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LIST OF ABBREVIATIONS

AP	Auditory Processing
AL	Additional Language
ANAs	Annual National Assessments
CPH	Central Processing Hypothesis
DoE	Department of Education
L1	First Language
L2	Second Language
LIH	Linguistic Interdependence Hypothesis
LiEP	Language in Education Policy
LoLT	Language of Learning and Teaching
LTH	Linguistic Threshold Hypothesis
MT	Mother Tongue
NRS	National Reading Strategy
NS	Northern Sotho
PA	Phonological Awareness
PGST	Psycholinguistic Grain Size Theory
PIRLS	Progress in International Reading Literacy Study
PP	Phonological Processing
PWM	Phonological Working Memory
RAN	Rapid Automatised Naming
RD	Reading Development
RF	Reading Fluency
RSA	Republic of South Africa
SA	Syllable Awareness
SP	Speech Perception
SDH	Script Dependent Hypothesis
SACMEQ	Southern and East African Consortium for Monitoring Educational Quality
WR	Word Recognition

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CHAPTER 1
INTRODUCTION

Literacy development in the Republic of South Africa (RSA) is at a lower level than in many other countries (Prinsloo and Heugh 2013, 1; O'Carroll and Hickman 2012, 3). The reasons for this are complex and rooted in various linguistic, sociocultural, socioeconomic and cognitive factors (Pretorius and Mampuru 2007, 39; Zimmerman 2010, 2) that go well beyond the classroom (O'Carroll and Hickman 2011, 1). This study sets out to examine the role of phonological processing (PP) skills in the reading development (RD) of Northern Sotho (NS)-English bilingual children. While the term 'literacy' encompasses constructs such as 'spelling' and 'reading comprehension', this study will only focus on the constructs 'word decoding' and 'reading fluency', as the main aim is to determine the relationship between these aspects of literacy and PP. This does not undermine other important constructs in the field of literacy, but the choice was guided by the research aims and by what is reasonable, given the scope of a Masters study.

PP skills are treated as a subcomponent of auditory processing skills (AP) in this study. Several studies show that RD correlates strongly with children's abilities in AP (Meng, Sai, Wang, Wang, Sha and Zhou 2005, 293; Corriveau, Goswami and Thomson 2010, 380; Rowe, Pollard and Rowe 2005, 15; Ellis 2007, 17). However, despite the attention that the relationship between AP skills and reading has received in other countries, this area has been under-researched in the African languages spoken in RSA. Assessing the contribution of AP skills to RD in a multilingual RSA is therefore of significance. This study is of importance in understanding some of the cognitive-linguistic variables that contribute to low levels of literacy in RSA.

It is evident from research that teachers who receive professional training on how to develop AP skills in learners achieve better results in teaching literacy skills (Rowe et al. 2005, 16). Teachers need to be equipped with the necessary knowledge enabling them to identify AP difficulties and assist children effectively. Kim (2008, 375) maintains that teachers should be well trained in reading acquisition to help children become proficient readers. Despite this, Heugh (2006, in Howie, Venter, Van Staden, Zimmerman, Long, Du Toit, Sherman and Archer 2006, 9) argues that the Language in Education Policy (LiEP) in RSA fails to equip teachers with reading instruction methodologies. This study will hopefully equip researchers and teachers with a better understanding of AP skills (particularly PP skills) and, more specifically, of the importance of developing these skills in children during the foundation phase (Grade 1-3) of their schooling.

1.1 Background to the study

1.1.1 Reading literacy in South Africa

Reading literacy is one of the most important foundational skills that all children need to acquire if they are to succeed in life (Van Staden and Bosker 2013, 1). Acquiring reading abilities is not an easy task for most learners in RSA. A national assessment undertaken by the Department of Education (DoE) (2003, 66) on literacy levels among Grade 3 learners showed that 61% of children could not read at their age appropriate level and that up to 18,5% of learners in some provinces had to repeat Grade 3 because of a failure to meet the minimum requirements.

The low literacy rate in RSA is a challenge facing the nation. In the Annual National Assessments (ANAs), conducted by the Department of Basic Education, below average literacy performances have been detected for several years now, despite adequate Government expenditure of about 18.5% (of the total budget) on education (Snyman 2012, 1; Modisaotsile 2012, 2; Prinsloo and Heugh 2013, 2). The ANAs reports reveal that though there seems to be a steady increase in home language performance from 2012 to 2014 with an average performance of 50% and above in grades 1, 2 and 3, learners still show a decline in performance in the First Additional Language (English) in Grades 4-6 and in Grade 9 (especially in Grade 9 with an average of less than 50%) (DoE 2008, 11). Thus despite a reasonable level of performance in the lower grades, performance in the higher grades remains far below what RSA needs in order to become a “reading nation”. It is clear that the problem goes beyond the financial aspect. Snyman (2012, 1) emphasises that RSA's relatively high education expenditure is not enough to address poor education results.

The level of reading abilities of learners in RSA is a particular cause for concern when compared to reading abilities of children in the international arena. The Progress in International Literacy Reading Study (PIRLS) (2006; 2011) reports indicate that around 80% of Grade 4 and Grade 5 RSA learners perform below the lowest international reading benchmark, meaning that they had not mastered the most basic reading skills (Howie, Venter, van Staden, Zimmerman, Long, Du Toit, Scherman and Archer 2006, 29; Howie, Van Staden, Tshele, Dowse and Zimmerman 2011, 35). The phrase "below the lowest" signifies that literacy development in RSA, in comparison to the rest of the world, is disconcertingly low. The Southern and East African Consortium for Monitoring Educational Quality (SACMEQ) study on four Southern African countries (including RSA) also reveals that learners' major challenge stem from their reading abilities (Spaull 2011, 18). Combined, the evidence above suggest that RSA learners are thus failing to acquire adequate basic reading skills in their early years at school, and the various factors that affect the acquisition of reading literacy must therefore be investigated systematically.

Interestingly, the RSA government is aware of the reading problems facing the nation. Hence the government has embarked on a National Reading Strategy (NRS) which is focused on improving the reading competency of all learners (DoE 2008a, 4). The main goal of the NRS is to create a nation of effective readers. According to the Minister of Education, Angie Motshekga, it is necessary for learners in the foundation phase to obtain proper reading skills in order to achieve success in the rest of their school careers, as well as in their later economically active years (Phajane 2012, 1).

1.1.1.1The language factor

It is apparent that part of the problem in RD stems from the language factor (Prinsloo and Heugh 2013, 1; Phajane 2012, 2, Naidoo, Reddy, Dorasamy 2014, 157). The choice of language as a medium of instruction has been mentioned as a factor contributing to the low literacy rate in RSA. RSA is a multilingual country with 11 official languages, which include Zulu, Xhosa, Swazi, Ndebele, NS, Southern Sotho, Tswana, Tsonga, Venda, English and Afrikaans (Pretorius and Mampuru 2007, 40). The challenge facing the RSA education system is to provide quality education to multi-cultural learners in the country (Van der Berg, Taylor, Gustafsson, Spaull and Armstrong 2011, 17).

The new LiEP gives all the official languages in RSA an equal status in education up until Grade 3 (DoE 1997, 1) and it adopts an additive approach to bilingualism (Howie et al. 2011, 10). The policy aims to use the learners' first language (L1) as the Language of Learning Language of Teaching (LoLT) in the foundation phase, while providing access to an additional language (English). The policy offers the learners and parents the right to choose their preferred language of instruction from the official languages. The major challenge is implementing the policy. Heugh (2002, 17) warns that while this multilingual LiEP seems ideal on paper it is difficult to implement. In some cases, it might not be practically possible to educate every learner in his/her own language, especially in areas where many languages co-exist (Howie et al. 2011, 10).

Practically, English as a LoLT is used most widely in schools despite the South African LiEP promoting mother tongue (MT) education (Prinsloo and Heugh 2013, 1; Broom 2004, in Vermaak 2006, 8). Several studies argue in favor of MT education in literacy development (Cummins 2001, 4; Skutnabb-Kangas 2009, 5), but English is often used extensively in RSA due to its global prestige as a language of business and communications (Buthelezi 2003, in Soares De Soussa and Broom 2010, 518). English is associated with socio-economic upliftment. Many parents opt for "straight for English" with the misperception that primary schools that offer "straight for English" are schools that provide quality education (Pretorius 2008, 62; Heugh 2002, 18). Although English is the most frequently used language in schools, it is not the most frequently spoken home language (Naidoo, Reddy and Dorasamy 2014, 157) and is used by less than 10 % of the RSA population as an L1 (Van

Staden and Howie 2012, 87). Most children in RSA have early verbal input in an African language and English is introduced once they enter school (Verhoeven 2007, 225). This is the situation with the NS-English bilingual children in this study. The NS-English bilingual children's language situation is referred to as emergent bilingualism (Wilsenach 2013, 17). The majority of these learners have few or no real life experience in using English outside the classroom (Madileng 2007, 2). Hence, the challenge of learning reading in an L2 is a reality for the majority of learners in RSA (Naidoo et al. 2014, 157; Soares De Sousa and Broom 2011, 2) including the learners participating in this study.

In most cases where learners in RSA learn in their MT, they do so for the first three years of primary school (Grades 1-3) after which they switch to English for the remainder of their schooling (Grades 4-12) (Spaull 2011, 18). [1] After switching to English, the children are offered their home language as a school subject until grade 12. Schooling in RSA therefore tends to be characterised by literacy acquisition in a second language (L2) or by some form of bilingual schooling where initial literacy is acquired in the home language and a switch is later made to L2 literacy (Pretorius and Mampuru, 2007, 38). Some studies blames the poor achievements of learners on the early transition to English (Alexander 2005, 199) which is thought to be a weak bilingual model. Three years of MT education is inadequate. According to Heugh (2006, 13) the approach should involve at least six to eight years of L1 education together with good provision for the development of the L2. The situation is worsened by the fact that most educators may not have the repertoire of skills needed to prepare learners for the transition (Zimmerman et al. 2006, 4). This shortage of skills undermines a smooth transition from one LoLT to another.

1.1.1.2 Socio-economic and cognitive factors

The problem of low literacy levels in RSA goes beyond the issues related to the medium of instruction. The PILRS (2011) report reveals that learners in

[1] Note that Afrikaans learners have the opportunity to continue their schooling in Afrikaans after Grade 4. These learners' primary and secondary education is typically delivered in Afrikaans, or in a bilingual environment where some subjects are taught in Afrikaans and some in English. This unequal situation is a remnant of previous political structures.

RSA receiving instruction in a MT failed to meet international norms on reading achievement (similarly to learners receiving instruction in English) (Howie et al. 2011, 29).

There are several factors in addition to the language factor contributing to low reading abilities in RSA. Inadequate supply of learning materials, overcrowded classrooms, poorly trained teachers, lack of commitment by teachers and poor support for learners at home are some of the factors that result in low literacy rates (Pretorius and Mampuru 2007,40; Modisaotsile 2012, 2). As a result of these factors a considerable number of learners end up not receiving appropriate and adequate reading instruction (Van Staden and Howie 2012, 95; Pretorius and Mampuru 2007, 40). In trying to tackle RSA's persistently low literacy rates, policy-makers have focused on school quality issues, such as leadership and infrastructure, whilst ignoring the actual learning in the classroom (O'Carroll and Hickman 2011, 1).

Socio-economic factors in RSA such as poverty also play a role in hampering RD (Pretorius and Mampuru 2007, 40; Naidoo et al. 2014, 157). Research has shown that poverty affects the cognitive development of a child (Smith et al. 1997, in Jensen 2009, 31) which can have negative repercussions on literacy development of a child. Poverty is not unique to RSA - it is a problem of most countries in Africa and of many beyond the African continent (Hemphill and Tivnan 2008, 447; Pretorius and Ribbens 2005, 140). Poverty is a condition common to most schools in RSA. Children living in high poverty conditions have fewer chances of learning to read successfully (O'Carroll and Hickman 2011, 3). Scholars explain poverty in schools as a product of two subsystems that exist in RSA education (Van der Burg et al. 2011, 2). Of the two subsystems, the smaller subsystem accommodates the wealthiest 20-25 percent of pupils whilst the larger subsystem caters for the poorest 75-80 percent. Learners from the wealthiest quintile (i.e. socioeconomic status rankings) areas (Gauteng and Western Cape) far outperform learners from the poorest quintile areas (Limpopo, KwaZulu-Natal and Eastern Cape) on literacy achievement (Spaull 2011, 61; Spaull 2013, 6). Thus, socioeconomic status seems to be one determiner of literacy development due to unequal educational opportunities.

The cognitive-linguistic skills of learners are also fundamental in enhancing reading abilities. Learning to read is a complex process that involves the use of cognitive-linguistic components such as vocabulary, memory, knowledge of syntax and phonological ability (Verhoeven, Reitsma and Siegel 2011, 388). Reading involves the integration of different language related cognitive skills. Tunde (2007, 12) and Pretorius and Ribbens (2005, 139) describe reading as a cognitive-linguistic accomplishment. Cognitive-linguistic skills are a necessary tool without which effective RD cannot be successful. Research has emphasized the importance of developing the cognitive linguistic skills related to reading during the first years of formal education (Mousinho and Correa 2009, 117). The earlier the skills are introduced the greater the chances for children to succeed in reading. RD is compromised if cognitive-linguistic skills are not sufficiently developed. Teachers in RSA must thus ensure that cognitive-linguistic skills are developed in learners for effective RD. However, the development of cognitive-linguistic skills in learners is a challenge for most educators. Many teachers simply do not know how to teach reading (DoE 2008a, 8). Even when the teachers are aware of learners with reading problems they fail to identify and apply appropriate teaching reading strategies to remedy the problems (Pretorius and Ribbens 2005, 145; Van Staden and Howie 2012, 95). The DoE (2008b, 11) emphasises the importance of cognitive linguistic skills in RD. The field of cognitive-linguistic skills in RSA as it relates to RD is under-researched, and this study will make a contribution in this study field. The study will provide an in-depth understanding of the contribution of PP (a cognitive-linguistic skill) to RD in emergent bilingual NS-English children.

1.1.2 Auditory processing and reading development

AP skills are often described as existing in a hierarchy, and consisting of two broad ranges of skills, namely speech perception (SP) and phonological processing (PP) (Zhang and McBridge-Chang 2010, 333; Boets, Wouters, Wieringen, De Smedt and Ghesquière 2008, 36). According to Zhang and

McBridge-Chang (2010, 333) the influence of AP and SP on reading is facilitated through PP skills. AP skills are basic-level skills (they come first) and they help shape SP, which in turn influences PP. PP, in turn, is directly associated with RD. This particular study shall focus on one broad range of auditory skills, namely PP skills and their contribution to RD.

AP skills play a critical role in the development of reading skills. Wepman (1972, in Ramp 1980, 8) defines AP as the capacity of children to collect, transmit, decode and integrate signals received along the auditory pathways. The first step in learning to read requires learners to map the sounds (phonemes) of a language to their corresponding letters (graphemes) (Ziegler and Goswami 2005, 3; Konza 2011, 4). This process, which underlies the automatic decoding of written text, is partly a result of effective AP capabilities. An efficient AP mechanism is therefore a prerequisite, without it the successful decoding of graphemes cannot take place. A deficit in AP leads to difficulties in mapping sounds to their corresponding written symbols (Richardson, Thomson, Scott and Goswami 2004, 230). Once a learner experiences a deficit in AP some remedial actions are needed straightaway as the child will be at risk of reading failure. Auditory training could be beneficial in improving reading abilities in children with an auditory deficit (Rowe et al. 2005, 31; Veuillet, Magnan, Ecalle, Thai-Van and Collet 2007, 2915), although some indicate that auditory training only improves auditory discrimination and might not lead to improvement in reading skills (Agnew, Dorn and Eden 2004, 21).

Empirical evidence clearly suggests that AP might play a unique causal role in RD (Hood and Conlon 2004, 248; Corriveau et al. 2010, 390; Boets et al. 2008, 36; Georgiou, Protopapas, Papadopoulos, Skaloumbakas and Parilla 2009, 32) and that the causal relationship between AP and reading is reciprocal (Kuppen, Huss, Fosker, Mead and Goswami 2011, 32, Ramus 2004, 7). This conclusion suggests that AP is also a consequence of learning to read (AP facilitates RD and vice versa).

Even so, there does not seem to be a unanimous view about the role of AP in learning to read. In contrast to the findings mentioned above, some research evidence suggests no causal connections between the two constructs (Heath and Hogben 2004 761). Hence it is necessary and relevant to do more research in this area. Georgiou et al. (2009, 11) argue in favour of examining the contributions of AP to RD in languages with different phonological structures and different levels of orthographic transparency. The contributions of AP (particularly of PP) to RD in RSA, which have diverse languages with different phonological and orthographic structures, are worth studying in an attempt to ascertain its contributions to literacy development.

1.1.3 Speech perception (SP) and reading

SP is one skill that fits in the broad AP hierarchy and it is the first subcomponent of AP (Boets et al. 2008, 37; Zhang and McBridge-Chang 2010, 333). Generally AP mechanisms influence the development of specific SP skills (Kluender, Diehl and Killeen 1987, 1195; Diehl, Lotto and Holt 2004, 153). Speech sounds are said to be perceived categorically[2].

AP mechanisms determine the accuracy and the ability of individuals to perceive speech sounds categorically. For example, listeners can make sharp and clear category boundaries between /b/, /d/ and /g/ sounds if their AP capabilities are effective. Perceptual difficulties can arise if the auditory system interferes with accurate detection of the acoustical changes in speech sounds (Vandermosten, Boets, Luts, Poelmans, Golenstani, Wouters and Ghesquière 2010, 1).

[2] Categorical SP is the ability to differentiate between-category but not within-category differences along a stimulus continuum (Levin and Angelone 2002, 567). In categorical perception, listeners discriminate sounds that lie on different category boundaries and ignore differences between sounds that lie on the same boundary. Listeners are more likely to notice the differences between phonemic categories than within phonemic categories (Healy and Repp1980, 139).

Several studies have shown a causal link between categorical SP and reading disability (Serniclaes, Ventura, Morais and Kolinsky 2005, 41; Vandermosten et al. 2010, 5). On the contrary, some researchers found that the correlational connection between categorical perception and reading is weak (Robertson, Joanisse, Desroches and Ng 2009, 1467; Nouwens 2008, 38; Manis, McBridge-Chang, Seidenberg, Keating, Doi, Munson and Peterson 1997, 212). These researchers have argued that the role played by categorical perception in RD is not a significant one.

Research studies in bilingual children have shown that as a consequence of language experience, a bilingual's perception of the L1 phonemic contrast may be categorical and precise, whereas the perception of non-native contrasts may turn out to be inaccurate and difficult (Sebastián-Gallés and Soto-Faraco 1999, 111; De Gelder and Vroomen 1992, 424; Sundara and Polka 2007, 21). This suggests that L1 shapes the perceptual system at early stages of development in such a way that it will determine the perception of non-native phonemic contrasts. Contrary, research evidence has shown that the perceptual system does not lose its capacity to distinguish new non-native contrasts (Miyawaki, Strange, Verbrugge, Liberman, Jenkins and Fujimura, 1975, 331; Mann 1986, 169) and that given early and intensive exposure, bilinguals can discriminate non-native contrasts easily (Lively, Pisoni, Yamada, Tohkura and Yamada 1994, 2086). These findings suggest that early and intensive exposure to L2 can alter the influence of L1 native categories. Hence, it is necessary to expose learners to L2 as early as possible to minimise perceptual difficulties of L2 contrasts.

Some research has however, demonstrated that no amount of early and intensive exposure can alter the influence of L1 native categories in the formation of new categories (Sebastian-Gallés, Echeverria and Bosch 2004, 240; Bosch, Costa and Sebastian-Gallés 2000, 371). These findings suggests that even given enough exposure to L2 from birth, the influence of dominant L1 native categories cannot be altered. The L1 still poses strong perceptual influences on L2 categories despite early exposure to L2. It should be noted here that SP is not the focus of this study and (following this brief background) this concept will not be discussed further.

1.1.4 Phonological processing skills and reading

PP is an auditory processing skill that represents the processing of phonological aspects of the auditory signal (Ellis 2007, 6). PP is the second sub-component of AP skill in the broad hierarchy (Boets et al. 2008; Zhang and McBridge-Chang 2010). The significance of PP skills in early RD has been proven by research (Wilsenach 2013, 27; Veii and Everatt 2005, 239; Soares De Soussa and Broom 2011, 15; Jongejan, Verhoeven and Siegel 2007, 835; Chow, McBride-Chang and Burgess 2005, 86; Gottardo and Lafrance 2005, 559). Strong phonological skills aid learners to acquire reading skills successfully. The importance of PP skills for reading is not specific to languages with alphabetic orthographies. Rather, there is evidence that shows that PP skills are also important for reading in non-alphabetic languages like Chinese (Gottardo, Chiappe, Yan, Siegel and Gu 2006, 389; Chow et al. 2005, 86). Phonological skills reliably predict reading achievement in both alphabetic and non-alphabetic languages.

Wagner and Torgesen (1987, 192) identified three key PP skills, namely phonological awareness (PA), phonological working memory (PWM) and rapid automatised naming (RAN). The three skills play important parts in facilitating and assisting RD. PP is the use of phonological information in processing written and oral language (Wagner and Torgesen 1987, 192). PP skills enable the learner to analyse, manipulate and discriminate sounds of a language. Wagner and Torgesen (1987, 206) found the different processing skills to be related and linked to each other. For example, performance in PA relies on the efficiency of PWM. However, there is also evidence for the distinctiveness of these phonological skills. Mann (1984, 130) found that the correlations between different processing skills were non-significant, therefore indicating their individuality in aiding reading. This suggests that these PP skills can function separately during RD.

