	prop	quite	bough		ceiling	your



[ɪə]	[ɔɪ]	[ɜ:]	[ɑ:]	[ɛ:]	[eɪ]	[əʊ]	[ʊ]	[ə]	[u:]
Reading									
pierce	soy	worse	alarm	dare	paint	dome	full	ago	boot
spear	Troy	her	cart	fair	taste	toad	cushion	tower	pool
clear	cloy	pearl	army	stare	cake	load	pulpit	banana	loose
rear	oil	fur	art	compare	play	explode	wool	umbrella	use
disappear	soiled	work	lather	beware	day	comb	hoof	motor	mousse
we're	loyal	turn	glass	where	baby	clone	soot	shoulder	cute
steer	destroy	jersey	lark	lair	great	grown	brook	computer	bruise
appear	employ	search	far	tear	they	show	rook	booster	doom
peer	turquoise	permanent	prance	bare	reign	roam	cook	mister	rule
sphere	foil	stir	hard	wear	pain	throne	should	lower	school
Spelling									
tear	coil	first	task	their	lady	soak	put	the	fool
gear	ploy	burn	after	rare	haste	hope	pull	teacher	you
smear	soil	stern	rather	flared	grey	don't	push	under	room
near	annoy	burp	chance	prepare	mainly	stone	soot	user	root
jeer	spoiled	worm	park	unfair	name	blow	nook	super	June
mere	foiled	learn	tart	where	steak	drove	shook	winner	boost
sheer	Roy	dirty	party	stairs	chain	poke	took	shower	crew
cheer	decoy	curl	are	dared	say	loan	would	kitten	group
sear	royal	earn	card	mare	weight	moan	could	around	juice
clearing	recoil	term	star	nightmare	train	thrown	mush	slower	cue



C3: Words used for practice

Spelling			
bark	coy	led/lead	shot
bike	cue	lid	soak
bit	draw	map	sound
blood	eight	more	soup
cheer	fear	mud	star
church	first	need	their/there
clean	from	phone	took
clown	gem	plural	tour
coil	guy	power	train
could	hand	share	under

Reading			
ago	hard	pair	spade
clock	hat	pier	spend
come	heater	plough	sphere
crook	her	pool	stew
dance	loaf	pour	thank
dream	lure	reign	tin
feed	mouse	rhyme	tread
fought	neural	show	wear
fox	night	son	wit
full	noise	soy	word

Appendix D

UNIVERSITY OF PRETORIA
FACULTY OF HUMANITIES
RESEARCH PROPOSAL & ETHICS COMMITTEE

DECLARATION

Full name: Maria le Roux

Student Number: 04433565

Degree/Qualification: DPhil Linguistics

Title of thesis/dissertation/mini-dissertation:

An acoustic investigation of English vowels as produced by English L1
and Setswana L1 foundation phase learners

I declare that this thesis / dissertation / mini-dissertation is my own original work. Where secondary material is used, this has been carefully acknowledged and referenced in accordance with university requirements.

I understand what plagiarism is and am aware of university policy and implications in this regard.


SIGNATURE

4-05-2016
DATE

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