In fact, not all scholars agree with the inclusion of RAN as a PP skill. A contrary view suggests that although RAN might have a phonological component, it represents an independent cognitive function (Wolf and Bowers 1999, 415). This means RAN should be treated as a construct that is distinct from other PP skills. While the traditional approach to PP by Wagner and Torgesen (1987) is nowadays debated, this classification shall be used in this study when explaining PP as (i) it is still accepted by many scholars in the field and (ii) as it is a useful classification to orientate the reader with regards to this study, especially given that the standardised testing instrument used here to measure PP includes RAN as a subcomponent of PP. This debate will, however, be highlighted further in Chapter 2.

Overall, there seems to be no universal agreement among researchers concerning the interrelations between PP skills and concerning the relations between PP and reading. Wagner et al. (1997, 478) argues that the relative contributions of PP skills to reading may differ across languages, depending on the degree of regularity of phoneme-grapheme correspondence of different orthographies. It is therefore interesting to assess the contributions of PP to reading in NS and English, as these languages differ in terms of their orthographical transparency. The constructs PA, PWM and RAN, as well as their relation to RD, will be discussed in detail in chapter 2.

1.1.5 Transfer of phonological processing skills

Cross-linguistic transfer is the application of previously learned linguistic patterns onto a new learning situation (Isurin 2005, 1). Some studies have shown that PP skills are cross-linguistically transferable and can predict RD in another language regardless of different orthographic and alphabetic systems (Chow et al. 2005, 86; Dickinson, McCabe, Clark-Chiarelli and Wolf 2004, 323; Gottardo and Lafrance 2005, 574, Soares De Soussa, Greenop and Fry 2010, 517; Wei and Zhou 2013, 11; Veii and Everatt 2005, 239; Gottardo et al. 2006, 367). For example, Wei and Zhou (2013) investigated cross-linguistic transfer among 424 third-grade Thai-English bilinguals and found that PA in Thai predicted learning to read in English.

Some research studies have demonstrated that the relationship between the transfer of L1 and L2 PP skills and L1 and L2 reading skills is bidirectional (Dickinson et al. 2004, 323; Veii and Everatt 2005, 239). Veii and Everatt (2005, 239) for example, found evidence of bidirectional transfer of PA skills in Herero-English bilingual children: L1 (Herero) predicted L2 (English) RD and vice versa. A strong link between L1 and L2 PP and reading abilities suggest that these skills may be universal across languages (Durgunoglu 2002, 189). Unfortunately, the extent to which PP skills positively transfer across languages is not clear, which further support the rational for carrying out this particular study.

Contrary, some research studies reveal that L1 knowledge may interfere with L2 language development and that differences between the orthographies of the L1 and L2 may affect positive transfer of PP skills (Wade-Woolley and Geva 2000, 309; Wang, Koda and Perfetti 2003, 129). For example, Wang et al. (2003) found that phonological knowledge interfered with phoneme identification in Chinese learners acquiring English as L2. The effect of linguistic transfer can be different in different linguistic contexts and thus, the present study has relevance in that it will endeavour to determine whether cross linguistic transfer of skills is helpful to NS-English bilinguals, given the differences in the orthographical and phonological systems of the two languages.

1.1.6 Gender differences in PP and reading

Some research studies point to gender differences in reading abilities of boys and girls (Limbrick, Wheldall and Madelaine 2011, 3; Rutter et al. 2004, 1; Krizman, Skoe and Kraus 2011, 595). Rutter et al. (2004) observe that girls have an advantage in reading achievement and that more boys than girls are at risk of reading disabilities. The most notable reason given for gender differences in reading ability relate to AP abilities. Rowe and Rowe (2006, 4) for example, have shown that boys are more at risk of reading disabilities than girls because they are more delayed in their development of AP capacity up to the age of 10.

Contrary, evidence shows that although AP abilities have some impact on reading achievement, it does not significantly appear to account for gender differences in reading ability (Shaywitz, Shaywitz, Fletcher and Escobar 1990, 8; Shaywitz and Shaywitz 2004, 2). There are other factors that scholars attribute to the gender differences in AP and RD, which includes differences in brain wiring and in maturational rates. Shaywitz and Shaywitz (2004, 2) claim that methodological biases cause boys to be identified as more prone to reading difficulties than girls. This study will contribute to this debate by assessing whether gender contributes to differences in reading achievement of NS-English bilingual children, with particular reference to the role of PP skills in reading.

1.2 Research problem

This study will examine the role of various levels of PP in the RD of NS-English bilingual children. Phonological structures of languages lead to differences in PP skills and RD (Georgiou et al. 2009, 11). The degree of complexity of the phonological structure of a language determines PP strengths in children. For example, Bruck et al. (1997, in Gottardo and Lafrance 2005, 263) compared French and English speaking children and found that French children performed better on syllable awareness tasks contrary to English children who performed well on onset-rime and phoneme level tasks. The differences in phonological skills were attributed to differences in the phonological structures of French and English.

Wilsenach (2013, 28) states that there are phonological differences between NS and English. The phonological differences between NS and English which are important for this study are:

1. The phonological system of NS has, compared to English, a simpler vowel system (Thamaga 2012, 30), a simpler syllabic structure and fewer consonants clusters (Demuth 2007, 530).
2. NS and English have orthographic differences (Milwidsky 2008, 15). NS has a transparent orthography whilst English is opaque.
3. NS and English have different rhythmic properties. NS is a syllable timed language (Wilsenach 2013, 20) whilst English is stress timed (Gottardo and Lafrance 2005, 563).[3]

Given the uncomplicated phonological structure and transparent orthography of NS (compared to English) one would expect NS children who learn to read in their MT to achieve success relatively easily; and to transfer their acquired literacy skills to their L2. Yet, this does not seem to happen in South African context. If the benefit of MT instruction is evident, NS learners receiving literacy instruction in NS (L1) should theoretically outperform NS learners receiving literacy instruction in English (L2). This is also not evident from recent assessments of learners. The role that various PP skills play at various points in bilingual literacy development is not well understood in NS-English learners in RSA and will form the main research problem in this research study. Specifically, it will be determined whether poorly developed PP skills contribute to low literacy levels in RSA. A secondary research problem that will be looked into is whether boys are more likely to struggle in the attainment of PP skills than girls.

1.3 Context of the research problem

As stated earlier, PP skill is an important predictor of reading outcome (Boets et al. 2008, 36; Georgiou et al. 2009, 32). Limited research exists in RSA regarding phonological and reading skills, particularly in African languages. Wilsenach (2013) focused on the relationship between phonological skills and reading in NS-English emergent bilingual children and found that phonological skills correlated significantly with word reading and reading fluency. Soares De Sousa et al. (2010) investigated the effects of Zulu and

[3] These differences between NS and English will be discussed in greater detail in Chapter 3.

English PA on the acquisition of English spelling skills in learners that speak Zulu as an L1 but require literacy in English only and found that Zulu PA skills were related to spelling in both Zulu and English. Soares De Sousa and Broom (2011) explored the relationship between English PA and reading in monolingual English and bilingual Zulu-English learners and found that PA was associated with both word reading and reading comprehension. Diemer (2016) examined the contribution of PA and naming speed to the reading fluency, accuracy, comprehension and spelling of Grade 3 IsiXhosa readers and found out that PA was the strongest predictor of reading fluency, accuracy, comprehension and spelling. Existing data however, does not adequately address the development of a broad range of PP and reading skills in a South African context. Hence, this topic is worth exploring.

1.4 Theoretical and analytical framework

Five theories about (bilingual) reading development are set to guide this research study. These theories include the phonological deficit theory (PDT), linguistic interdependence hypothesis (LIH), linguistic threshold hypothesis (LTH), script dependent hypothesis (SDH) and central processing hypothesis (CPH).

The PDT asserts that difficulties in acquiring literacy skills result from a phonological deficit (Stanovich 1988, in Kuppen et al. 2011, 3). A phonological deficit is the major driving force behind reading difficulties in clinical syndromes, such as Dyslexia and Specific Language Impairment (SLI). The LIH posits that L1 literacy provides a good foundation for L2 RD (Cummins 2005, 4). L1 reading skills are transferrable and can facilitate successful development of L2 reading skills. The LTH holds that L2 learners should gain a certain level of proficiency in L2 before the transfer of L1 reading skills to L2 reading will be possible (Bernhardt and Kamil 1995).

The SDH stresses that reading acquisition in bilingual children varies as a result of the orthographic transparency of a language (Gholamain and Geva 1999, in Veii and Everatt 2005, 239; Katz and Frost 1992, 150). Literacy skills are acquired more easily in languages with consistent sound-letter relationships (transparent) than in opaque languages with inconsistent sound-letter relationships. The CPH argues that the cognitive-linguistic component skills facilitating learning to read in monolingual children (e.g. PA, working memory, efficient serial naming, verbal ability, speed of processing) also facilitate L2 reading and writing (Geva and Siegel 2000). Cognitive-linguistic skills are universal and can facilitate reading in any language. These theories are discussed in greater detail in chapter 2 and 3.

1.5 Research aims

The aims of the present study are:

1. To establish whether there is a relationship between PP skills and RD in NS-English bilingual children.
2. To determine whether NS children, who have received their initial literacy in their L1, positively transfer PP skills from their L1 to their L2 (English).
3. To assess whether there are differences in the bilingual PP and reading skills of NS-English bilingual children who have received their initial literacy instruction in their L1 and those who received their initial literacy in English only.
4. To examine whether gender differences in PP contribute to differences in reading achievement of NS-English bilingual children
5. To establish whether a lack of L1 literacy instruction negatively affects the development of PP and reading skills in NS-English bilingual children.

1.6 Research questions

The research questions for the present study are as follows:

1. Is there a relationship between PP skills and RD in NS-English bilingual children?
2. Do NS children who have received their initial literacy in their L1, positively transfer PP skills from their L1 to English reading acquisition?

3. Are there differences between the PP skills of NS-English bilingual children who have received their initial literacy instruction in their L1 and those who received their initial literacy instruction in English only?
4. Does gender contribute to differences in PP abilities and reading achievement in NS-English bilingual children?
5. Does a lack of L1 literacy instruction negatively affect the development of PP and reading skills in NS-English bilingual children?

1.7 Research hypotheses

The following hypotheses will be tested in this study:

H1. PP skills will predict RD of NS-English bilingual children.

H2. NS PP skills will predict RD in NS and English.

H3. NS-English bilingual children receiving instruction in NS will have better PP and reading outcomes in NS compared to English.

H4. Girls will outperform boys on PP and RD in NS and English

H5. NS-English bilingual children receiving instruction in L2 (English) will show poorer phonological and reading skills in NS.

1.8 Research methodology

An experimental, quantitative and cross sectional design will be used in this study to investigate the role of PP skills in the RD of NS-English bilingual children in Grade 3. The participants are from two primary schools situated in a high poverty suburb in the Tshwane Municipality (in Gauteng Province). Grade 3 learners, who all speak NS as home language, will be divided into two groups based on their LoLT, i.e. there will be a NS instruction group and an English instruction group. Richards and Schmidt (2010, 476) maintain that quantitative research uses procedures that gather data in numerical form. Tables were used to present data. Data gathered was analysed statistically, with statistical inferences adopted in reaching conclusions.

1.9 Limitations to the study

The main limitation to this study lies in the study being a cross sectional study. This might limit the researcher in establishing a relationship between

PP and RD. Studying the development of PP and RD in bilingual children in a longitudinal study would have been more appropriate, but was impossible, given the time constraints associated with completing a Masters dissertation. The other shortcoming is the lack of any form of qualitative data collection (such as classroom observation, teacher/parent interviews). This limits the researcher in taking into account the quality of education and other social factors in explaining RD and performance of the children on the various PP skills.

1.10 Synopsis of the dissertation

Chapter one provides a general introduction. It comprises of the background of the study, the research problem, research aims, research questions, as well as an overview of the methodology and theoretical framework and the limitations of the study. **Chapter two** comprises of the first part of the literature review. It reviews studies in PP and reading and provides the theoretical background to the research. **Chapter three** constitutes the second part of the literature review. It gives a review of reading development in bilingual children. **Chapter four** contains the research methodology. It outlines the research design, the sample and sampling procedure, the data collection and analysis procedures, as well as ethical considerations of the study. **Chapter five** presents the data obtained from the statistical analyses. **Chapter six** present discussion of the findings, a summary of key findings and the conclusion. It includes recommendations for further research and again highlights the limitations of the study.

1.11 Conclusion

In this chapter, the background of the study, the research problem, questions, aims, hypothesis, methodology and analytical framework of the study have been explained. The need for research in the field of PP and reading in the multilingual RSA has been justified against the background of low literacy levels and limited research in PP and reading in the country. This study is crucial as it may contribute to national language policy evaluations and teacher training curricula. An in-depth study on PP and literacy development will give policy makers insight into pedagogical aspects that will facilitate literacy development and shift their policy formulation approach from school management and improvement of the infrastructure to classroom-based interventions. Policies must be centred on improving the teaching and learning skills in the classroom if RSA is to realise an improvement in literacy development.

CHAPTER 2
PHONOLOGICAL PROCESSING AND READING

PP is best understood as an AP skill together with other cognitive skills, such as speech perception. The development of the PP system is a crucial component in learning to read. The PP system is a cognitive mechanism in human beings that processes speech sounds. This chapter explains the PP system and also discusses the contribution of PP (a sub-component of AP) to reading development. The relations of three sub-components of PP skills (PA, PWM and RAN) to reading shall be focused on. Theories of PP and reading development are central to this discussion.

2.1 Phonological processing skill

PP is an auditory processing skill (McGowan 2010, 1; Ellis 2007, 52) which involves the use of phonological information, especially the sound structure of one's oral language, in processing oral language (i.e. listening and speaking) and written language (i.e. reading and writing) (Wagner and Torgesen 1987, 192, Wagner et al. 1994, 71). Two well-known models, which show how PP fits into the broad hierarchy of AP skills and how these skills relate to reading are the 'Developmental model of AP and reading' by Zhang and McBridge-Chang (2010) and the 'Causal path model' by Boets et al. (2008). Both models assume that SP and PP form the broad range of skills that fall into the AP hierarchy.

2.1.1 Zhang and McBridge-Chang (2010) developmental model

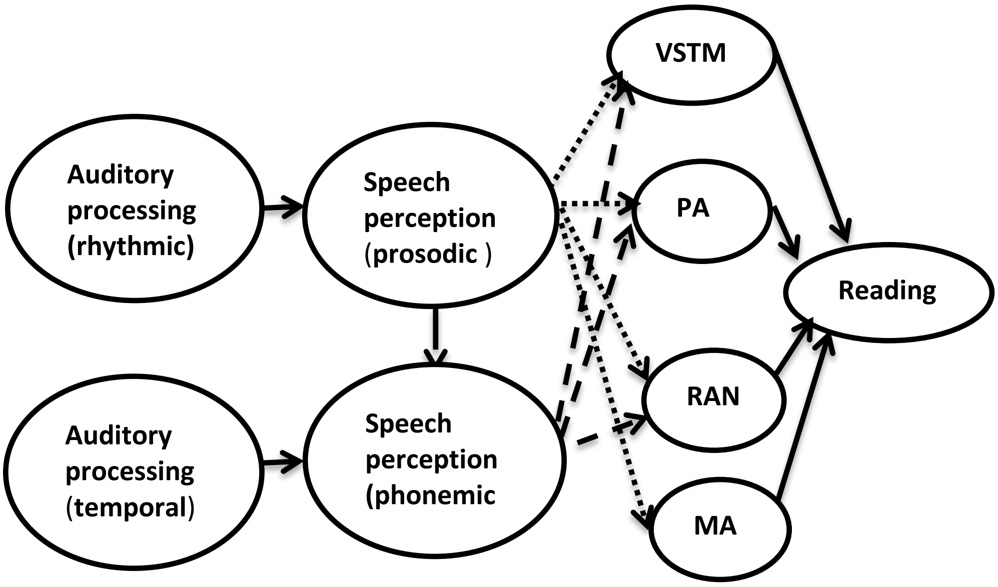

Fig. 2.1 Zhang and McBridge-Chang's (2010) four-stage developmental model showing the pathways from AP, SP, PP (i.e. VSTM (verbal short-term memory), PA, RAN and MA (morphological awareness) to reading. .

Figure 2.1 depicts a four-stage model showing the developmental pathways from AP, SP, PP skills to reading as propounded by Zhang and McBridge-Chang (2010). The model assumes that AP develops first and influences SP, which in turn impacts PP, and PP in turn directly shapes reading development. The model assumes that AP is a universal skill, whilst SP and PP are assumed to be language specific. Thus, while SP and PP skills need to be acquired for each language independently (Zhang and McBridge-Chang 2010, 334; Chung, McBridge-Chang, Cheung and Wong 2013, 216), general AP skills are more universal, not subject to language specific knowledge and develop normally in the population at large (i.e. in children with no hearing problems or developmental disorders).

2.1.2 Boets et al. (2008) Causal path model

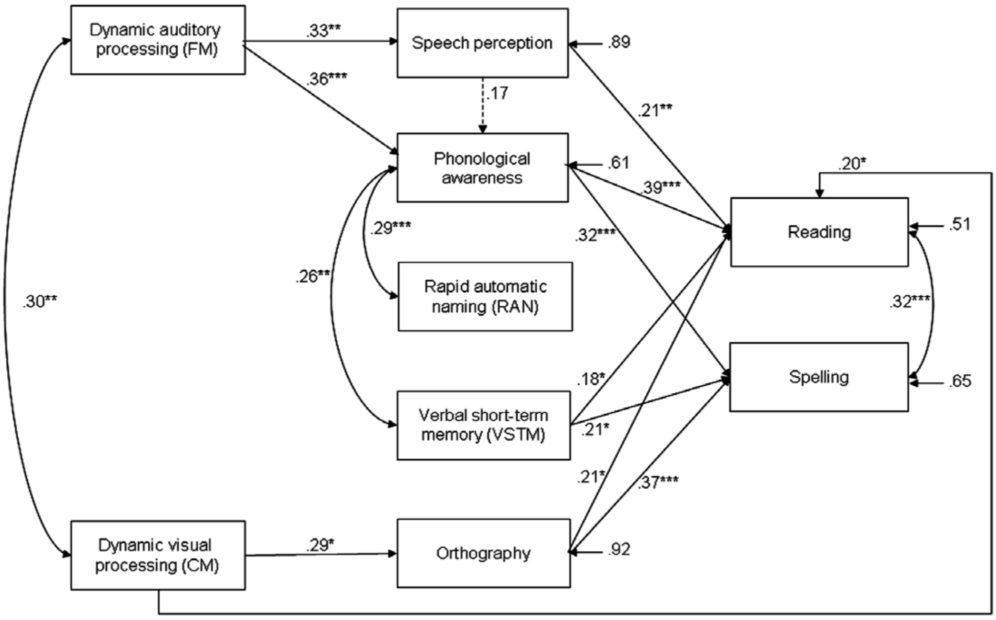

Fig 2.2 A causal path model of AP, SP, phonological ability and reading (Boets, Wouters, Wieringen, De Smedt and Ghesquiere 2008, 35).

The causal path model proposed by Boets et al. (2008, 31) assumes that AP determines SP, which in turn determines PP skills. PP in turn directly influences reading ability. The causal path model assumes AP to be at the first level, SP at the second level, PP occupying the third level and reading development on the fourth level. The model assumes that AP has a direct influence upon PP, particularly PA. This determination happens in a direct way and is only marginally mediated by SP (Boets et al. 2008, 36). SP also directly influences reading parallel to the influence mediated by PA. The influence of AP on reading is indirect and is mediated by SP and PP skills. SP and PP, on the other hand, do have direct relations with reading development. AP, SP and phonological ability influence each other reciprocally (Boets et al. 2008, 37).

2.1.3 The developmental model and the causal path model

The two models of AP and reading proposed by Zhang and McBridge-Chang (2010) and Boets et al. (2008) give an outline of two major broad ranges of skills that falls in the AP hierarchy, namely SP and PP. PP comprises of PA, RAN and VSTM in these models. Zhang and McBridge-Chang's (2010) model mainly focuses on the developmental aspects of AP, SP, PP and reading. On the other hand, Boets et al.'s (2008) model describes how AP, SP and PP are related to each other and also how they relate to reading.

The developmental model by Zhang and McBridge-Chang (2010) acknowledges that there are language specific constraints which influence the development of some skills (particularly SP and PP skills). This could mean that the developmental sequence of these skills might not be fixed across all orthographies. The causal path model by Boets et al. (2008) on the other hand, fails to take into consideration some language-specific constrains that may influence the relationship between auditory skills and reading acquisition.

While some studies have replicated Boets et al.'s (2008) findings (Boets et al. 2011, 9; Chung et al. 2013, 215), it is clear that such causal claims have been difficult to replicate consistently. For instance some studies have found no reliable relationship between general auditory skills and PP (Heiervang, Hugdahl and Stevenson 2002; Share, Jorm, MacLean and Mathews 2002, 151), or between PP and SP skills (Nittrouer 1999, 938). This means that there may be differences on the relations between various AP skills and reading which may arise from the differences in phonological properties of languages (Georgiou et al. 2009, 31). Essentially, not enough studies have tested the Zhang and McBridge-Chang (2010) developmental model and Boets et al. (2008) causal path model to refute or support their claims. Despite this however, the two models provides a good framework for understanding a broad range of cognitive-linguistic skills that affect reading development.

2.2 The phonological system

Children possess an in-built PP system that processes the sounds of a language. According to Eide and Eide (2011, 23) the PP system's main role is to process, analyse and manipulate basic sound structures of words, called phonemes. Thus, the phonological system enables a child to break down a word like *unlikely* into its discrete categories /un/- /like/- /ly/. There are two brain regions involved in PP. The neuropsychological and neuroimaging literature suggests that the neural basis of PP is lateralised to the left hemisphere, and encompasses a distributed neural system that includes posterior brain structures (superior temporal gyrus) and anterior brain structures (inferior frontal gyrus) (Zatorre, Evans, Meyer and Gjedde 1992, 848; McCandliss and Noble 2003, 196).

2.3 Reading development

Reading is an important skill which facilitates the process of formal learning. As a result, every child should master reading skills (Siok and Fletcher 2001, 2). Failure to acquire reading skill compromises knowledge acquisition (Perfetti 2001, 12804). Reading is the ability to decode, encode, and comprehend written symbols and texts (Tracey and Mandel, 2006, in Esmaeeli 2012, 10). Scott (2010, 1) refers to reading as a complex developmental cognitive process that requires learners to interact with print on many levels. Learners go through many cognitive stages in reading development-these stages typically occur in parallel fashion with increasing cognitive ability. The stages will be discussed in detail in this section.

Reading development begins at an early age and is an on-going, continuous, and gradual process (Esmaeeli 2012, 10). The foundational skills (such as oral language skills), on which the development of reading partly relies, start to develop during infancy, and reading development is dependent on these skills (Pang, Muaka, Bernhardt and Kamil 2003, 8). A learner needs to master the language in which reading is to take place, in order to gain adequate control of the reading process.

Reading involves word recognition and reading comprehension (Hook and Jones 2004, 16; Siok and Fletcher 2001, 8; Travers 2005, 5); i.e. the ability to recognise words and getting meaning from a text. Brain activation for reading related tasks has been consistently found in three main areas of the left hemisphere; namely the inferior frontal gyrus, temporoparietal area and occipitotemporal area (Richlan et al. 2009, in Norton and Wolf 2012, 442). Pneuman (2009, 33) describes reading as a systematic and organised process, suggesting a hierarchy in reading development. Many theories explain the developmental progression of reading and show the systematic and organised way in which reading acquisition takes place. In the present study, Chall's (1967; 1983) and Ehri's (2005; 2011) models of reading provides the basis for understanding reading development.

2.4 Jean Chall's model of reading development

Chall's model of reading development is based on her research on the effectiveness of different reading approaches in the American context (Chall 1967). Chall (1983, 1) outlines six hierarchical progression stages of reading development namely:

Stage 0: Pre-reading

Stage 1: Initial reading

Stage 2: Confirmation and fluency

Stage 3: Reading for learning the new

Stage 4: Multiple viewpoints

Stage 5: Reconstruction

2.4.1 Pre-reading (6 months to 6 years)

Children are in the pre-reading stage from around 6 months to 6 years (around kindergarten). Children at this stage are described as "pretend readers" (Chall 1983, 1). During this stage, children acquire knowledge about letters and words. They begin to recognise that words can be broken up into separate parts and/or that words can be put together into whole words. They learn that some words can sound the same at the beginning (alliteration) and/or at the end (rhyme). Children at this stage acquire knowledge of print e.g. naming letters of the alphabet and writing their own names (Canine, Silbert, Kameenui and Tarver 2014, 13). They also learn essential concepts about reading like holding the book properly; turning the pages and pointing to words. The pre-reading stage provides an opportunity for children to acquire pre-reading knowledge (Chall 1983, 1), which lays the foundation for later reading development.

2.4.2 Initial reading stage (6 years to 7 years)

The initial reading stage occurs during 6 and 7 years, i.e. from Grade 1 to Grade 2. Children learn the letters of the alphabet and to associate the letters in print (graphemes) to their corresponding sounds (phonemes) (Chall 1983, 1). Children at this stage rely on direct instruction to develop on decoding skills. Children are able to read simple texts and can read to about 600 words. Some children enter the initial stage earlier or later than 6 years, depending on their environment. A child coming from an environment that exposes him/her to letters and sounds earlier might develop reading skills faster. In order to succeed in the initial reading stage, children must be enrolled in schools where the environment supports the acquisition of reading; and parents must ensure that the home environment is conducive to reading development.

2.4.3 Confirmation and fluency stage (7 years to 8 years)

The confirmation and fluency stage occurs during 7 to 8 years (Grade 2 to 3). Confirmation of learnt knowledge takes place at this stage. The focus of children is not on gaining new information but rather to consolidate basic decoding skills learnt at the initial reading stage (Chall 1983, 1). An individual accumulates new vocabulary (up to approximately 3000 words) and can read simple texts more fluently through practice. The initial reading and the confirmation stages both constitute the “learning to read stage”, in which the main focus is on mastering decoding skills and recognising words. Chall (1983, 2) emphasises that at the end of the initial and the confirmation stages children may recognise most words automatically and read passages with ease.

2.4.4 Reading for learning the new stage (9 years to 13 years)

Children move from the confirmation stage to reading for learning the "new", marking a transition from "learning to read" to "reading to learn". This stage occurs, roughly speaking, between 9 and 13 years (Grade 4 to 8) and comprises of two phases, Phase A (grade 4-6) and Phase B (grade 7-8 and/or 9) (Chall 1983, 1). These age groups however, are based on research in American school contexts and may thus vary depending on the context. For instance, in the South African context, at 9 years of age, most learners are still in Grade 3 and are expected to be in grade 7 at 13 years.

Children in this stage are able to use their reading skills to enhance their learning experience. The stage focuses on reading to gain new knowledge, information, thoughts and ideas (Chall 1983, 1). Reading different materials, such as textbooks, magazines and encyclopaedias, widen their knowledge and vocabulary. Children at this stage can initiate reading on their own and relies less on direct instruction. In Phase A of Stage 3, children still have limited knowledge and vocabulary and reading is best developed with materials and purposes that focus on one viewpoint, but as they move through Phase B, children start to confront different viewpoints and begin to analyse and criticise what they read (Canine et al. 2014, 13).

2.4.5 Multiple viewpoints stage (14-18 years)

The multiple viewpoints stage occurs between 14-17 years (Grade 10 to 12). At this stage children read various texts and they gain diverse knowledge and perspectives about an individual topic (Chall 1983, 1). Learners deal with more than one viewpoint and they begin to develop multiple viewpoints about a certain topic through reading various texts. They can also treat topic in the textbooks with greater depth (Canine et al. 2014, 14).

2.4.6 Construction and reconstruction stage (over 18 years)

The final stage in reading development is the construction and reconstruction stage and it takes place at ages 18 and above, when an individual is considered to be an adult. At this stage, reading is done to serve the purposes of the reader whether professional or personal. The reader at this stage is able to make decisions about what not to read as well as what to read, and can generally analyse and synthesise information and make judgments about what they read (Chall 1983, 2). Reading also becomes more constructive and is mainly done to integrate knowledge from various texts.

2.5 Ehri's model of reading development

Ehri (2005; 2011) proposes a model of reading development that describes the process of learning to read with four phases (to be discussed below), namely:

Phase 1: Pre-alphabetic

Phase 2: Partial alphabetic

Phase 3: Full alphabetic

Phase 4: Consolidated alphabetic

2.5.1 Phase 1: Pre-alphabetic phase

The pre-alphabetic phase occurs around the pre-school age when children have little knowledge of the alphabetic system. Children "learn to read" by memorising visual and contextual cues (Ehri 2011, 140) - they select salient cues around or in part of a word that can help them to identify and read a word. They use names of friends, restaurants and schools as well as common signs, labels and stickers in the environment as cues that guide them to read a particular word. For example, a stop sign can be *read* by focusing on its shape or red colour, but not by focusing on the actual letters of the word *stop* (Esmaeeli 2012, 11). The ability to form sound-letter correspondences to read words is not yet developed because children lack knowledge of the alphabet. Thus, children in this phase are essentially still non-readers (Ehri 2005, 173).

2.5.2 Phase 2: Partial alphabetic phase

In the partial alphabetic phase, children's alphabetic knowledge is not fully developed and they read by making connections between only some of the letters and sounds in words. During this phase, children cannot yet segment a word into all its constituent phonemes, due to their lack of alphabetic knowledge (Ehri 2011, 173). For example, they can only connect the first and final letter sounds, which are easier to detect (like "s" and "n" to read the word *spoon*). The child selects the first and final letters as salient cues to help him/her remember a word whilst letters in the middle positions are more or less ignored.

Children make a transition from "visual cue reading" to "phonetic cue reading". They begin to use phonetic cues to facilitate reading but they still rely on and use visual cues to some extent. They make a lot of spelling mistakes because they only make partial connections between the letters and sounds of a word (Ehri 2005, 143). Children at this stage still lack automatic decoding skills and have difficulties in decoding unfamiliar words.

2.5.3 Phase 3: Full alphabetic phase

At the full alphabetic phase, children have developed some word decoding skills and they have also mastered adequate knowledge of letter-sound correspondences in the spelling system (Ehri 2011, 148). At this stage, children recognise that the five letters (b, r, e, a, and d) in the word *bread* correspond to four phonemes (/b/, /r/, /e/ and /d/) and (s, p, o, o and n) in the word *spoon* correspond to four phonemes (/s/, /p/, /ʊ/, n/). Furthermore, children can also distinguish when letters do not correspond to any phonemes in words (e.g. "w" in *write*) (Esmaeeli 2012, 13). Readers can decode unfamiliar words and they can remember correct spellings of words better compared to partial phase readers (Ehri 2005, 175).

2.5.4 Phase 4: Consolidation phase

The last phase is the consolidation stage at which the letter-sound connections in words become consolidated into larger units. Children at this stage develop decoding strategies that help them to recognise letter patterns (chunks) that occur across different words (Ehri 2005, 175). These chunks include morphemes, syllables and other units such as the onset and rime. The chunks are consolidated and they become part of the child's knowledge of the spelling system. Knowing letter chunks is valuable for remembering how to read multisyllabic words (Ehri 2005, 175). For example, readers can learn a word such as *interesting* more easily, if the syllabic spellings are recognised as the chunks (in-ter-est-ing), as fewer connections are required to secure the word in memory (Ehri 2011, 150). Readers also form consolidated chunks in words that share letter patterns symbolising the same phoneme blend in different words, for example (king, thing, bring, sing) (Ehri 2011, 150). In this case, knowledge of the chunk (-ing) means that a child can read the chunk as a whole rather than as a sequence of letters and sounds, which aids automaticity in reading.

The consolidation phase marks the development of sight word reading. Ehri (2005, 168) defines sight words as words that are in one's instant recognition repertoire. Sight word reading is the ability of a child to spontaneously recognise a word by sight without too much effort, and it ensures automatic word recognition (which, in turn, assists reading fluency, accuracy and comprehension).

2.6 Implications of the two models of reading development

Both Chall's (1967; 1983) and Ehri's (2005; 2011) models of reading conceptualise reading as a gradual process in which children progress from lower to higher skills in reading acquisition. According to Siok and Fletcher (2001, 34), stage models as put forward by Chall (1983) holds the view that all children pass through the same stages in the same order when learning to read, irrespective of the orthography of the language. The development at each stage is dependent upon adequate development at the prior stages (Canine et al. 2004, 14).

Ehri's (2005) model of reading development provides an interactive approach to word reading. The model conceptualises reading development in terms of phases rather than stages. According to Ehri (2011, 137) the use of the term 'stage' denotes a stricter view to reading development whilst the term 'phase' relaxes such constraints. The interactive approach acknowledges a bottom-up and a top-down approach to reading (Pneuman 2009, 36). It acknowledges that while the reading process can proceed from acquisition of smaller to larger units, prior contextual knowledge also influences reading development. Children are not restricted to a strict order in reading development but can make connections from different kinds of knowledge in each phase. This means that children do not necessarily have to master one skill before they develop another skill (Esmaeeli 2012, 11).

In the present study, the reading development models of Chall (1997) and Ehri (2011) were used to inform the choice and design of phonological tasks and reading tasks for the purpose of data collection. The tasks must be suitable to the cognitive level of the Grade 3 learners under study. According to Chall's (1997) model, Grade 3 learners should fall in the confirmation and fluency stage -learners at this stage begin to read simple texts more fluently but are not yet fully developed readers. Ehri's (2011) model does not clearly predict in which of the four phases of reading development the population under study might fall, but one could assume that the learners under study should fall into phase 3 or 4. Importantly, however, Grade 3 learners are not fully developed readers and thus the phonological and reading tests must ensure that the stage/phase in terms of reading development of learners is catered for in designing and/or selection of the tasks. The design and selection of phonological tasks used in this study will be discussed in chapter 4.

2.7 Word recognition skills in reading development

Word recognition (WR) is the ability to determine and identify a written word, (Kurvers 2007). It is the most integral part of reading (Seidenberg and McClelland 1989, 255) and at the same time a lower level process of reading (Yamashita 2013, 1). WR involves decoding skills. Decoding in reading is a mental process through which the individual assigns a mental sound to each written letter (Travers 2005, 5). The process of decoding depends on the language and how oral language is encoded in the writing system. Learning how to read involves learning how one's writing system goes about encoding one's spoken language (Perfetti 2001, 12800). The alphabetic principle and automatic WR are two concepts involved in development of WR skills.

2.7.1 The alphabetic principle

Mastering the alphabetic principle of a particular language facilitates the development of WR skills. Reading in any alphabetic orthography requires the discovery of the alphabetic principle (Nieto 2005, 83). In other words, children have to develop alphabetic insight (Yang 2009, 4), which is the starting point of acquiring decoding skills (Ziegler and Goswami 2005, 1). The alphabetic principle entails understanding the relationships between written letters and spoken sounds (Pneuman 2009, 134). For instances the child must be able to link the letter "p" in print with the sound /p/. Lack of mastery and application of the alphabetic principle can negatively affect the decoding process (Nieto 2005, 82).

The alphabetic principle is often complicated by the fact that letter-sound relationships are not always consistent (Seidenberg and McClelland 1989, 257). For example, some English sounds are represented by more than one letter, as when /k/ is alternatively represented with "c" (*cat*), "k" (*kit*), or "ck" (*pack*) (Treiman 1999, 6). Similarly, for the vowel sound /i/, there are several different representations, such as "ie", "e", "ei", "I", "y", "ea", and "ee" (Catts and Kamhi 2005, 35). The lack of a one-on-one relationship between sounds and letters often prevent accurate mapping of letters to their corresponding sounds (especially in beginning readers) and makes learning to read a slow and difficult process (Yang 2009, 10).

The development of the alphabetic principle relies upon PP abilities. Proper application of the alphabetic principle rests on an awareness of the internal phonological structure of words that the alphabet represents (Liberman, Shankweiler and Liberman 1990, 1). Particularly, phonemic awareness sets the basis for mastering the alphabetic principle. Pang et al. (2003, 9) argues that children who are able to attend to the individual phonemes in alphabetic languages are much more likely to learn the alphabetic principle and, therefore, learn to recognise printed words quickly and accurately. A PP difficulty can lead to a failure in mastering the alphabetic principle and subsequently to developing decoding skills (Nieto 2005, 82).

Children must be taught the alphabetic system systematically and explicitly (Pneuman 2009, 135). Explicit phonics teaching in an organised, systematic and efficient way, using a well-designed curriculum, can help children to establish letter-sound relationships (Torgesen 2002, 14; University of Oregon 2009, 69). Children can develop reading skills independently, but explicit instruction by teachers forms a crucial part of the process. Children need to be sensitised to the systematic relations between letters and sounds and how to apply the relationship in reading.

2.7.2 Automaticity in word recognition

The ultimate goal of WR is recognising words automatically (Warrington 2006, 52). Ehri's (2005) model of reading development refers to the stage of WR automaticity as 'sight word reading'. Automaticity entails knowing the pronunciations and meanings of written words immediately upon seeing them, without expending any attention or effort in decoding the words (Ehri 2011, 151). WR becomes automatic when the process is speedy, effortless and lacks conscious awareness (Logan 1997, in Kuhn et al. 2010, 231). Once lower level WR skills become automatic, the conscious awareness of the sub-skills that comprise them disappears (Warrington 2006, 52), and reading becomes a rapid and efficient process.

The stage at which children develop automatic WR skills is usually marked as the orthographic stage (Ehri 2011, 151; Catts and Kamhi 2005, 35). The orthographic stage comes after children have acquired the alphabetic principle. Automatic WR involves the development of strong orthographic representations (Hook and Jones 2004, 16) and at this stage children rely on letter sequences and spelling patterns (orthographic knowledge) to recognise words without activating phonological knowledge (Yang 2009, 5). For example, the orthographic patterns that children usually detect include regularly spelled morphemes (e.g. *-ing, -ed, -able, and -ment*) or words that share common orthographic neighbourhoods (e.g. *-each* in *teach, preach, and reach)* (Catts and Kamhi, 2005, 35). Seidenberg and McClelland (1989, 567) emphasise that children must take advantage of these regularities to enhance the development of automatic WR.

2.8 Reading fluency in reading development

Reading fluency (RF) is the skill to read text quickly, accurately, and with proper expression while maintaining the flow of information (Pikulski and Chard 2005, 511; Pang et al. 2003, 11). A fluent reader is not easily distracted and reads in an effortless manner (Torgesen and Hudson 2006, 4). Fluency in reading starts developing during the earliest ages or grades (Hook and Jones 2004, 16). Chall's (1983; 1997) model of reading development refers to this stage as the confirmation and fluency stage.

There are three factors that are critical for the development of RF, namely automatic WR, reading accuracy and the ability to read with prosody (Kuhn et al 2010, 231; Warrington 2006, 52; Pikulski and Chard 2005, 511). A child who has developed some automaticity in WR acquires RF easily. Most fluent readers read quickly and accurately while at the same time maintaining a flow that allows them to understand the text. A child who develops automaticity in WR is likely to be successful in reading development. Without basic automatic decoding skills, reading is an arduous process.

Reading accuracy facilitates RF (Kuhn et al. 2010, 238; Hook and Jones 2004, 16). A child has to acquire reading accuracy prior to RF. Word reading accuracy is the ability to decode words properly and precisely (Torgesen and Hudson 2006, 4). Torgesen (2002, 11) argues that inaccurate WR causes slow growth of RF skills, seeing that inaccurate WR disrupts the flow of information and can have a far reaching negative impact on the development of RF. The ability to read with an appropriate prosodic structure also characterises RF. Fluent reading involves the application of appropriate prosodic features (rhythm, intonation and phrasing) at the phrase, sentence and text level (Hook and Jones 2004, 16). Application of proper prosodic features makes reading enjoyable. Prosodic reading involves appropriately chunking groups of words into phrases or meaningful units in accordance with the syntactic structure of the text (Kuhn and Stahl 2003, 5). Children who are able to apply prosodic features are likely to be effortless readers. According to Hook and Jones (2004, 18), a lack of RF is often evidenced by a slow, halting, inconsistent rate, as well as by poor phrasing and inadequate intonation patterns. The ability to read with an appropriate prosodic structure is often used as an index to determine whether the reader is actively constructing the meaning of the passage (Torgesen and Hudson 2006, 4).

Stanovich (1986, in Pikulski and Chard 2005, 511) argues that there is a reciprocal relationship between fluency and the amount of reading in which a reader engages. Readers who have achieved fluency are more likely to engage in more extensive amounts of reading than readers who lack fluency. RF is a bridge and stepping stone to comprehension (Kuhn et al. 2010, 240; Hook and Jones 2004, 19), since RF enables a reader to focus more on the meaning of the text. There are various models that aim to explain reading comprehension, using bottom-up, top-down and interactive processing approaches, but they will not be discussed in this chapter since reading comprehension is not the focus of this study.

2.9 Phonological processing and reading development

Reading is not a unitary skill (Snowling 2009, 3) but a complex one (Siok and Fletcher 2001, 1), drawing upon a multiple of cognitive and linguistic domains in a composite way (Nagy and Snowling 2013, 2; Hamilton 2007, 3). PP is a cognitive skill influencing reading development (Kraus and Anderson 2013, 1; Corriveau et al. 2010, 370, Hollander 2011, 39). The PP model assumes that PP encompasses a large spectrum of skills which include PA, PWM and RAN (Wagner and Torgesen 1987, 192; Wagner et al. 1994, 75; Wagner, Torgesen, Rashotte, Hecht, Baker, Burgess, Donahue and Garon 1997, 468).

2.10 Phonological processing skills and the process of reading

Wagner and Torgesen (1987, 206) posit that the three PP skills are correlated and might be interrelated to each other. However, the three PP abilities also represent independent and distinct underlying skills (Wagner et al. 1997, 469; Wagner and Torgesen 1987, 192). The contribution of PP skills to reading development is not questioned and is without doubt. The contention might arise in the manner in which these skills aid reading development. After an in-depth analysis of various literatures on PP, the current researcher conceptualises the interrelation between PA, PWM and RAN in a model of PP as shown in figure 2.3 below.

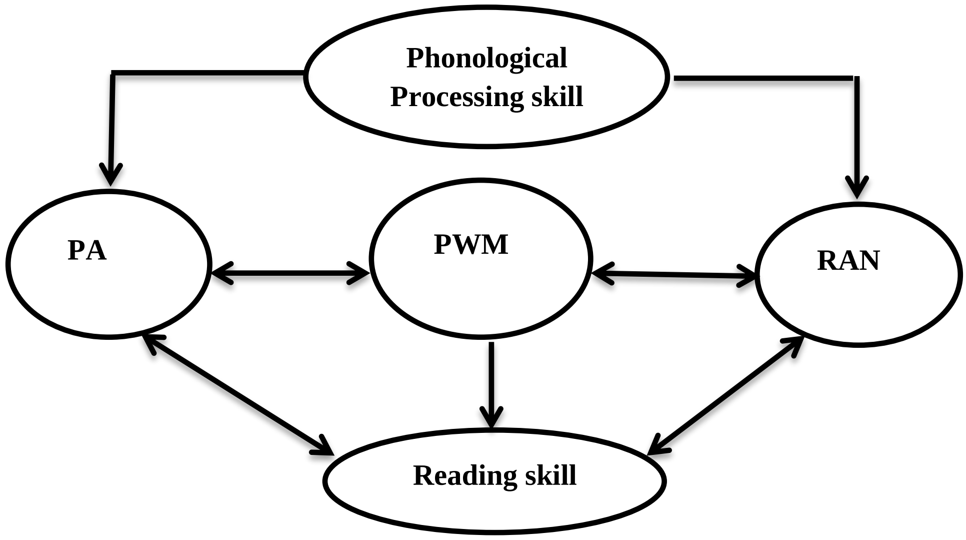

Fig 2.3 PP and reading model

The various PP skills (PA, PWM and RAN) that contribute to children's ability to acquire reading skills, will be discussed in the following subsections.

2.10.1 Phonological awareness (PA) skill

PA is the ability to recognise, identify, or manipulate any phonological structure of a language (Lane 2007, 2; Ziegler and Goswami 2005, 4; Konza 2011, 2). Learners must be sensitive to the sound structure of a particular language and develop the ability to analyse the sounds effectively independent of their meaning. PA comprises of phoneme awareness, onset/rime awareness and syllable awareness (SA) (Milwidsky 2008, 39; Nagy and Anderson 1995, 3; Anthony, Lonigan, Burgess, Driscoll, Phillips and Cantor 2002, 67). Words comprise of a sequence of individual sounds. For example, the word *cowboy* can be split into its phonemic components /c/- /o/- /w/-/b/-/o/-/y/ and the word *fish* into individual phonemes /f/-/i/-/sh/. Phonemic awareness allows a child to make connections between sounds and letters, i.e. to realise that the phonemes /k/, /æ/, and /t/ correspond to the sounds of the letters “c”, “a”, “t” in the word *cat* (Wang 2011, 18).

SA is the ability to segment and blend chunks within a word (Lane 2007, 2). It demands the child to know the syllable constituents in a word. For example, a child should be able to segment a word *cowboy* into two syllabic components /cow-boy/ and the word *telephone* into three syllabic units /tele-phone/. Syllable segmentation activities are easiest with compound words. Apart from segmenting, a child should know how to blend separate syllabic units like /im-poss-i-ble/ into *impossible* and /o-per-a-tion/ into *operation.* SA is generally mastered in kindergarten, but once children start to become familiar with the concept, teachers can introduce letter tiles or squares and manipulate them to form sounds and words (Teacher Vision 2015, 1-2).

Onset-rime awareness is the manipulation of intrasyllabic units (Lane 2007, 2). Learners identify different divisions within a syllable. Onset refers to the initial consonant or consonant cluster in a word, whereas rime contains the remaining vowel and consonants (Yang 2009, 10). Onset-rime awareness is a skill that requires the learner to split a word into its onset and rime division. For example, the word *stamp* can be divided into /st/ (onset) and /amp/ (rime). Onset-rime awareness helps children to learn about word families, which can lay the foundation for future spelling strategies (Bear, Invernizzi, Templeton and Johnston 1996, 305). Onset and rime awareness lays a good foundation in reading development.

The development of PA begins at an early age and it precedes skilled decoding (Lane 2007, 1). SA is usually present by the age of three to four, and onset-rime awareness is usually present by about age four to five (Ziegler and

Goswami 2005, 4). SA is strongest in young children, then onset awareness followed by rime awareness (Milwidsky (2008, 32). According to Richardson et al. (2004, 217), an early deficiency in extracting syllable level information from the speech stream can impair the development of the entire phonological system, including the representation of onset-rime level and phoneme-level information. The SA skills of a child should be developed as effectively as possible to enhance the development of other skills.

Phoneme awareness on the other hand, develops in response to reading instruction. It starts to develop once children are exposed to reading and writing, irrespective of the age (Ziegler and Goswami 2005; Nation and Hulme 1997, 154). Pre-reading children and illiterate adults are generally not aware of phonemes (Goswami 2006, 4). Children without formal reading instruction may not be able to identify phonemes in words. However, they might have a working (implicit) knowledge of phonemes long before it becomes conscious (explicit) knowledge (Adams 1990 in Milwidsky 2008, 31). The development of explicit representations of phonemic structures is a gradual process (Bentin 1992, 167), starting at five to seven years (Fowler 1991, 54). Reading instruction allows explicit realisation of phonemic segments to be possible.

2.10.2 The developmental models of phonological awareness

The development of PA is systematic. PA follows a hierarchical progression over a period of time from the syllable level, through the onset-rime level to the phoneme level (Anthony, Lonigan, Driscoll, Phillips and Burgess 2003, 481; Ziegler and Goswami 2005, 4; Goswami 2006, 4). Children first learn to manipulate words at the syllable level e.g. (butter-fly), followed by the awareness of onset and rime e.g. (cr-eam) and finally at the phoneme level (cr-ea-m). The hierarchical conceptualisation of PA assumes that larger linguistic units are acquired first, and that children became increasingly sensitive to smaller and smaller parts of words as they grow older (Anthony and Francis 2005, 256). This developmental progression treats the levels of

PA as though they reflect separate cognitive processes (Anthony et al. 2002, 68). PA skills are thus conceptualised as independent abilities.

However, some developmental hierarchies conceptualise PA skills as though they reflect a single cognitive ability. Stanovich (1992, in Anthony and Lonigan 2004, 44) advocate a much broader developmental conceptualisation of PA that suggests continuity between lower levels and higher levels of PA. Stanovich conceptualize PA along a continuum that begins with a ‘shallow’ awareness of large phonological units such as words, syllables, onsets, and rimes to a ‘deep’ awareness of smaller units such as phonemes at a later stage. Sensitivity to shallow PA skills builds the foundation for the development of deep and more complex PA skills. Though the two developmental hierarchies of PA differ on whether PA skills reflect a single ability or independent separate abilities, they agree on the hierarchical development from large level to small level of PA

2.10.3 The importance of PA in reading development

Research has shown that PA is the most important predictor of reading success (Bradley and Bryant 1983, 301; Wagner and Torgesen 1987, 192; Wagner et al. 1994, 84; Antony and Lonigan 2004, 43). The three levels of PA have been found to be differentially related to reading acquisition (Snow, Burns, and Griffin 1999, 101; Stanovich, Cunningham and Cramer 1984, 175) with phoneme awareness emerging regularly as the strongest predictor of reading ability compared to SA and onset/rime awareness (Newmans, Tardif, Huang and Shu 2010, 242; Nation and Hulme 1997, 164; McBride-Chang, Bialystok, Chong and LI 2004, 93; McBridge-Chang, Tong, Shu, Wong, Leung and Tardif 2008, 186). These findings suggest that the three levels of PA skills have varying predictive power in terms of the development of reading.

PA skills are needed most in the initial stages of reading development, when reading mostly depends on phonological decoding (Boets et al. 2008, 37) PA impacts on reading by creating a foundation for phonological decoding to take place. According to Pugh et al. (2012, 2), PA instils in the learner a sensitivity to component features of spoken words which creates the metacognition foundation necessary for learning to associate letters with the phonemes they represent. As discussed earlier, the process of understanding these relations is referred to as mastering the alphabetic principle (Shankweiler 1992, 224; Yang 2009, 4).

Deficits in PA and the consequent failure to master the alphabetic principle impede the development of an efficient letter-sound decoding routine (Pugh et al. 2012, 2), which lead to subsequent reading failure. It is therefore important to facilitate enhancement of PA skill at a young age to curb reading failure (Vermaak 2006, 29). PA skill is a trainable skill, and evidence proves that training of PA skills for high risk pre-school children can have beneficial effects on subsequent reading trajectories (Byrne et al. 2008, 20).

2.10.4 The relationship between PA and reading

There are three views concerning the nature of relationship between PA and reading. The first view states that there is an intimate and causal relationship between children's PA skills and learning to reading (Nation and Hulme 1997, 154; Wagner et al. 1994, 73; Wagner et al. 1997, 468; Bradley and Bryant 1983, 301; Hulme, Snowling, Caravolas and Carroll 2005, 362; Kjeldsen, Niemi and Olofsson 2003, 263). A causal relationship between PA and reading means that PA is a prerequisite or trigger for reading development (Bentin 1992, 175). The causal relation between PA and reading is regarded as proximal (Chung et al. 2013, 205) in the sense that PA has a direct causal influence on a child's ability to read. Contrary however, Castles and Coltheart (2004, 88) argue that the causal influence of PA on reading is distal. Distal causality means that the effect of PA on reading is not immediate but is influential at some later stage in reading development.

The second view states that PA is a consequence of reading ability (Morais, Cary, Alegria and Bertelson 1979, 330; Morais, Alegria and Content 1987, 425). PA is a by-product of learning to read. The development of reading fosters the children's awareness of the phonological components of a language. Hence, PA may not be a precondition for learning to read (Siok and Fletcher 2001, 24).

The third view supports the idea that the relationship between reading and the development of PA is a bidirectional/reciprocal one (Stanovich et al. 1984, 189; Nation and Hulme 1997, 154; Bentin 1992, 175; Wagner et al. 1994, 73). PA plays a causal role in reading development whilst reading knowledge may in turn enhance development of PA. Causation runs in both directions. Goswami and Bryant (1990, in Siok and Fletcher 2001, 29) suggest that awareness of larger linguistic units such as syllables and onset/rime develops preliterately and is causally related to reading acquisition, while awareness of smaller linguistic units, such as phonemes, develops later and is possibly a consequence of learning to read. The relation between PA and word-level reading becomes bidirectional after children receive reading instruction (Yang 2009, 14). However, some have argued that this bidirectional relation of PA and reading is present relatively early in the development of reading skills, possibly prior to the onset of formal reading instruction (Burgess and Lonigan 1998, 117).

2.11 Phonological working memory skill

PWM is the coding of sound-based representations of spoken sounds or written symbols for temporary storage in working (or short term) memory (Wagner et al. 1997, 469). It involves the use of phonological codes to represent information for temporary storage. For instance, children code information according to its phonological features, such that *daddy* may appear different from *doggy* (Goswami 2000, 133). The term PWM and phonological short-term memory (PSTM) are often used interchangeably (Pneuman 2009, 83; Brady 1986, 147). Attempts have been made to differentiate the two based on their functions. 'Working memory' is widely used to refer to an active and dynamic system used to store information while engaging in other cognitively demanding activities (Ellis 2007, 46) whilst 'short-term memory' is a more passive capacity to store material over short periods of time, in situations that do not impose other competing cognitive demands (Miettinen 2012, 33; Gathercole, Alloway, Willis and Adams 2006, 20). Although this difference may seem to be clear cut, the exact difference between short-term memory and working memory remains unclear (Miyake and Shah 1999, 2). PWM and PSTM are better treated as one element of the brain function but in principle the two might differ. This study does not aim to determine the differences that might exist between the two, and thus the PWM and PSTM shall be used interchangeably.

2.11.1 A model of working memory (Baddeley and Hitch 1974)

The concept of PWM is derived from a working memory model proposed by Baddeley and colleagues (Baddeley and Hitch 1974; Baddeley 2000), which is depicted in Figure 2.4 below.

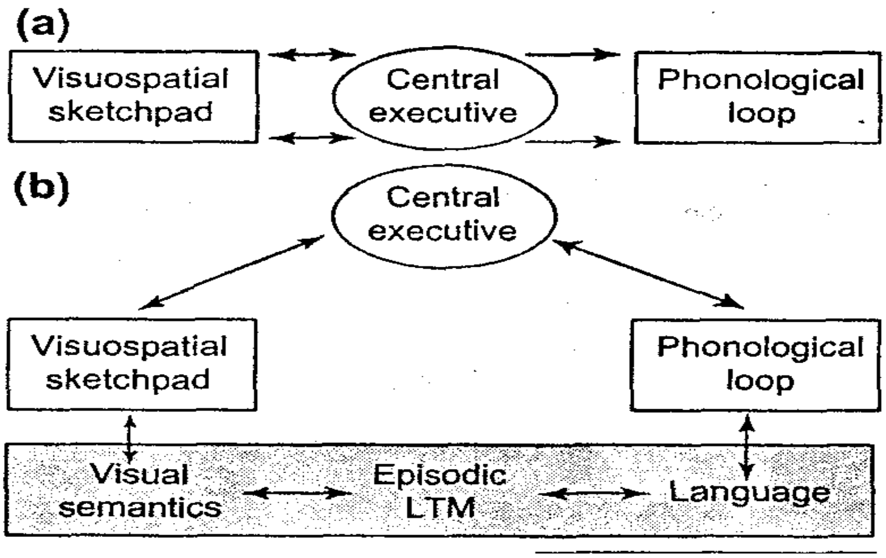

Fig 2.4 Baddeley and Hitch (1974) and Baddeley (2000) working memory model.

The model assumes that the working memory system comprises of three subsystems namely, the phonological loop, visuo-spatial sketchpad, and central executive (Baddeley and Hitch 1974). The working memory model proposed by Baddeley and Hitch (1974) was later revised and extended by Baddeley (2000) who proposed a fourth subsystem which is the episodic buffer. The phonological loop is responsible for temporal storage of phonological information. The visuo-spatial sketchpad is in charge of maintaining visual and spatial information. The central executive coordinates the information flow within the working memory system, facilitates attentional control, as well as the retrieval of information from more permanent knowledge stores, and oversees the integration of working memory with long-term memory (Baddeley 2000, 5; Gathercole 1999, 410).

The central executive is described as the most crucial element of working memory with the visuo-spatial sketchpad and phonological loop operating as "slave-systems" (Baddeley 1992, 257). The central executive coordinates the visuo-spatial sketchpad and the phonological loop subsystems. These two subsystems do not perform any duty other than holding information in a relatively passive manner (Gathercole 1998, 1). The episodic buffer is a temporary storage system with limited capacity, which has the capacity of integrating information from multiple codes used by the other subsystems (visuo-spatial sketchpad, the phonological loop) and long-term memory (Baddeley 2000, 5).

The most widely researched component of the working memory system is the phonological loop, also referred to as PWM or PSTM (Gathercole and Baddeley 1993, 25; Gathercole 1998, 1; Kornacki 2011, 1; Miettinen 2012, 38). One of the best known ways to operationalise PWM is via the non-word repetition task, where participants have to repeat non-words of varying length (Kormos and Sárfár 2008, 262). Other tasks include the memory span task, whereby a sequence of items such as digits must be repeated back immediately in the order of presentation (Baddeley 2000, 3).

According to Gathercole (1999, 415) non-word repetition provides a more sensitive measure of PWM capacity than measures such as digit recall, because of the absence of any stored lexical specification of the phonological structure of a non-word. It is a more effective measure of PWM because there is no stored information about the non-word in the long term memory. Some research evidence however, have shown that non-word repetition is less valid as a measure of PWM when conducted in the L2 (Gathercole 1995, 91;

Masoura and Gathercole 2005, 385; Engel de Abreu, Baldassi, Puglisi, Befi-Lopes 2012, 640). Furthermore, research have shown that non-word repetition can also be mediated by long term phonological and lexical knowledge (Gathercole et al. 1991, 349; Gathercole and Adams 1994, 674, Gathercole 1995, 91; Kornacki 2011, 19; Miettinen 2012, 162). This means that there is also interference of existing lexical knowledge on non-word repetition tasks.

The phonological loop is located in the left temporoparietal region of the brain (Baddeley 2003, 831; Caylak 2010, 3) and it comprises of a short term phonological store and an articulatory rehearsal component or articulatory loop. The short term phonological store is responsible for storing auditory information temporarily in the phonological form (Gathercole 1998, 1). For instance, when auditory information is presented (e.g. when one is given a phone number but don't have a pen to write it down), speech sounds are analysed and fed into the phonological storage system, where the memory traces remain for a few seconds before they decay (Kornacki 2011, 1). This fading of phonological representations within the store is assumed to occur within about 2 seconds (Gathercole and Baddeley 1990, 337).

The decaying of information can however be offset by the articulatory loop mechanism which is responsible for refreshing the auditory information (Baddeley 2000, 3). For example, the information received in the phonological store is fed into the articulatory rehearsal system, where it can be rehearsed subvocally (i.e. repeating the phone number in the mind) and then reactivated in the phonological store (Baddeley et al. 1998, in Kornacki 2011, 1). The articulatory rehearsal system plays an important role of reviving the information so that it cannot decay.

Information gains access to the phonological loop through one of two routes. The direct route involves auditory input which gains obligatory access to the phonological store whilst the indirect route is available for information which is not presented in spoken form but which can be recoded internally into a phonological code by accessing stored knowledge of its label (Gathercole

1998, 1). Examples of information that enters the phonological loop indirectly through the rehearsal system include visual inputs such as pictures, printed forms of familiar words, written letters or words. The other role of the articulatory rehearsal mechanism is converting visual input into phonological codes (Baddeley 2000, 5). A central principle of the working memory model is that the temporary storage of information may play an important role in a range of complex cognitive tasks such as learning, comprehension and reasoning (Gathercole and Baddeley 1990, 336). The working model provides a framework for understanding the role of a storage system of information in performing cognitive processes.

2.11.2 The development of phonological working memory

The working memory system of a child appears to be functional at birth (Gathercole and Baddeley 1993, 25-26) but the phonological loop appears to be functional from at least three years of age (Gathercole 1998, 2). PWM capacity improves with increasing age. Gathercole, Willis, Emslie, and Baddeley (1991, 365) point out that the PWM develops very rapidly in the early school years, reaching the adult level at about the age of 12. This rapid increase in PWM development is influenced by the efficiency of the subvocal rehearsal component. An increase in subvocal rehearsal efficiency means that more information can be held in the phonological loop and continuously recycled without decay which results in the increased PWM capacity of a child (Gathercole 1998, 2; Gathercole and Baddeley 1993, 26-31).

The rehearsal component of the PWM is not very efficient until children reach about seven years of age (Gathercole and Hitch 1993, in Miettinen 2012, 38) and around that age more information can be held in the phonological store (Gathercole 1998, 2), resulting in a better PWM. Children’s speaking rate increases as they grow older, which also increases the efficiency of their rehearsal systems.

2.11.3 The importance of phonological working memory in reading

PWM skills have been linked to reading achievement (Gathercole and Baddeley 1993, 259; Gathercole 1995, 83; Ferreira, Valentin and Ciasca 2013, 7; Kormos and Sárfár 2008, 261; Dahlin 2010, 11). PWM maintains phonological information necessary in reading; it retains words, phrases or sentences while they are being processed, for brief periods, so that longer units of text can be comprehended (Baddeley 1992, 255). Learning to read requires a child to retain information in the memory system while engaging in a task. PWM appears to make a critical contribution to reading development at the point at which relationships between letters and sounds are being acquired (Gathercole and Baddeley 1990, 358) and efficient phonological coding of information enables the beginning reader to maintain an accurate representation of the phonemes associated with letters or parts of words (Wagner et al. 1997, 369).

PWM promotes word reading and text comprehension. According to Ellis (2007, 38), PWM supports the acquisition of reading skills, from the execution of efficient reading to the understanding and retention of what we read. The nature of the contribution of PWM to the acquisition of reading skills appears to be complex and highly dependent on the level of reading expertise (Gathercole and Baddeley 1990, 358). The early stages of learning to read places more demand on the PWM skill; a beginning reader explicitly relies on an efficient storage system to crack the reading code (Wagner and Torgesen 1987, 193). Skilled reading, on the other hand, places less demands on the PWM since the functioning of the PWM becomes automated when reading skills become stronger (Gathercole 1998, 4; Numminen 2002, 1).

Research evidence shows that poor PWM may be one of the underlying mechanisms causing reading difficulties, because typical reading comprises the maintenance of phonological representation in the working memory system (Gathercole, Alloway, Willis and Adams 2006, 17; Chiappe, Hasher and Siegel 2000, 169; Siegel and Ryan 1989, 973). Poor readers may have a deficit specific to the phonetic coding of information in the working memory.

A reduced PWM capacity means that the storage system cannot readily retain information for processing, leading to reading failure. It has been claimed that a defective PWM may result both from poorly-specified phonological representations and poor phonetic coding skills (Numminen 2002, 3; Wang 2011, 30). A difficulty in PWM skill slows down the reading process because the phonological features of sounds are encoded defectively and are being lost quickly in the memory (Gathercole and Baddeley 1993, 71).

Encoding is the process of translating information into a form that can be stored and retrieved efficiently (Ellis 2007, 42). Poor encoding leads to poor storage and information retrieval. If phonological encoding is inefficient, only parts of the phonetic material of the input can be stored in the lexicon (e.g. *sub* for subway or *croco* for crocodile), or relatively full but not complete representation can be provided (e.g. *cro?dile*), where the question mark indicates that any unspecified segment can be inserted which fits with the phonotactic rules of English (e.g. *crowdile, cropodile*) (Park 2013, 33). A problem in establishing clear and accurate phonological representations will have negative repercussions on reading development.

Inaccurate coding of phonological information also affects the establishment of long-term PWM representations. If the temporary trace in the PWM system is not distinct and durable enough, forming more permanent phoneme representations in long-term memory is unlikely or at least very difficult (Miettinen 2012, 40; Numminen 2002, 2), which in turn may negatively affect the acquisition of the letter-sound correspondences crucial for learning to read (Wilsenach 2013, 18). A contrary view suggests that there is no relationship between PWM and reading disability. Some studies have shown that although memory deficits are prominent in poor readers they are not universal and not consistently linked to reading disability (Torgesen and Houck 1980, 159; Brady 1991, 10). The degree to which PWM deficits affect reading progress is thus somewhat controversial. However, it is possible that some methodological and conceptual differences between studies may have led to different findings on the relationship between PWM and reading.

2.11.4 The relationship between PWM and reading development

The relationship between PWM skill and reading seems to be causal. Research evidence has shown that the efficiency of phonetic coding in working memory is causally related to the acquisition of reading skills (Mann 1984, 124; Share, Jorm, Maclean and Matthews 1984, 1309). A causal connection means that reading development is a consequence of PWM skills. However, current evidence suggests that although PWM is significantly associated with reading achievements over the early years of reading instruction, its role is as part of a general PP construct related to reading development rather than representing a causal factor per se (Wagner et al. 1997, 478). This view suggests that there is no causal linking between PWM and the process of learning to read.

2.12 Rapid automatised naming skill

RAN is the ability to name, as quickly as possible, visually presented familiar symbols (Georgiou et al. 2013, 1) and it is divided into two broad subdivisions namely alphanumeric RAN (i.e. letter and digit naming) and non-alphanumeric RAN (i.e. objects and colour naming) (Lervåg and Hulme 2009, 1040). RAN can be assessed using serial and discrete naming trials. The standard format (serial) for RAN tasks involves laying out a series of letters, digits, drawings of common objects or colour samples in five rows of ten stimuli each and the participant is required to name each stimulus in order, from left to right and from top to bottom, as quickly as he/she can (Stringer, Toplack and Stanovich 2004, 892). In another format, (discrete-or isolated format), stimuli are individually presented, usually on a computer screen and in between each presentation, a blank screen is shown for a set amount of time (i.e. interstimulus interval) and the time necessary to name each stimuli is recorded (Logan, Schatschneider and Wagner 2012, 4).

The metric for RAN tasks is the naming speed, typically measured by the average time it takes the participant to name all the stimuli in a series after they are presented (Logan et al. 2012, 4). If an individual takes much longer than average to name all the stimuli, that individual is said to have a naming speed deficit (Norton and Wolf 2012, 434). One construct that plays a role in naming speed is ‘automaticity in task performance’. The automaticity theory suggests that the more familiar or rehearsed a child is with, for example, letter names, the more automatic the process of naming them becomes and, as a result, the faster a child names them (Bowers, 1995, in Logan et al. 2012, 3). The RAN process becomes less effortful and more automatic with more exposure and practice. Thus, the processing speed increases with increasing age (Kail and Hall 1994, in Logan et al. 2012, 3).

The development of RAN depends on the integrity of left-hemisphere circuits, involving the left mid-fusiform area (Lervåg and Hulme 2009, 1046), the left inferior frontal gyrus, left posterior middle frontal gyrus, and bilateral inferior occipital areas (Misra et al. 2004, in Norton and Wolf 2012, 443). However, there is also emerging evidence showing that the development of non-alphanumeric naming may diverge from alphanumeric naming, suggesting that different cognitive processes may be involved in these different subtasks (Waber et al. 2000, in Arnell, Joanisse, Klein and Busseri 2009, 174).

There is controversy regarding whether RAN should be considered a PP skill or whether it is an independent process. One view incorporates RAN under the PP skills, together with PWM and PA. A major argument that has been made for including RAN as a part of a larger phonological construct is that RAN tasks require the participant to rapidly transfer presented visual symbols to phonological codes retrieved from the long term memory store (Wagner and Torgesen 1987, 192; Wagner et al. 1994, 75). When faced with a RAN stimulus, a child searches for a phonological representation of that visual stimulus before articulation. A deficit in RAN skills, therefore, represents a difficulty in efficiently and automatically retrieving stored phonological representations (Arnell et al. 2009, 173).

Norton and Wolf (2012, 437) argues that to subsume RAN under PP for this reason alone would, however, be inaccurate. An alternative view suggests that though RAN has a phonological component, they represent independent cognitive functions in that RAN also taps a distinct process namely, the ability to form orthographic representations (Wolf and Bowers 1999, 415; Wolf and Bowers 2000, 323). RAN also requires sensitivity to orthographic units. Hence, under this view, RAN should be treated as a distinct component that is independent of PP. In this study, RAN is considered to be a phonological process, but the researcher hopes to shed more light on whether RAN should be seen as an independent cognitive skill, or whether it indeed forms part of PP skills.

2.12.1 The importance of RAN in reading development

Research has proven that RAN predicts reading abilities across orthographies (Kirby, Parrila and Pfeiffer 2003, 4; Furnes and Samuelson 2011, 25) and that alphanumeric RAN is a stronger predictor of reading ability than non-alphanumeric RAN (Wagner et al. 1997, 476; Schatschneider, Fletcher, Francis, Carlson and Foorman 2004, 265). Furthermore, RAN correlates with reading much more strongly when presented in a serial form than in a discrete format (Protopapas, Altani and Georgiou 2013, 914; Logan et al. 2012, 15). Contrary evidence however, suggests that RAN is not so clearly linked to successful reading (Heath and Hogben 2004, 761, Boets et al. 2008, 37).

RAN has been conceptualised as an index of automaticity in lower level word reading processes (Norton and Wolf 2012, 429) and also as an index of fluent reading processes (Lervåg and Hulme 2009, 1040). A deficit in RAN may lead to slow and effortful word recognition which in turn affects higher-level comprehension processes. Research has proven that early differences in RAN abilities are predictive of later reading difficulties (Wimmer, Mayringer and Landerl 2000, 668; Wolf and Bowers 2000, 323). Slow naming speed primarily represents a deficit in the ability to form orthographic representations and/or a general underlying impairment in the ability to process sequences of rapidly presented brief information (Wolf and Bowers 1999, 435).

More recently it has been suggested that a RAN deficit is more problematic only if combined with a PA deficit and that the two deficits reflect a general impairment in automatising low-level sub-processes involved in reading (Wolf and Bowers 1999, 435; Wolf, Bowers and Biddle 2000, 387). The double deficit hypothesis predicts that an interaction between PA and RAN influence reading development. This view is supported by studies showing moderate to high correlations between PA and RAN, and that the association between RAN and reading is mediated through PA (Wagner, et al., 1994, 81; Wagner et al. 1999; Swanson, Trainin, Necoechea, Hammill 2003, 407). The relationship between RAN and PA however, still remains unclear (Cristo and Davis 2008, 8). Some studies have found the RAN and PA association to be weak (Cornwall 1992, 535) and that RAN and PA account for independent variance in reading achievement (Cristo and Davis 2008, 14; Wimmer et al. 678; Kirby et al. 2003, 4), suggesting that RAN and PA are separate constructs (Norton and Wolf 2012, 438).

One reason why RAN might predict reading skill is that RAN is an apparent analogue of the reading process (Stringer et al. 2004, 892), which relies on the same cognitive processes. Both RAN and reading requires the implementation of serial processing (Protopapas, Altani and Georgiou 2013, 194; Georgiou et al. 2012, 70), the identification of a visual stimulus, the connection of orthographic and phonological representations, the assembly of a verbal response and its articulation, and finally visual scanning to the next stimulus or line to repeat the process (Stringer et al. 2004, 892; Norton and Wolf 2012, 430). Though the reasons for RAN-reading connections are clear, there is however, no straightforward conceptualisation yet that explains how the processes underlying naming speed affects word identification and word decoding (Wolf et al. 2000, 396).

2.12.2 The relationship between RAN and reading development

RAN supports reading development. Lervåg and Hulme (2009, 1040) argue that there are three possible relationships between RAN and reading. The first view is that RAN has a basic causal influence on the acquisition and development of reading skills (Wagner et al. 1994; Lervåg and Hulme 2009, 1040; Wimmer et al 2000, 678; Wolf and Bowers 1999, 436). Thus, the ability of a child in RAN facilitates and enhances the process of learning to read.

A second view is that RAN is a consequence of reading. Research evidence proves that differences in RAN arise, at least in part, as a consequence of differences in reading ability (Bowey 2005, 19). RAN is thus a result of learning to read. The third view suggests that there is a bidirectional causal relationship between RAN and reading. RAN taps mechanism that causes differences in learning to read and such differences might cause differences in RAN (Kirby et al. 2003, 4). The relationship between RAN and reading is thus seen as reciprocal.

2.13 Phonological processing deficit and reading difficulties

A PP deficit is predicative of many cases of reading disability (Farmer and Klein 1995, 480). A PP deficit arises because phonological representations of words do not appear to be stored in the detailed and well-specified manner required for learning letter-sound relations (Thomson and Goswami 2010, 453; Meng 2005, 293). The phonological deficit theory holds the view that reading disability stems from a PP deficit.

2.13.1 The phonological deficit theory

The proponents of the phonological deficit theory are Snowling (2000), Stanovich (1998) and Ramus (2003; 2004). The basic assumption of the theory is that a PP deficit is a primal cause of reading difficulties (Ramus 2004, 2, Stanovich 1998, 17). The theory assumes that individuals with reading difficulties have difficulties in the phonological representation, storage and retrieval of speech sounds that hinders learning letter-sound associations, that negatively affects reading development (Ramus 2003, 1). A PP deficit manifests as a result of a deficit either in PA, RAN and PWM.

Recent research support the idea of an underlying PP deficit being causal to reading disability (Stanovich et al. 1984, 189; Mann 1984; Ahissar et al. 2000, 6837; Boets et al. 2008, 37; Law, Vandermosten, Ghesquière and Wouters

2014, 10). However, while this theory is supported by much current research, others reason that even as the core phonological deficit is appropriate, it cannot always be utilised for all children who experience struggles with reading (Mody, Studdert-Kennedy and Brady 1997, 199). The most obvious way to challenge the specificity of the PP deficit is to postulate that it is secondary to a more basic auditory deficit (Caylak 2010, 8).

In fact, there is no agreement about the exact nature of a PP deficit. One view suggest that a PP deficit stems from a more general auditory deficit (Tallal and Gaab 2006, 296; Ramus 2003, 1; Ramus 2004, 2). Poor PP may be due to problems with general AP abilities. Contrary research evidence has shown no reliable relationship between general auditory and PP measures (Heiervang, Hugdahl and Stevenson 2002; Share, Jorm, MacLean and Mathews 2002, 151). Some have challenged the auditory view by arguing that the phonological impairments in individuals with reading difficulties are in origin speech-specific and cannot be attributed to a more general auditory deficit (Studdert-Kennedy and Mody 1995, 513; Studdert-Kennedy 2002, 11). In other words, a PP deficit is traceable to a deficit in speech perception per se. A conciliatory view by Zhang and McBridge-Chang (2010, 332) is that a PP deficit may stem from either general AP level or at the speech perception level or both.

2.14 Gender differences in phonological processing and reading

Gender differences in reading attainment are one variable which needs to be considered in any reading research. According to Martino and Keller (2007, 407), boys' failure and under-achievement in literacy testing, relative to girls, has been an issue of concern. The PIRLS 2011 research in RSA found that girls outperformed boys on reading (Howie et al. 2011, 28). This situation is not unique to RSA. International studies show that girls generally perform better than boys with regard to reading acquisition (USAID 2013, 1). Some scholars have suggested that such gender differences in reading abilities are non-existent (Shaywitz et al. 1990, 8; Shaywitz and Shaywitz 2004, 2) and that the underachievement of boys in reading appears to be overstated (White

2007, 570). Klinger, Shulha and Wade-Woolley (2010, 5) however, indicates that there are no studies in which boys performed better than girls in reading. The issue of gender differences in reading development needs to be investigated further.

Gunzelmann and Connell (2006, 2) state that there are multifaceted causes of gender discrepancies in reading, which include biological differences. The biological theories believe that girls have a different biological make-up which gives them an advantage in reading acquisition over boys. They argue that the differences are rooted in differential brain wiring and maturation rates (White 2007, 3; Watson, Kehler and Martino 2010, 357; Sauver, Katusic, Barbaresi, Colligan and Jacobsen 2001, 787).

The 'brain wiring view' states that girls have an advantage in reading because they are "left brained whilst boys are right brained" (Alloway et al. 2002, 54). The differences in reading success are caused by the use of different brain mechanisms. The left hemispheric brain strength of girls suggests enhanced language skills, which allows for advantages in reading, whilst the right hemispheric strength of boys is more dedicated to visual-spatial and visual motor skills, which leads to an advantage in subjects such as science, math and geography (Gunzelmann and Connell 2006, 6; Gurian and Stevens 2012, 2). These ideas are in line with the lateralisation theory which states that the left side of the brain is critical for language and speech while the right is more specialised to process spatial functions (Musa 2005, 28).

Another brain based difference regards the corpus callosum. The corpus callosum is a connecting bundle of tissues between hemispheres, located at middle of the brain. It connects and facilitates communication (i.e. transmitting of information) between the left and the right hemispheric brain parts (Gurian and Stevens (2012, 2). Girls have a bigger corpus callosum than boys - on average, 25 percent larger by adolescence (Musa 2005, 28; Gurian and Stevens 2012, 2) - which enables girls to integrate auditory and visual information from the two hemispheres more effectively (Hlabangwane 2002, 27). Thus, it facilitates reading development in the early stages of development that requires a child to integrate auditory and visual information (Ziegler and Goswami 2005, 3; Ziegler, Perry and Zorzi 2014, 1).

The 'maturational rate view' states that girls mature faster than boys and that the early development gives girls superiority in the acquisition of reading skills (Klinger et al. 2010, 4). The earlier physical maturity of girls means that they are better able to demonstrate the biomechanical skills needed in reading development and the late development of the boys' fine motor skills result in difficulties in mastering the biomechanics of reading (Alloway et al. 2002, 55; Chuy and Nitulescu 2009, 5).

Another theory is that gender differences in reading can be explained by differences in AP capabilities (Limbrick et al. 2011, 2). This theory is not unlike the maturation view. Gender differences in reading abilities are caused by the fact that AP abilities of girls develop earlier than those of boys (Gunzelmann and Connell 2006, 5; Chuy and Nitulescu 2009, 5). More precisely, girls' left hemispheres, which are responsible for AP and verbal expression, develop before boys' do and this early maturation allows girls to develop faster in reading development. Research has proven that girls tend to show greater skill in AP than boys (Rowe and Rowe 2006; Rowe et al. 2005, 16; Krizman et al. 2011; Burman, Bitan and Booth 2008; Limbrick et al. 2011, 2). This difference in AP capacity exists between boys and girls well before they start schooling.

The delay in the development of AP skills continues up to the age of 10 (Rowe and Rowe 2006, 4) - with boys processing auditory information more slowly and with boys' brains essentially receiving less information during the first decade of their life (Le Page 2002, in Rowe et al. 2004, 23). A delay in the development of AP mechanisms of boys affects their processing of sounds. Rowe, Pollard and Rowe (2005, 2) argues that a delay in AP development is indicated when a child does not appear 'to listen', and has difficulties in following verbal instructions or directions. The gender differences in AP capacity may disappear at some point as most of the boys catch up with girls in the development of AP skills (Commonwealth of Australia 2002, 105).

2.15 Conclusion

PP is an important cognitive process in reading development. There is little, if any, disagreement on the contribution of PP skills to reading development. The components of PP comprise PA, PWM and RAN which plays important parts in reading acquisition of a child. Theories of reading development were outlined and discussed. The development of reading is a stage to stage process and reading materials must be designed and presented following the cognitive development of reading. The next chapter will focus on development of reading skills in bilingual children; and will outline theories in the field of bilingual reading development.

CHAPTER 3
READING IN BILINGUAL CHILDREN

The development of reading in bilingual children proves to be a complex process. Multiple factors determine L2 reading development and these factors include L2 oral proficiency, L1 background knowledge and PP skills, just to mention a few. Theories on bilingual reading development facilitating an understanding of L2 reading have been central in the study of bilingualism. Some of these theories will be outlined in this chapter. Furthermore, the linguistic properties of NS and English and how the differences in linguistic systems impact on reading development of bilinguals will be discussed in this chapter.

3.1 Reading development in bilingual children

Bilingualism refers to the ability of an individual to communicate effectively in two languages (Butler and Hakuta 2006, 115). The two languages of bilinguals may however, not be used with the same degree of proficiency, as one language may dominate over the other and the language of reading may not be the L1 acquired (Baker 2006, 3). Thus, bilingualism does not strictly entail an equal level of proficiency and competence in both languages. A linguistic dilemma is therefore created, seeing that it becomes very difficult to determine when an individual qualifies as a bilingual.

Bilingualism is, broadly speaking, classified into ‘simultaneous bilingualism’ and ‘sequential (successive) bilingualism’. A simultaneous bilingual is an individual whose two languages are present from birth (Butler and Hakuta 2006, 118). The current global phenomenon presents a language scenario where individuals are born into a world of more than one language. Despite a community using a particular L1 on day-to-day basis, an L2 is often introduced to children at the same time that they begin to develop their L1. The exposure to an L2 often happens through a wide range of media. A sequential bilingual is an individual whose L2 is added at some stage after the L1 has begun to develop (Butler and Hakuta 2006, 118). The NS-English bilingual children in the present study are classified as sequential bilinguals.

They learn an L2 after acquiring linguistic knowledge of their L1. The language situation of the NS-English bilingual children in this study can be termed 'emergent bilingual' (Wilsenach 2013, 17). The children have early oral input in NS at home. English is formally introduced once they are enrolled in primary school.

Learning to read in two languages is a challenging task (Ehlers-Zavala 2005, 656; Strauss 2008, 19; Yildiz-Genc 2009, 407). There are a number of barriers that bilinguals have to overcome in reading development. For example, while reading in L2 shares some basic elements with reading in L1, there are important differences between the two processes (Bernhadt 2009, 3; Singhal 1998, 1).[4] Differences may exist in terms of strategy use and in the development of cognitive skills necessary for reading. For instance, there is evidence that L2 readers use more top down strategies, such as background knowledge about the topic or predictions/inferences to try and compensate for limited L2 proficiency (Yildiz-Genc 2009, 412).

Certain metalinguistic and cognitive skills that are critical for reading development emerge differently in bilingual children and in monolingual children (Bialystok 1997, in Lesaux and Siegel 2003, 1006). Other factors that determine differences between L1 and L2 reading processes are the cultural, linguistic, and educational backgrounds of the learner (Singhal 1998, 1). Though there are notable similarities and differences between L1 and L2 reading, existing literature does not provide very clear and conclusive evidence on the nature of these differences and similarities (Yildiz-Genc 2009, 407); possibly due to the interplay of various factors in the two processes.

The process of reading can be affected in different ways in bilingual children. Bilingualism can facilitate or impede L2 learners reading development (Joy

[4] L1 and L2 reading share similarities in that both processes involves the reader, the text, and the context in which the reading act takes place, the use of metacognitive strategies when constructing meaning, the orchestration of bottom-up (e.g. decoding) and top-down (e.g. making inferences) strategies, and the use of language systems with systematic and rule governed phonological, morphological, syntactic, semantic, and discourse structures (Anderson 2008, 12). These similarities make L2 reading a reflection of L1 reading?

2011, 5; Lesaux and Siegel 2003, 1005). Bilingualism can act as a catalyst to reading development but at the same time it can constrain the process. Bialystok's (2002) research framework for bilingual reading acquisition identifies three prerequisite skills that are essential for bilingual reading development, including the concept of print, oral language proficiency, and metalinguistic awareness. Using this framework, Bialystok (2002) reviewed a large body of research and literature to show how bilingualism may alter the developmental course of these skills in the learners L1 and L2. Bialystok (2002,190) concludes that the effects of bilingualism with respect to understanding the concept of print are supportive for reading, negative with respect to oral language proficiency and neutral with respect to metalinguistic awareness. Based on this framework, it can be expected that bilingualism could have both enhancing and negative effects on the reading acquisition of NS-English bilingual children, depending on the skills involved.

3.2 Theories of reading development in bilingual children

Bilingualism is a reality in the RSA, just as it is in most countries around the globe. A number of theories have been advanced in explaining reading development in bilingual children. These theories include the *linguistic interdependence hypothesis*, *linguistic threshold hypothesis*, *central processing hypothesis* and *script dependent hypothesis*. Each of these theories contribute to our understanding of how a learner's L1 and L2 relate in reading, as well as how skills in L1 reading transfer and assist in L2 reading development. The mentioned theories will be discussed below.

3.2.1 Linguistic interdependence hypothesis

The linguistic interdependence hypothesis (LIH), also known as the common underlying proficiency model, was proposed by Cummins (1991a, 2005). The LIH assumes that L1 and L2 reading abilities are interdependent. L1 reading development provides a good foundation for the development of L2 reading. The basic reading skills acquired in L1 are transferrable and facilitate L2 reading development. According to Cummins (2005, 4) there is a common cognitive proficiency across languages which facilitates the transfer of language skills (such as reading skills) from one language to another. The linguistic knowledge that a child possesses in the L1 reading becomes instrumental in developing reading abilities in the L2.

The LIH holds the view that the transfer of skills from L1 to L2 happens automatically (Cummins 1991a, 84) – the acquired L1 reading skills are readily available for and transferrable to L2 reading; and one need not re-learn reading in an L2, given that one has a certain level of L1 reading ability. In other words, once reading ability has been acquired in the L1, the same operation does not have to be reacquired in the L2 (Bernhardt and Kamil 1995, 17). Reading skills are seen as universal across languages but, according to the LIH, the L1 must be adequately developed before exposure to L2 so that L1 knowledge can effectively support L2 learning. The hypothesis not only predicts transfer from L1 to L2, but also predicts the possibility of bidirectional transfer (i.e. from L2 to L1).

Scholars have often criticised the LIH for lacking detailed information that supports the theory. For instance, August (2006, in Cui 2007, 2) notes that the hypothesis neither identifies the cognitive mechanisms involved in transferring linguistic knowledge nor elaborates on which L1 skills the L2 learners transfer, or how they transfer them. The cognitive mechanisms involved in such a mental function need to support the theory and as such an explicit explanation of how the process of transfer occurs needs to be provided. The theory falls short in this regard. The LIH further overlooks the importance of L2 language proficiency. The LIH attributes L2 academic difficulties to weak L1 skills (Bernhardt and Kamil 1995, 19) and places emphasis on increasing L1 instruction, at the expense of L2 instruction. L2 instruction is seen as not really important as long as L1 skills are fully established. According to Grabe (2009, 141), the LIH gives the impression that L2 language proficiency is not critical to L2 reading development and that L2 learners can have weak L2 proficiency, but use their L1 reading skills to carry out L2 reading tasks successfully. This is overemphasising the importance of L1 reading skills in L2 reading and neglecting the importance of proficiency in the L2.

3.2.2 Linguistic threshold hypothesis

The linguistic threshold hypothesis (LTH) was developed by Clark (1988), and was originally known as the 'short-circuit hypothesis'. More recently, this hypothesis is more commonly referred to as the LTH (Bernhardt and Kamil 1995). The LTH assumes that language is a key factor in literacy development (Bernhardt and Kamil 1995, 17; Yamashita 2002b, 84; Bossers 1991, 55; Verhoeven 2000, 313; Droop and Verhoeven 2003, 78).

According to the LTH, L2 learners must reach a threshold level (i.e. a certain cognitive level) of L2 proficiency before being capable of transferring their L1 reading ability to the L2; as such the linguistic transfer of L1 reading skills to L2 demands certain conditions. Before the linguistic threshold level of language proficiency is reached, L1 reading does not significantly contribute to learners' L2 reading (Bernhardt and Kamil 1995, 17). At any point below the threshold level, L1 linguistic skills and reading strategies will not automatically transfer to L2 reading (Taillefer 1996, 475). As a result, good readers' L1 reading skills are "short-circuited", in the sense that these readers revert to poor reader strategies when engaged in a challenging reading task in their L2 (Bosser 1991, 48; Clarke 1980, 120). These poor reading strategies make no positive impact on L2 reading. Therefore, due to deficient L2 knowledge, the skilled L1 reader cannot become a skilled L2 reader.

Research has provided clear evidence that attempts by learners to transfer L1 reading skills to their L2 are less successful when learners have a low L2 proficiency (Lee and Schallert 1997, 736; Brisbois 1995, 581). Unlike the LIH, which stresses the role of L1 reading knowledge in L2 reading, the LTH gives emphasis to the importance of linguistic knowledge of the L2 for successful L2 reading. However, the LTH does not provide empirical evidence to demonstrate what exactly the threshold level of L2 proficiency entails (August 2006, in Cui 2007, 3). There is no empirical support to suggest a threshold level of language proficiency in terms of age or linguistic cognitive level. The reason for this is that children develop and mature at different age levels, for instance, a 7 year old learner might have reached the threshold level, whereas a 12 year still has to attain that particular level.

Even so, it remains difficult to define the hypothesised threshold level in absolute terms, due to the continually changing relationship among L1 reading, L2 reading and L2 proficiency (Jiang 2011, 183; Bosser 1991, 57). Cummins (1991b, 85) argues that it is probably unrealistic to expect significant progress in clarifying the precise nature of the hypothesised threshold. The LTH has always been criticised for its lack of explanatory power, specifically with regard to the absolute nature of the linguistic threshold that a learner has to attain (August, 2006, in Cui 2007, 3). This has narrowed the scope of the theory.

3.2.3 Central processing hypothesis

The proponents of the central processing hypothesis (CPH) are Geva and colleagues (Geva and Siegel 2000; Geva 2006). The CPH is also known as the Universalist theory. The CPH theorises that there are cognitive and linguistic processes which transfer across languages and which facilitates reading acquisition in any language. According to Geva and Siegel (2000, 2), a range of cognitive and linguistic skills which facilitate learning to read in monolingual children (e.g. PA, working memory, efficient serial naming, verbal ability, speed of processing) also contribute to the acquisition of L2 reading and writing.

The theory emphasises the role of cognitive and linguistic processes in the development of reading in an L1 or L2 (Geva 2006, 1) ignoring the differences in orthographic structure that exist in languages. The CPH posits that individuals with deficient cognitive and linguistic skills will experience difficulty in acquiring basic reading skills, regardless of the language and script involved, and regardless of whether it is their L1 or L2 (Aquino 2012, 3). A child with a deficiency in auditory/phonological skills is at risk of having reading difficulties.

The CPH fails to take into consideration some language-specific constrains in the transfer of skills from one language to another. For instance, NS and English do have different linguistic structures which could mean that reading in the two languages require the acquisition of skills that are language specific. This shortcoming in the CPH is complimented by the script dependent hypothesis.

3.2.4 Script dependent hypothesis

According to the SDH, the acquisition of literacy skills is language-specific. Geva and Wade-Woolley (1998) urge that the acquisition of literacy skills is driven by specific processing requirements of the orthography and that underlying cognitive resources are tapped differentially, to the degree demanded by the orthographic characteristics of the L1 and L2 writing systems. Thus, reading acquisition varies across languages depending on the orthographic characteristics of a language. The orthographic differences determine which skills are transferrable or not from one language to another and impose certain limitations on the transfer of skills involved in learning to read in different languages.

According to the SDH the neural pathways for reading development are language specific. The transfer between languages depends on the similarity between their orthographies and phoneme-grapheme correspondences (Gorman 2009, 249). Transfer of skills is positive in languages which share similar orthographic characteristics. On the contrary, transfer is negative in languages with orthographic differences. According to Geva (2006, 2), languages differ in orthographic depth and regularity of correspondence between letters and sounds. For example, English has a ‘deep’ (also called an ‘opaque’) orthography whilst NS has a ‘shallow’ (also called a ‘transparent’) orthography (Wilsenach 2013, 20).

The assumption is that reading skills develop more slowly in languages with a deep/less transparent orthography like English than in a language with a shallow /more transparent language like NS. Transparent orthographies permit a simple, direct one-to-one correspondence between letters and sounds whilst less transparent orthographies use more complex relationships between letters and sounds (Veii and Everett 2005, 239). It has been found that bilingual children, who learn to read in two languages, progress faster in the language that is orthographically more transparent (Veii and Everett 2005, 250).

According to the SDH the prevalence of reading difficulties varies depending on the orthographic characteristics of each language. A child might experience difficulties in learning to read in L2 because of typological differences between his/her L1 and L2 (Geva 2006, 2). The greater the difference between L1 and L2, the more difficult it becomes to transfer reading skills between the two languages. Unlike the CPH which posit a universal approach in explaining reading in different languages, the SDH provides a language specific explanation to reading development (Gottardo et al. 2005, 574).

3.2.5 Implications of the theories of L2 reading

The four theories as discussed provide the basis for understanding the relations between L1 and L2 in reading. The theories agree that bilingual children employ the linguistic knowledge they have acquired in L1 to the task of acquiring reading skills in L2. The assumption common to these theories is that L1 reading processes must attain a certain developmental level in learners for L1 to effectively assist L2 reading acquisition. Children must be given time to develop the L1 before they can be expected to transfer L1 linguistic skills (including phonological skills) to L2 reading. The four theories differ on how and when L1 reading influences L2 reading development. The LIH and LTH differ in that the LIH stresses the significance of L1 reading skills, whilst the LTH advocates the importance of language proficiency in the L2. The CPH and SDH differ in that the CPH advocates for a universal approach in transfer of skills whilst the SDH gives a language-specific explanation for skills transfer. The SDH, unlike the CPH contends that there are certain language constraints that may affect transfer of skills.

3.3 Reading in a second language (L2)

The principal processes involved in L2 reading acquisition are under researched (Damber 2010, 30; Soares De Soussa and Broom 2011, 4). L2 reading is often viewed as merely a "slower version" (Singhal 1998, 1) or "slavish imitation" (Bernhardt 2005, 133) of L1 reading, which involves the use of processing skills similar to those used in L1 reading. While it might be true that L2 and L1 reading involves similar processes, there are many factors that come into play which makes L2 reading a unique phenomenon. Omaggio

Hadley (1993, in Yildiz-Genc 2009, 487) argues that even though research on L1 reading provides insights into L2 reading process, models of L1 reading cannot be applied directly to L2 reading. The factors that affect the L2 reading process are discussed in the following section.

Learning to read in an L2 is a complex, and challenging activity (Charles, Tepper and Baird 1999, 47; Segalowitz, Poulsen and Komoda 1991, 16; Strauss 2008, 16). It is more demanding to attain a high reading proficiency in an L2 than in an L1. According to Alderson (1984, 123), L2 learners commonly read at a slower rate, and experience difficulty during the reading process. Strauss (2008, 19) argues that, there are many difficulties related to the decoding of words, the development of phonological skills, the knowledge of text structure, the development of automatic processing and use of metacognitive skills that an L2 reader has to overcome. As a result, L2 readers often encounter problems in word identification and reading comprehension, turning reading in the L2 into a strenuous and laborious activity.

The L2 reading process is further made complex because the reader of L2 normally lacks an experience similar to that of L1. According to Carrell and Grabe (2002, 55) L2 readers often do not have the same language resources, cultural and social text background knowledge that an L1 reader typically have. General background knowledge and/or cultural experiences aid readers to interpret texts. Most L2 learners come to the L2 reading task without any general background and cultural based knowledge about the language community whose language they need to use for reading. Charles et al. (1999, 38) argues that the cultural background of L2 readers is in fact usually very different from the culture embedded in the L2 reading material. With no background knowledge of the L2 community, L2 readers cannot adequately relate their own experiences with the L2 text (Charles et al. 1999, 38) and meaning abstraction then becomes abstract. If a learner is familiar with the general cultural framework of the L2, the reader constructs meaning more easily through inferences, drawing on their background knowledge or personal experiences (Durgunoglu and Hancin-Bhatt 1992, 402).

3.4 Key factors in L2 reading

Factors affecting L2 reading acquisition include L2 language proficiency, L1 background knowledge and experience as well as knowledge of text content and structure (Bernhardt 2009, 10; Jackson 2013, 16; Yildiz-Genc 2009, 408; Peregoy and Boyle 2000, 239). These factors determine the success of an individual in L2 reading development.

3.4.1 Language proficiency

Language proficiency has been defined in different ways. Jackson (2013, 16) states that "language proficiency is the individual's knowledge and ability to use the language through listening, speaking, reading and writing in contextually appropriate ways". For instance, a bilingual NS-English learner can be regarded as proficient in English if the learner can understand instructions in English, speak the language with ease, and read and write in the language. The definition by Jackson (2013) is simple, precise and attempts to explain a complex concept in simple terms.

According to Peregoy and Boyle (2000, 239) language proficiency is an "individual's general knowledge of language, including vocabulary, grammar and discourse conventions which may be called upon during any instance of oral or written language use". Defining language proficiency is very subjective in the sense that the amount of vocabulary, grammar and level of discourse convention which must be attained by an individual cannot be stated in absolute terms. For instance, most of the people that are considered proficient readers in L2 make grammatical errors when speaking and writing. This refers back to the gaps discussed in the LTH, where it is difficult to determine a precise language proficiency level at which transfer of L1 skills to L2 will become possible. The definition by Peregoy and Boyle (2000) thus presents a very abstract understanding of language proficiency.

The most appropriate and realistic definition of language proficiency is given by Lee and Schallert (1997). According to Lee and Schallert (1997, 716), "language proficiency relates to language competence, metalinguistic awareness and the ability to speak, listen, read, and write the language in contextually appropriate ways". Language proficiency refers to one being well versed in the language. An individual might have a vocabulary of a language which is not very broad, but still use the language competently in writing, speaking and dialogue. One must have a phonological knowledge of the language, should be able to speak, comprehend and write in the language.

L2 reading proficiency develops from a firm foundation of oral language proficiency (Strauss 2008, 20; Verhoeven 1991, 72; Yamashita 2002b, 91). In fact, L2 oral proficiency has been said to be the most prominent factor in ensuring positive L2 reading development. Successful L2 reading is also dependent upon a child's ability to master L2 language structures. This is in line with the LTH which emphasises the importance of L2 language proficiency in L2 reading. Eskey and Grabe (1988, 226) claim that reading requires a relatively high degree of grammatical control over structures that appear in whatever readings are given to L2 students.

The learner should thus, ideally, receive sufficient oral exposure to the L2 before they attempt to read it, and a working knowledge of the L2 is essential to ensure successful decoding and comprehension in the L2 (Limbos and Geva 2001, in Damber 2010, 30). The moment one speaks a language, one has created an appropriate linguistic atmosphere to read in the language. Proponents of this view would prescribe to what Cummins (2000, 174) refers to as a "time-on-task remedy"; i.e. that increasing the instructional time in the L2, often at the expense of time spent on the L1, will lead to improved reading outcomes.

Lack of proficiency in an L2 is one of the primary reasons for L2 reading difficulties (Peregoy and Boyle 2000, 239; Charles et al. 1999, 34; Alderson 1984, 133; Lee and Schallert 1997, 736; Clarke, 1978, 147). The L2 reader may not have enough linguistic proficiency in order to pick up correct cues from the text to make correct guesses and predictions (Durgunoglu and Hancin-Bhatt 1992, 393) which increases the risk of L2 learners becoming word callers (i.e. readers who decode without comprehension) (Damber 2010, 31).

Another challenge for L2 readers is that the oral language that they possess of an L2 is often different from the written form of the language (Bernhardt 2009, 12). Many L2 learners begin to read in an L2 at almost the same time that they start to acquire the L2 vocabulary (Jackson 2013, 16; Strauss 2008, 20). This implies that the L2 readers have to explicitly rely on the written print in accomplishing the L2 reading task. Geva (2006, 4) states that even after five to six years of attending school in the L2 environment, aspects of L2 oral proficiency skills, and especially those required for academic learning, continue to lag behind the skills of L1 peers. The main cause for inadequacy in L2 oral proficiency is the size of the bilingual child's vocabulary (Bialystok 2002, 176). The vocabulary of L2 learners has been found to vary between 2000 and 7000 words, compared to fluent L1 readers' vocabulary of 10 000 to 100 000 words (Grabe 1991, in Damber 2010, 33).

Achieving L2 proficiency is a big challenge. Bilingual children appear to be at risk of developing inadequate oral language proficiency in their L2 (Bialystok 2002, 176) and their oral language proficiency is often higher in their L1 than in their L2 (Soares De Soussa and Broom 2011, 3). However, this may not be true for all bilinguals. The distinction between additive and subtractive bilinguals is crucial in this case. An additive bilingual is an "individual whose two languages combine in a complementary and enriching fashion" whilst a subtractive bilingual is an "individual whose L2 is acquired at the expense of the aptitudes already acquired in the L1" (Karahan 2005, 1153). In this case, whilst it might be difficult for subtractive bilinguals to acquire proper L2 oral proficiency to support reading, it is possible for additive bilinguals to gain adequate oral language proficiency in both L1 and L2, sufficient to support L2 reading. Cummins (1991b, 85) argues that unless children are in a situation which promotes additive bilingualism, where both languages are developing, the positive effects of bilingualism will not manifest. A subtractive bilingual condition will have negative consequences on the development of reading in an L2 learner.

According to Damber (2010, 31), the question of whether L2 reading should be taught before an adequate level of L2 oral proficiency is reached, is a contentious one. While it has been argued that the postponement of formal reading instruction is appropriate until L2 learners have attained an adequate level of L2 oral proficiency (Snow et al. 1998, 238), the delay may have serious effects on the children's schooling in general, as it may take up to two years for children to acquire conversational language proficiency (Cummins 1981, 135). A delay in L2 reading instruction may have other negative repercussions on the general achievement of the learner. For example, in many African contexts, formal schooling mostly takes place in a L2 (typically English) due to the multilingual nature of most African countries. In such environments, formal instruction in L2 reading should not be delayed.

3.4.2 L1 literacy knowledge and experience

Most L2 readers bring a wealth of knowledge, strategies and processes from their L1 to L2 reading (Durgunoglu and Hancin-Bhatt 1992, 391; Jackson 2013, 19). L2 readers are (theoretically) expected to transfer and apply the skills and strategies they have developed in their L1 to support the L2 reading process (Cummins 1991b, 77; Bernhardt and Kamil 1995, 16; Bernhardt, 2009, 12; Bialystok, 2001, 174; DeKeyser, 2007; 287).

It is important to clarify the terms 'reading skill' and 'reading strategies' in this regard. A reading skill is a cognitive ability a person is able to use when interacting with written text (Bojovic 2010, 2) and it operates largely subconsciously (Pang 2008, 6). A reading strategy is a conscious procedure carried out to solve problems in the comprehension process (Pang 2008, 6). Reading strategies are the different tactics that readers use to solve a reading challenge. Strategies that help learners to read include previewing, predicting, skimming and scanning, guessing from the context, paraphrasing and summarising (Yildiz-Genc 2009, 411). The importance of L1 reading skills and strategies in L2 reading is supported by the LTH, and mirrors the reading principle "reading develops reading" (Pretorius 2008, 79).

Some scholars have argued that reading skills and strategies transfer automatically from L1 reading to L2 reading (Charles et al. 1999, 34). The basic cognitive processes such as PA, working memory and rapid naming involved in reading remains the same regardless of language (Lesaux and Siegel 2003, 1005; Tunde 2007, 12; Verhoeven, Reitsma and Siegel 2011, 388-390) and children can use the same skills in learning to read in any language (Bernhardt and Kamil 1995, 17). However, although there is lots of evidence of automatic transfer of cognitive linguistics skills related to reading, it is also clear that transfer may not always readily happen if languages are structurally very different from one another. Some scholars have argued that simpler phonological skills such as SA and onset awareness may transfer automatically, but that others, such as rime and phoneme awareness, are language specific (Soares de Sousa et al. 2010, 530), while others have found that cognitive-linguistic skills such as RAN and PWM are language specific (Keung and Ho 2009, 28; Gottardo and Lafrance 2005, 573). Essentially, researchers claim that good L1 readers should also be good L2 readers (Durgunoglu and Hancin-Bhatt 1992, 393; Goy and Roehrig 2011, 42; Bernhardt and Kamil, 1995, 18), and that underdevelopment in L1 reading would probably lead to poor L2 reading development.

There are various reading strategies and skills that L2 readers transfer from L1 reading. According to Peregoy and Boyle (2000, 241) attitudes and expectations about print as well as the general process of decoding, interpreting the language, constructing meaning from text, and monitoring comprehension are aspects of reading which are transferrable across languages. L2 readers already possess general knowledge about decoding and have some knowledge about the function of print. They can use those previous reading experiences in L1 to understand L2 reading.

Metacognitive strategies and awareness, including selective attention to the task, planning, goal setting, self-monitoring, and self-evaluating are also transferrable from L1 to L2 reading and aids bilingual reading development (Durgunoglu and Hancin-Bhatt 1992, 403; Strauss 2008, 22; Goy and Roehrig 2011, 45; Yamashita 2002a, 275; Pang 2008, 10). Metacognitive awareness is one’s ability to understand, control and manipulate one’s cognitive processes to monitor and enhance comprehension (Mokhtari and Reichard 2002, 429). L2 readers make full use of metacognitive strategies acquired in L1 to achieve maximum L2 reading comprehension. Metacognitive strategies are more applicable to learners in the higher grades, who are intrinsically motivated to succeed in L2 reading. Learners in the early grades (grades 1 to 3) might not be at a level which enables them to make use of such strategies. Hence, metacognitive skills and strategies will not be discussed in further detail.

L2 readers can also transfer metalinguistic awareness skills from the L1 into L2 reading (Strauss 2008, 22; Jayusy 2012, 150; Durgunoglu and Hancin-Bhatt 1992, 403; Bialystok 2002, 185). Metalinguistic awareness is defined as an ability to employ one's implicit structural knowledge and functions of language (Karmiloff-Smith 1997, in Verhoeven, 2007, 426) and it includes knowledge of letters and sounds and how they relate, knowledge of words and word parts, knowledge of sentences and their parts, and knowledge of texts and genres and how they are organised (Carrell and Grabe 2002, 40). The metalinguistic knowledge that L2 learners bring from L1 is thought to assist them especially in comprehension (Carrell and Grabe 2002, 39). Due to the exposure to two linguistic systems, bilingual development has been found to strengthen/facilitate children's metalinguistic awareness (Dickinson et al. 2004, 339; Reynolds, 1991, in Verhoeven 2007, 426; Diaz and Klinger 1991, 190; Cummins 1991, 85). However, as Bialystok (2002, 189) pointed out, such bilingual advantages appears to be mitigated by the age of the children, the nature of the task, and the language pairs in the bilingual mix. Hence, as previously stated by Bialystok (2002, 190) the bilingual effect on metalinguistic development might be neutral.

The transference of skills from L1 to L2 is not always beneficial (Bernhardt 2009, 12; Durgunoglu and Hancin-Bhatt 1992, 391). The transfer of skills from the L1 can have negative effects especially in contexts where there are structural differences between languages. In such a scenario the L2 reader will be further hindered in their goal of becoming a fluent L2 reader (Strauss 2008, 22).

3.4.3 Knowledge of text content and structure

The L2 reader's background knowledge of the content can impact the L2 reading process positively or negatively (Anderson and Pearson 1984, 255; Carrell and Wise 1988, 285). Peregoy and Boyle (2000, 239) argue that the comprehension challenges imposed by limited L2 proficiency are alleviated when the text contains content with which the L2 reader is familiar – when the text reflects the L2 reader's culture, reading comprehension is reinforced (Carrell 1988b, in Jackson 2013, 19). Peregoy and Boyle (2000, 240) emphasise the need to build learners background knowledge on a text topic through first hand experiences such as science experiments and museum experiences to facilitate success in reading.

Bilinguals can also use their knowledge of text structure (as experienced in their L1) to inform their reading of an L2 text (Grabe and Stoller, 2002, 80). Sensitivity to the structural elements of the text helps L2 readers to remember the main idea of the text and to comprehend better (Commander and Stanwyck 1997, in Pang 2008, 5; Carrell 1992, 18). Text structure knowledge enhances comprehension by helping readers to anticipate and predict the direction of a plot or argument, thereby facilitating attention to the overarching meaning of the text. Peregoy and Boyle (2000, 240) argues that L2 learners can benefit from explicit instruction in L2 text structure.

3.5 Failure to read in L2: A 'language problem' or a 'reading problem'

L1 reading ability and L2 proficiency are important factors in L2 reading development (Bossers 1991, 55; Bernhardt and Kamil 1995, 35; Bernhardt 1991, 32; Lee and Schallert 1997, 737). These concepts were highlighted more than three decades ago, when Alderson (1984, 31) asked whether "poor reading in an L2 is due to poor reading ability in the L1" or whether "poor reading in an L2 is due to inadequate knowledge of the target language". Today, this issue remains a hot topic in the field of L2 reading acquisition.

A 'reading problem' refers to a weakness in what is called higher level mental operations such as predicting, analysing, synthesising, inferencing, and retrieving relevant background knowledge, which are assumed to operate universally across languages (Yamashita 2000, 2). When such weaknesses occur, a learner will typically lack the necessary reading skills and strategies in their L1, and as a result, reading development in the L2 will not be supported by these higher level operations.

On the other hand, a 'language problem' refers to a weakness in the knowledge and skills required for processing linguistic properties in the L2, i.e. orthographic, phonological, lexical, syntactic, and discoursal knowledge specific to the L2 (Yamashita 2000, 2). In cases where L2 readers lack relevant linguistic knowledge, L2 reading problems are believed to stem from a language problem. In such contexts, learners often come from a background where L2 acquisition happens in a formal schooling context and where L2 reading is not supported at home.

Reading in an L2 can be a language problem and/or a reading problem (Alderson 1984, 4; Bernhardt 1991, 32). According to Alderson (1984, 4) L2 reading is most likely a reading problem when learners have higher levels of L2 proficiency and a language problem when learners have lower levels of L2 proficiency. Thus, for a less proficient L2 speaker, language is more of a barrier to L2 reading; whilst for a more proficient L2 learner; poor reading skills are more likely to cause an impediment to L2 reading. Yamashita (2002b, 91) suggests the possibility of a compensation mechanism between L1 reading ability and L2 language proficiency in influencing L2 reading. The compensation mechanism works in such a way that high L1 reading ability compensates for low L2 proficiency whilst high L2 proficiency compensates for low L1 reading ability.

3.6 Transfer of L1 phonological skills to L2 reading

PP skills acquired in the L1 have been found to be related to L2 reading performance (Gottardo and Lafrance 2005, 574; Chow et al. 2005, 86; Gottardo et al. 2006, 389). The process through which PP skills facilitates reading and/or spelling in one language can be applied to other languages, meaning that L2 reading can benefit from the transfer of L1 phonological skills (Sun-Alperin 2007, 9).

According to Durgunoglu (2002, 192) PA skill is one AP skill that is transferrable across languages. Soares De Soussa et al. (2010, 530) suggested that, in the African context, where bilingual children often learn to read in languages that are very different from one another, only certain PA skills are transferable. There is also limited understanding of how other cognitive skills, such as rapid naming and phonological memory transfer from one language to another when it comes to reading (Keung and Ho 2009, 8). However, some scholars have argued that PA skills acquired in the L1 do not have to be relearnt in the L2 – under this view PA is seen as a universal skill that transfer across alphabetic languages (Milwidsky 2008, 17; Durgunoglu 2002, 201).

The transfer of the phonological skills across languages happens in a bidirectional manner (i.e. from L1 to L2 and vice versa) (Gottardo and Lafrance 2005, 574; Dickinson et al. 2004, 336; Veii and Everatt 2005, 250). One view suggests that orthographic type (logographic or alphabetic) and orthographic depths (shallow or deep) of a language do not prevent PA skills to transfer across languages (Shakkour 2014, 551) and that phonological skills predict word reading development cross-linguistically even when the two languages have different orthographies (Chow et al. 2005, 86; Gottardo et al. 2001; Dickinson et al 2004, 336; Wei and Zhou 2013, 11; Veii and Everatt 2005; 250; Chuang 2010, 90; Keung and Ho 2009, 26). This lends support for the CPH which states that basic underlying processes like PA transfer across languages regardless of linguistic differences.

Contrary, other scholars have found that PA skills are not always transferable between languages with different orthographic characteristics (Lingred et al 1985, in Shakkour 2014, 551; Wang, Koda and Perfetti 2003, 14; Wade-Woolley and Geva 2000, 295). Positive transfer occurs when L1 reading development promotes or facilitates L2 reading development, and vice versa (Durgunoglu and Hancin-Bhatt 1992, 391). However, should the cognitive skills acquired in L1 reading development hinder learning to read in the L2, then it would be considered as negative transfer of skills (Keung and Ho 2009, 6). Under such cases, successful transfer of L1 literacy skills to the L2 depends on the orthographic distance between languages (Geva and Siegel 2000, 2; Peregoy and Boyle 2000, 241).

Transfer is typically positive when the languages are more similar, but may be negative when languages exhibit more differences. For instances, Jiang (2011, 182) states that L1 skills used to read a logographic language such as Chinese are too specific to transfer to the reading of an alphabetic language like English. Transfer of L1 skills to L2 reading might not be successful in languages with diverse orthographic systems. Specific linguistic knowledge from the child's L1 may interfere with language development in the child's L2, suggesting language-specific processing skills (Shakkour 2014, 549; Gottardo and Lafrance 2005, 562). This lends support for the SDH which posits that the transference of reading skills across languages is determined by the degree of orthographic similarities between languages.

3.7 Language systems: Northern Sotho and English

Language systems differ in terms of phonological and orthographical rules. NS and English differ in both their phonological and orthographic systems. Phonological differences between NS and English exist in rhythmic properties, syllable shape, quantity of consonant clusters and quantity of phonemes. A NS-English bilingual child is expected to learn the phonological and orthographic rules of each language, which can be challenging.

3.7.1 Rhythmical Properties

Nespor, Shukla and Mehler (2010, 1147) define rhythm as the flow of speech from one unit to another. NS and English have different rhythmic properties. NS is regarded as a syllable timed language (Wilsenach 2013, 4). In a syllable timed language, syllables are approximately equal in duration (Roach 1982, 1). In NS, for example, in sentences like *Ba swa-ne-tše go ntu-ša* (*They are supposed to help me),* and *Ke tla go re-ke-la bo-ro-kgo (I will buy you a pair of trousers)* all the syllables in the sentence have approximately the same duration.

English is a stress-timed language (Gottardo and Lafrance 2005, 563). A stress timed language is a language with a rhythm in which syllables tend to exhibit regular inter-stress intervals (Nespor et al. 2010, 1150). English syllables occur at regular intervals of time and they vary in duration from one syllable to another. Inter-stress intervals in English vary in duration proportionally to the number of syllables they contain, so that the duration of the intervals between consecutive stresses is not constant (O'Connor 1965, in Nespor et al. 2010, 1150). English syllables vary from long to short. Longer syllables are stressed, while shorter syllables are unstressed. For example, in the sentence *I am going to the store,* the two syllables *to* and *the* are unstressed whilst *going* and *store* are stressed. In another example, *This is the house that John built,* it is clear that *this, house, John* and *built* are stressed whilst is the and *that* are unstressed. The purpose of stressing the syllables is to draw the hearer's attention to the meaning of the expression (Ramus et al. 2003, 338).

Stress is a more salient linguistic feature in English than the syllable (Dalbor 1997, in McKay 2012, 11), while the syllable is a most salient feature in NS. However, there is no language which is totally syllable-timed or totally stress timed (Mitchell 1969, in Roach 1982, 6). All languages display both kinds of timing but languages differ with regards to the type of timing which predominates. Nevertheless English exhibits stress timing to a greater extent than NS.

NS is predominantly syllable timed. Even so, stressed syllables exist in NS. For example, NS is characterised by lengthening of the penultimate syllable of a phonological phrase (Zerbian 2006, 109) as in /dume: la/, /dumela: ŋ/ and /kea bó:na/. In some cases in NS, the syllable that comes before the last syllable is stressed. Syllable stressing in NS does not, however, occur at the penultimate syllable of every word (Zerbian 2006, 110). Thus, stressing is a less prominent feature in NS than in English.

3.7.2 Syllable Structure

The syllable is an element of speech that acts as a unit of rhythm, consisting of a vowel, a syllabic consonant or vowel + consonant combination (Crystal 1989, 164; McKay 2012, 8). The syllable may contain a combination of a vowel and consonants as in /the/ or a vowel only as in /i/. Some syllabic consonants such as /m/ or /n/ may function as syllables in the final position (Jehjooh 2005, 132), as in the word *man*.

The nature of the syllable varies from one language to another, since there is no universal phonological syllable (O'Connor 1973, 201). NS and English have language-specific syllables. English contains complex and closed syllables (Ramus et al. 2003, 337; Roach 1982, 4), with the most frequently occurring syllable shape in English being the consonant-vowel-consonant (CVC) pattern as in *cat* and *man* (McKay 2012, 11). A closed syllable consists of one consonant following a vowel. English has a much larger inventory of word final consonant sounds (McKay 2012, 11) than NS, although some words in English ends with a vowel as in *noble, base, ratio.*

NS has a simple syllabic structure. Roach (1982, 4) argues that languages classed as syllable-timed typically have a simpler syllable structure. NS has open syllables with a consonant-vowel-consonant-vowel (CVCV) structure (Demuth 2007, 529) as in *wena, dira, tate, pula* and *golela.* Most syllables in NS end in a vowel of /a/, /e/ or /o/. NS consonants in the word final position are infrequent and restricted/constrained to the /ng/ sound as in *diregang, lebaleng, moeng or nthušeng.*

English syllables consist of an onset, nucleus and a coda (Roach 1982, 66; Jehjooh 2005, 137). The onset consists of the beginning sound(s) of the syllable. The nucleus is the sound which succeeds the onset. The coda is the sound at the end of the syllable which follows the nucleus. For example, *get* consists of the onset /g/, the nucleus /e/ and the coda /t/. English has a large number of monosyllabic words (Jehjooh 2005, 138). Monosyllabic words are words containing only one syllable for example *sun, act* and *raid.*

According to Auer (1991, 295), syllable timed languages have a syllable structure which maximizes the consonantal onset and minimises the consonantal coda. NS stress falls on an onset and nucleus and disregards the coda. The onset may be a consonant, the nucleus may be a vowel and no codas are allowed in NS. For example, NS words /ra-ta/ (love) and /ba-na/ (children) consists of an onset /ra/ and /ba/ and a nucleus /ta/ and /na/ respectively, with no coda. Contrary to English, NS avoids monosyllabic words (Wilsenach 2013, 4).

The syllables in a syllable-timed language are uniform and easily perceived (Auer 1991, 295). NS syllables are easily noticeable and have well defined boundaries. Contrary, syllables in English are not always easily discernible. The syllable length in English tends to fluctuate according to stress. With regards to reading development, Seymour, Aro and Erskine (2003, 146) state that reading will be traversed more rapidly in languages with simple syllabic structure than in languages with complex syllabic structure. As such, reading is likely to be easier in NS than in English because of the differences in syllabic structure.

3.7.3 Consonant Clusters

NS and English differ in consonant clusters or consonant blends. Consonant clusters are a sequence of consonants that appear together in a syllable without a vowel between them (Gregova 2010, 79). When two or more consonants occur together or adjacent to each other they are called consonant clusters (Yoshida 2012, 4).

English has many consonant clusters (approximately 55 initial two-consonant clusters, 9 initial three consonant clusters, 55 final two-consonant clusters, 40 final three-consonant clusters and 7 final four-consonants clusters) (Gregova 2010, 80-81). English words with consonant cluster *include <u>sp</u>oon, <u>tr</u>ain, <u>spr</u>ing, <u>shr</u>iek, <u>spl</u>endid, qui<u>ck</u>, ea<u>rth</u>, de<u>pth</u>, atte<u>mpts</u>, exe<u>mpts</u>, twe<u>lfths</u>.* Besides word initial and word final clusters, English also has word medial consonant clusters. Word medial clusters in English are divided into intrasyllabic and inter-syllabic clusters (Baral 2011, 1). A sequence of consonants in the word medial position belonging to the same/single syllable is called an intra-syllabic consonant cluster. Examples of intra-syllabic consonant clusters in English include (/mp/ in *camping,* /ply/ in *reply,* /ndy/ in *windy,* /kstr/ in *extra).* On the other hand, if the consonant belonging to different syllables occurs together, the cluster formed is called an inter-syllabic cluster. Examples of inter-syllabic consonant clusters in English include (/skr/ *description,* /kb/ *blackboard*, /pθr/ *upthrust*, /spl/ *explain*). Pierrehumbert (1994, 169) suggests that English has about 8708 possible word medial consonantal sequences.

Consonant clusters are more constrained in the NS phonological system (Wilsenach 2013, 4) compared to English. NS consonant clusters occur in the word initial, middle and final position (Demuth 2007, 530), for example in *skolo* (school), *hlapa* (bath), *lengwalo* (letter) or *bolelang* (speak). Price and Gee (1988, 430) mention the 37 most common consonant clusters in NS which include clusters like [/bj/, /fs/, /fš/]. However, after a critical analysis of the NS words from the *Oxford bilingual school dictionary: Northern Sotho and English* (De Schryver 2007), NS might consists of 51 more possible consonant clusters which are not specified by Price and Gee (1988). NS might have approximately 88 consonant clusters. Table 3.1 below summarises all possible consonant clusters in the NS language.

Table 3:1 Consonant clusters in NS

Position in the word	2-letter cluster	3-letter cluster	4-letter cluster	5-letter cluster	Examples
Word initial position	mm, sk, hl, hw, kg, kh, kw, ll, mn, mp, my, ng, nn, nw, ny, ts, tl, sw, rw, rr and ph	hlw, kgw, ngw, nny, nng, ntl, nth, ntš, ntw, nyw, tšw, pšh	ntlh, ntšh, tshw, tšhw mpšh, mpsh	ntšhw	skolo, ngwana, bjalo, kgetha, mpsha
Word medial position	hl, šw, lw, th, kg, mm, ny, tw, ts, fš, ph, sw, kh, kr, kw, ng, nn, tl, gw, nt, nw, mp, rw, kn, bj, nk, nš, lw, my, pš, and rr	nny, tsw, psh, kgw, tsh, tšh, mph, tlh, tlw, tšw, ngw, nth, nst, nnw	ntšw, tshw, ntšh, nkhw		batswadi, baahlodi, dikhuru, bokgwaro boitshwaro
Word final position	gw, bj, tš, fs, ng, st, kw, nn, rw, sw, nd, tl, nw, hw, pš, nt, ns, ll, mp, nk, ts, mm, kg, th, šw, ph, hl, lw, ny, nk, kw, tw, lw	nts, tšw, tlw, tšh, nyw, mpš, ntl, ntw, ntš, ngw, nth, tsw, kgw, hlw, khw, mph, thw, llw	ntšh, ntlh, nkgw	ntšhw	banna, dintlo, bolelwa, motho, lokollwa, thutlwa

According to this summary, NS has approximately 21 initial two consonant clusters, 12 initial three consonant clusters, 6 initial four consonant clusters and 1 initial five consonant cluster. There are 31 medial two consonant clusters, 14 medial three consonant cluster, 4 medial four consonant clusters, 34 final two consonant clusters, 18 final three consonant clusters, 3 final four consonant clusters and 1 final five consonant cluster. Approximately 57 of the consonant clusters recur either in the initial, medial or final positions, for example /mm/ and /hlw/.

However, a more modern take on consonant clusters in Bantu languages like Zulu, Tswana and Sotho is that these languages do not have true consonant clusters (Demuth 2007, 553; Cole 1992, 472; Naidoo, Van der Merwe, Groenewald and Naude 2005, 63). The argument is based on the fact that the purported consonant sequences (i.e. /ts/, /ll/, /nd/, /tsh/) stands for single consonants and should not be taken as real consonant clusters. Burton and Blumstein (1992, in Naidoo et al. 2005, 63) argues that these consonant sequences behave phonologically as single units. The name consonant cluster is therefore not applicable, at least not in the same way it is in English.

Thus, the NS consonant clusters presented in Table 3.1 might not be 'true' consonant cluster after all. Regardless, the definition of consonant clusters implies that there are consonant clusters in NS and the arguments presented by Demuth (2007, 553) and Naidoo et al. (2005, 63) are contentious and subjective since they failed to provide a working definition of a consonant cluster in Bantu languages. For the purposes of this study, it will be assumed that that consonant clusters do exist in NS but that they do not occur as frequently as in English.

Differences in consonant clusters between languages can affect reading performance. The absence of consonant clusters in an L1 can cause learners' inability to correctly pronounce L2 consonant clusters (Khanbeiki and Abdolmanafi-Rokni 2015, 2). Differences in consonant clustering cause problems for L2 learners whose L1 does not allow many consonant clusters.

Thus, in the context of this study, NS learners might have difficulties in mastering the rules predicting the structure of English consonant clusters.

3.7.4 Phonemic similarities and differences

A phoneme is the basic unit of human speech (Sarma and Sarma 2014, 32). Phonemes are smaller than words or syllables and make distinctions between words possible. NS has approximately 38 consonantal phonemes (Poulos 1994, in Thamaga 2012, 30; De Schryver 2007, S24-S25), while English has approximately 25 consonantal phonemes (Musk 2005, 2). Although NS and English share certain phonemic similarities, these languages also exhibit differences in terms of their phonemic inventories.

The phonemic inventories of NS and English have in common the following consonant sounds: /p, b, d, g, t, k, f, m, n, l, r, h, ŋ, j, s, w, y /. Sharing consonant sounds creates the base for drawing similarities in NS and English, and having many common consonant sounds in the L1 and L2 should aid learners who are learning to read in the L2. There are also consonant sounds that are unique to NS, such as /ph, fs, ps, psh, fš, bj, pš, pšh, th, tl, tlh, hl, ,ts, tsh, š, tš, tšh, ny, kh, ng kg/. Consonants that are unique to English include /v, θ, ð, z, ʃ, ʒ, ʧ, ʤ/. While the two languages use a similar alphabetic system, some letters like /c, x, v, q and z/ do not feature in NS. Such variances in consonant sounds between NS and English do create phonemic gaps between the two languages, which could make L2 reading a difficult task.

There are also differences between the NS and English vowel systems. The NS vowel system is simpler and contains only seven basic vowel phonemes /a, i, e, ê, o, ô, u/ (Thamaga 2012, 30, De Schryver 2007, S24-S25). Contrary, the English vowel system is varied and complicated (Dalbor 1997, in McKay 2012, 11). English language has a rich vowel system with approximately 25 vowel sounds (or more, depending on the dialect and/or definition). The English vowel system consists of approximately 12 pure vowel /iː, ɪ, i, e, æ, ɜː, ə, ʌ, ɑː, ɒ, ɔː, ʊ, uː/and 8 diphthongs /eɪ, aɪ, eə, ɔɪ, ʊə, aʊ, ɪə, ɔə/ and 5 triphthongs /eɪə, aɪə, ɔɪə, əʊə, aʊə/ (Musk 2005, 4). [5]It seems that vowel sounds in English also vary between English dialects. (Dalbor 1997, in McKay 2012, 12) states that depending on how the vowel sounds are combined in syllables, some English dialects have more than 40 possible vowel sounds.

In summary, NS emphasises the syllabic unit for rhythm, has fewer consonants and vowels sounds, fewer consonant clusters and a more constrained and simple syllable structure than English. English, on the other hand has a large phoneme inventory, emphasises stress for rhythm, has a complex syllable structure and many consonant clusters. The differences in the phonological structures of languages may lead to differences in reading abilities (Georgiou et al. 2009, 11; Gottardo and Lafrance 2005, 563). Theoretically, given its simpler phonological structure, reading acquisition should be easier in NS compared to English.

3.7.5 Orthographic structure

NS and English are both alphabetic languages (Milwidsky 2008, 15), but they have different orthographies. NS language is characterised by a transparent/shallow orthography (Wilsenach 2013, 4). NS has a one to one relationship between phonemes and graphemes. In simple terms, NS words can be pronounced exactly as they are spelled (Milwidsky 2008, 15). For instance, the spelling of NS words like *wena* and *dira* can be predicted from the pronunciation. Most words in NS have regular and consistent sound symbol correspondences.

Contrary, the English language has an opaque/deep orthography. English does not always have a one-to-one relation between graphemes and phonemes (Siok and Fletcher 2001, 32; Gottardo and Lafrance 2005, 563). English contains many irregularities. Words are not always pronounced as they are

[5] Diphthongs are two vowels immediately next to one another that are combined to make one sound as in the vowel sound for example /aʊ/ as in *house*, /ɔɪ/ as in oil and /ɪə/ as in *ear*. Triphthongs are defined as a combination of three vowel sounds in one syllable, for example /aʊə/ as in *shower* and /eɪə/ as in *layer* (Musk 2005, 5).

spelled, for example the way the word *ache* and *yacht* are pronounced is inconsistent with the spelling system. The English orthographical system has 1120 ways of representing 40 phonemes by different graphemes (Paulesu et al. 2000, in Siok and Fletcher 2001, 32; Port 2007, 13). What this means, in practice, is that an orthographic symbol (grapheme) can be mapped onto multiple sounds (phonemes), whilst a sound can be mapped onto multiple symbols, according to different contexts (Yamashita 2013, 2). For example, the grapheme /c/ represents the phoneme /k/ in *can* and the phoneme /s/ in *city* whilst the phoneme /k/ can be represented by the graphemes /k/ as in *kite,* /c/ as in *can,* /q/ as in *queen* or /ch/ as in *choir* (Siok and Fletcher 2001, 32). Thus, there may be a one to many correspondences between phonemes and graphemes in English.

Various orthographic systems may lead to inconsistency in reading abilities. According to Travers (2009, 13) learning to read in a transparent language is a relatively easy and straightforward task. The process of learning to read in English should, theoretically, be a more challenging and slower process than the process of learning to read in NS. The reason for this is the lack of one-on one correspondences between sounds and letters in English (Yang 2009, 5). Seymour, Aro, and Erskine (2003, 145) support this view and argues that the rate of reading development in English is more than twice as slow as compared to shallow orthographies. A theory that is relevant to this study, in that it explains the developmental differences in reading abilities of children across phonological and orthographical systems, is the Psycholinguistic Grain Size Theory (Ziegler and Goswami 2005, 2006). This theory will be the focus of the next section.

3.7.5.1 The Psycholinguistic Grain Size Theory

The Psycholinguistic Grain Size Theory (PGST) proposed by Ziegler and Goswami (2005, 2006) suggests that the development of reading is mostly rooted in phonological development. This is facilitated by an important process called phonological recoding which involves mapping of orthographic symbols onto phonological units.

According to PGST beginning readers have to overcome three problems in learning to read, which include availability, consistency, and granularity of spelling-to-sound mappings (Ziegler and Goswami 2005, 3). Firstly, the availability problem exits whereby some of the phonological units are inaccessible to a child prior to reading which compromises the transfer of orthographic to phonological units. Secondly, the consistency problem is reflected when some orthographic units have many pronunciations, or in cases where a phonological unit has many spellings. For example, as previously discussed, in English one phonological unit can be represented by multiple orthographic unit, as when /k/ is alternatively represented with "c" *(cat)*, k (*kit*), or "ck" (*pack*) (Treiman 1999, 6). The inconsistencies in sound letter correspondence affect the phonological recoding process which makes reading acquisition quite taxing.

Lastly, the granularity problem takes into consideration that children are likely to have many orthographic units to learn when large grain sizes (i.e. words, rimes and syllables) are more accessible in a phonological system than smaller grain sizes (i.e. onsets and phonemes). The phonological development models often assume that beginning readers have to develop sensitivity to larger units before smaller units can be developed (Anthony et al. 2003, 481, Anthony and Francis 2005, 256). The PGST however, assumes that smaller grain sizes like phonemes can present prior to literacy, depending on the phonological complexity of the language and the consistency of the orthography (Ziegler and Goswami 2006, 452). The efficiency with which the problems of granularity, availability and consistency can be solved may vary across languages which determine the development of reading abilities in different languages (Ziegler and Goswami 2005, 3).

The PGST suggests that the differences in reading abilities found across orthographies reflect fundamental differences in the nature of the phonological recoding and reading strategies that children develop in response to the orthography of the language they are learning to read in (Ziegler and Goswami 2005, 21). The phonological 'grain sizes' used by the children in reading may differ depending on differences in phonological structures between languages and also depending on the consistency with which that phonology is represented in the orthography. Ziegler and Goswami (2006, 452) propose that readers in shallow orthographies can afford to rely only on units of small grain size (phonemes) due to consistent phoneme grapheme correspondences, whilst readers in deeper orthographies are forced to use multiple grain size recoding strategies (due to the inconsistency of phoneme-grapheme correspondences). Thus, reading in inconsistent orthographies requires the use of both smaller and larger units. As a consequence, reading in an inconsistent language may be met with considerable difficulty (Ziegler and Goswami 2005, 20). This may be especially true if the inconsistent language is an L2, and if learners have not necessarily used a range of recoding strategies when they learned to read in their L1.

3.8 Conclusion

Bilingual NS-English learners are expected to excel in NS reading compared to English reading. Theories and hypotheses on bilingual children in reading development and the discussion on the NS and English language systems indicate that NS language is not a more complex language to learn to read than English. However, this assumption is very theoretical, and does not take into account any specifics about the learning – or sociolinguistic context of NS-English bilingual children in South Africa. Furthermore, literature on the NS language is relatively scarce and more needs to be done to study the language and expand the knowledge base, particularly in terms of the relationship between the phonological system, the orthographical system and reading development. The present study is thus important as it explores the role of PP abilities in reading development of NS-English bilingual children, and as it will contribute to our understanding of how children simultaneously acquire reading skills in languages that are diverse in terms of their phonology and orthography.

CHAPTER 4
METHODLOGY

This chapter outlines the research methodology of the study. The study utilised a quantitative experimental design and a cross-sectional approach. Firstly, the research study is explained within the parameters of quantitative research. Secondly, the research setting and subjects of the study will be described and the selection of the sample will be explained. Thirdly, the data collection instruments will be outlined and described. Fourthly, the data collection procedure, ethical considerations and the reliability and validity of the study will be explained. Lastly, the data presentation and analysis will be outlined.

4.1 Research design

The study utilised a quantitative and cross sectional design to investigate the relationship between PP skills and reading development in NS-English bilingual children. Quantitative research involves the collection of numerical data, which is analysed via statistical methods. Quantitative research designs are best suited to research problems which requires an investigation into the relationships that exists between measured variables (Dörnyei 2007, 24); hence its suitability for this particular study. Punch (2009, 17) argues that the crux of quantitative research is to understand how and why variables are related to each other. Quantitative research typically involves the formulation and testing of a research hypothesis (or of several hypotheses). Researchers thus make predictions in advance, which are supported or refuted later on (Creswell 2003, 15). Questionnaires, structured interviews, checklists, scales and tests designed to test a specific construct may be used to generate numerical data (Hatch 2002, 7).

Another crucial aspect of quantitative research is generalisability (Dörnyei 2007, 24). Generalisability means that the findings obtained from the data can be assumed to apply to the entire population from which the sample was drawn, as long as the sample is big enough to represent the entire population and shares similar characteristics with that population (Leedy and Ormrod

2004, 102). As argued by Dörnyei (2007, 99) a sample size of 100 or more participants is large enough for generalisability. However, it may technically not be possible to generalise the findings of this study considering that the study entails comparisons between smaller groups of 48 and 50 participants each.

One of the most common research designs used in quantitative research is the experimental design. The primary goal of an experimental design is to establish a cause-effect relationship between the independent and dependent variables (Dörnyei 2007, 115). The investigator deliberately manipulates some variables in order to test the effect on some other phenomenon (Butler 1985, 65; Litosseliti 2010, 59). This type of research relies on random assignment of subjects to treatment conditions (Creswell 2003, 15). However, this study will not utilise a 'true experimental design'. Rather, a quasi-experimental design was adopted. According to Campbell and Stanley (2005, 23), the term 'quasi' is used to describe an experimental design which does not rigidly follow all the principles guiding true experimental research designs. The quasi experimental design is used in most educational settings where random assignment of students by the researcher is rarely possible (Dörnyei 2007, 117). Random assignment of subjects was not possible in the present study, as the researcher tested already existing groups in two pre-selected schools (Creswell 2003, 15).

The quasi-experimental design utilised here is set to test the hypothesis that NS-English bilingual learners receiving instruction in NS (L1) will perform better in PP and reading tasks than NS-English bilinguals receiving instruction in English (L2). The relationship between PP (independent variable) and reading proficiency (dependent variable), and the effect of the LoLT and of gender on PP and reading development in NS-English bilingual learners were assessed by comparing the performance of 48 NS-English bilingual children receiving instruction in NS and 50 NS-English bilingual children receiving instruction in English on a battery of PP and reading tasks.

Given that a cross sectional approach was adopted, this study should be seen as a snapshot-like analysis of the target phenomenon at one particular point in time (Dörnyei 2007, 78). All data was gathered during the months of May and June 2015, with the aim of giving a factual representation of the relationship that had developed by that point between PP skills and reading in two groups of bilingual Grade 3 NS-English learners, that received their primary literacy instruction in either their first language or in English.

4.2 Research setting

The current study was conducted in two primary schools, located in a high poverty suburb in Pretoria West in the Gauteng province of the RSA. NS is a predominant home language in this suburb, but several other African languages, such as Tshwana, SeSotho, Zulu and Xhosa are also spoken in the area. Some primary schools within this suburb have adopted NS as LoLT from Grade R – Grade 3, and thus offer mother tongue instruction to NS learners at the foundational level. After Grade 3, the LoLT in these schools changes to English and the learners then study their home language as a school subject (until the end of primary school, and also going into secondary school). NS was the LoLT in one of the schools in this study; the other school followed a straight for English language policy, which means that the learners started their schooling (and foundational literacy instruction) in English in Grade 1, even though NS was their home language.

In South Africa, public schools are divided into five categories, mainly to determine how financial resources should be allocated. These categories are referred to as quintiles. Quintile one schools are the ‘poorest’ schools, while quintile five schools are the ‘least poor’. Poverty rankings are determined by the socio economic status (SES) of the community surrounding the school and by various infrastructural factors. The ‘NS school’ was a quintile one school, whereas the ‘English school’ was a quintile two school. Thus, it is safe to assume that the majority of the learners fell into a low SES group. Although poor, both schools had libraries containing around 5 000 books each, and the teachers in both schools had equal access to the basic resources typically required to teach literacy to first graders.

4.3 Subjects

120 Grade 3 learners were randomly selected to participate in the study from the two pre-selected primary schools. All the participants were mother tongue speakers of NS. Learners were asked what language they spoke at home, and were excluded from the study if they indicated a language other than NS. No reliable data exists about cognitive impairments in the sample; as such screening typically does not take place in these particular schools. Therefore, 60 randomly selected learners from each school were initially selected, but all learners who scored 0 on any of the PP or reading tasks were later excluded in an attempt to remove from the sample learners with obvious learning difficulties or cognitive impairments. After the removal of outliers and missing cases (this process will be described in detail in the next chapter), the overall sample was reduced to 98 participants.

These 98 learners are divided into two groups. One group (Group 1, N = 48) attended a NS school, where English was offered as a school subject from Grade 1. The other group (Group 2, N = 50) attended a school where the LoLT was English from Grade 1 onwards, and where NS was offered as a school subject from grade 2. The learners were thus divided into two groups based on their LoLT, i.e. a NS instruction group and an English instruction group. The age range of the participants was 7 to 10 years. The mean age of the learners in Group 1 was 8; 7 years, while the mean age of the learners in group 2 was 8; 8 years. There was no significant difference between the mean ages of the two groups. Group 1 consisted of 23 girls and 25 boys, whereas Group 2 consisted of 32 girls and 18 boys.

4.4 Data collection instruments

Several data collection instruments were used to test PP and reading. These instruments will be described below.

4.4.1 Phonological processing

Wagner, Torgesen and Rashotte's (1999) Comprehensive Test of Phonological Processing (CTOPP) was used to assess PA, PWM and RAN skills in English in the participants. The CTOPP is an individually administered, norm-referenced measure used to assess a wide range of an individual's PP abilities. The CTOPP measures are standardised, reliable and yield valid results as demonstrated in the CTOPP manual (Wagner et al. 1999, 49). The CTOPP consists of 11 subtests, including elision, blending words, phoneme isolation, memory for digits, non-word repetition, rapid digit naming, rapid letter naming, rapid colour naming, rapid object naming, blending non-words and segmenting non-words. Due to time constraints, and considering the average age of the participants, not all of these tests were conducted. The phoneme isolation and elision sub-tests of PA, the memory for digits and non-word repetition sub-tests of PWM and rapid letter, digit, object and colour naming sub-tests of RAN were elected for use in this study.

The elected PA CTOPP tests (i.e. the phoneme isolation task and the elision task) were used as basis to develop similar tasks for use in NS. The NS tests were developed with the aim to align them as closely as possible with the English CTOPP in terms of the skills addressed and the linguistic complexity within each subtest. According to Wagner et al. (1999, 40) an average score in the standardised tests indicates good PP abilities whilst a below average score indicate a deficit in PP abilities.

4.4.1.1 Elision Task

The elision task assesses the extent to which an individual can say a word and then say what is left after being instructed to drop designated sounds from the word (Wagner et al. 1999, 6).

The English elision task in the CTOPP consists of 34 items. The participants were asked to remove initial, middle or final syllables and phonemes from words. For the syllable deletion part, the participants were asked to say a word and then to say the word that remains after dropping one of the compound words. For example, the researcher asked the participant to say the word *toothbrush* and then asked the participant to repeat the remaining word after deleting a target syllable (Now say *toothbrush* without saying *tooth*). For the phoneme deletion part, the participant were required to say a word (Say *cup*) and then to say the remaining part of the word after removing a target phoneme (Now say *cup* without saying /k/). Feedback was given to the participants for the first 14 items of the subtest. Testing was discontinued if the participant failed three items in a row after receiving feedback from the researcher. The total score of each participant were recorded on a recording sheet. Raw scores were converted to standard scores using age norms. An average score on the elision subtest shows that an individual's can remove phonological segments from spoken words to form new words whilst a below average score shows a deficit in elision ability (Wagner et al. 1999, 40). The test items used in the English elision task are given in Appendix H.

No standardised NS elision tests exist. The test used in this study was thus tailor-made and the materials for this subtest were derived and adapted from the Reading is fundamental project (Pretorius and Mampuru, 2007) and from Wilsenach (2013). The NS elision task consisted of 18 items. One practice item with corrective feedback was given before the actual test. The first nine items of the task required participants to delete initial, middle and final syllables from words. For example, the participant was asked to say a word like *morago* and was then asked to repeat the remaining word after removing a target syllable (Now say *morago* without saying *go*). The remaining part of the subset required participants to remove phonemes in initial, middle and final position of the word. For example, the participant were asked to say *bana* and then to say it again without the /b/ sound. The participants were required to finish all the items in the test. The participant's score was based on the number of items answered correctly. The test items used in the NS elision task are given in Appendix G.

4.4.1.2 Phoneme isolation

The phoneme isolation subtest assesses an individual's ability to identify target sounds in words (Wagner et al. 1999, 7). The participants were required to identify initial, middle or final sounds in a word.

The English standardised phoneme isolation subset contains 32 items (4 practice items and 28 test items). The first 16 items are words with three sounds and participants were expected to identify the first, middle and last sounds in the words. For instance, the researcher would say *The word man has three sounds /m/-/a/-/n/. What is the first sound in the word man?* The next 16 items of the subtest consist of words with more than three sounds and the task of the participant was to identify the second, third or fourth sound in the words. The most difficult items required the participant to identify a particular sound in words that have more letters than sounds, for example, *What is the third sound in the word laughed?* According to Wagner et al. (1999, 7) these items are difficult because the correct answer cannot be obtained by using a spelling strategy of simply naming the sounds of the third letter in the word. Feedback was given to the participant for the first seven items and also following items 17-23 (in line with the CTOPP instructional manual). Testing was discontinued if the participant failed three items in a row. The researcher recorded the total score for each participant on a score sheet. The total score is the number of correct test items. Raw scores were converted to standard scores using age norms. An average score in the phoneme isolation subtest indicates an individual's awareness in identifying target sounds in words whilst a below average performance indicates a deficit in the ability to isolate phonemes (Wagner et al. 1999, 40). The test items used in the English isolation task is given in Appendix H.

As with the elision test, the NS phoneme isolation subset had to be tailor made. It consisted of 16 items. The first item was a practice item and the other 15 items were test items. The first items consisted of words with three and four sounds like /e-f-a/ or /p-e-d-i/ and participants were asked to identify the first, middle or last sounds in the words. The remaining items consisted of words with four or five sounds and the task of the participant was to identify the second, third or fourth sounds in words like /l-e-m-a/ or /k-a-t-s-e/. The test items used in the NS isolation task is given in Appendix G.

4.4.1.3 Memory for Digits/ Digit Span Task

The memory for digits task assesses the extent to which an individual can repeat a series of numbers ranging in length from two to eight digits (Wagner et al. 1999, 7). Participants were instructed to listen to a digital recording of numbers (provided as part of the CTOPP kit) and asked to repeat the numbers in the correct order as they were played by the recording. For example, the children were asked to repeat the digits (5 3) or (9 7 1) in the order in which they appeared. The recording was paused after presentation of each trail to allow the participant to respond. No trials were repeated more than once. Testing was discontinued when the participant failed three trails in a row. The memory for digits subtest consists of four practice items and 24 test items. Feedback was given to the participant for items one - four only. The responses for each participant were recorded. The participants received one point for each item completed without error. An average score in the memory for digits subtest shows a normally developed ability to repeat a series of numbers accurately, whilst a below average score indicates a deficit in the area (Wagner et al. 1999, 40). Raw scores were converted to standard scores using age norms.

4.4.1.4 Non-word Repetition (NWR) Task

The NWR task which forms part of the CTOPP measures an individual's ability to repeat non-words that ranges in length from three to fifteen sounds (Wagner et al. 1999, 7). The participants were instructed to listen to a digital recording of non-words and asked to repeat the non-word exactly as they heard it. The NWR subtest in the CTOPP requires of participants to repeat English made up words like /ral/ and /ballop/ clearly and correctly. 30 items were presented for this subtest. The sub-test consists of three practice items and 27 test items. Feedback was given to participants for the first nine items, in line with the CTOPP instructional manual. The pre-recorded non-words (provided as part of the CTOPP kit) were played only once and no trial was repeated. The researcher paused the recording after each item was played to give time for the participant to respond. Testing was discontinued when the ceiling was reached, that is when participant missed three items in a row. A raw score for each participant was recorded on the score sheet. The participant was awarded one point for each non-word for which all the phonemes were produced correctly. An average score on the NWR subtest indicates an individual's ability to repeat non-words accurately, whilst a below average score indicates a deficit in non-word repetition ability (Wagner et al. 1999, 40). Raw scores were converted to standard scores using age norms.

The NS NWR task described in Wilsenach (2016) was used in this study. In the NS task, children were instructed to repeat non-words like /sêpokari/ and /makêpodiri/. The items were pre-recorded by an L1 speaker of NS and were designed following most of the criteria set out by Dollaghan and Campbell (1998). Specifically, "neither the non-words nor their constituent syllables corresponded to lexical items; the non-words included phonemes and syllable types that are acquired early in development and the non-words were phonotactically possible in NS" (Wilsenach 2016).

The NS NWR consisted of one practise item and 20 test items, ranging from four syllables (e.g. *sêpokari*) to seven syllables (e.g. *nasibhekarabile*) in length. The test comprised five items at each syllable length. The non-words were presented in the same order to each of the participants. The 20 test items comprising the NS NWR task are included in Appendix G.

4.4.1.5 Rapid digit naming

The rapid digit naming task measures the speed with which an individual can name numbers (Wagner et al 1999, 07). The participants were instructed to name the presented numbers as quickly as possible, from left to right until all the numbers were named. The CTOPP RAN digit naming task contains 36 items arranged on an A4 page (consisting of four rows and nine columns of six randomly arranged numbers (i.e. 2, 3, 4, 5, 7 and 8)). The test consists of six practice items (i.e. six randomly arranged digits), which is presented on a separate A 4 page. Corrective feedback was given to the participant for the practice items. A stopwatch was used to time each participant's response time – the time trial was started as soon as the participant started pronouncing the numbers. Timing was stopped as soon as the participant finished naming the last digit. Testing was discontinued and no score was recorded if the participant failed to name all the digits correctly after error correction during the practice session and/or if the participant made more than four errors during the test phase. The individual score was the total number of seconds taken to name all the numbers on the page. No scores were awarded if the participant made more than four errors. Raw scores were converted to standard scores using age norms.

4.4.1.6 Rapid letter naming

The rapid letter naming subtest measures the speed with which an individual can name letters (Wagner et al. 1999, 7). The participants were instructed to name letters presented on an A4 carton board. The CTOPP RAN letter naming task contains 36 items, organised in four rows and nine columns, and included six randomly arranged letters (i.e. a, c, k, n, s, t). The participants were asked to name the letters on each row from left to right until all the letters have been named. The practice item page consisted of a series of six letters for which feedback was given. A stopwatch was used to time each individual's trial, as previously described. Testing was discontinued and no score was recorded if the participant failed to name all the letters correctly after error correction feedback during the practice session and/or if the participant makes more than four errors during the test phase. The individual score was the total number of seconds taken to name all the letters. Raw scores were converted to standard scores using age norms.

4.4.1.7 Rapid colour naming

The rapid colour naming subtest measures the speed with which an individual can name colours (Wagner et al. 1999, 8). The participants were instructed to name the colours presented on an A4 carton board. The CTOPP RAN colour naming task consists of 36 items (i.e. blue, red, green, black, yellow and green colour labels) in a four (row) x nine (column) random arrangement. The practice item page consists of all six colours and feedback was offered for these items. The participants were asked to name the colours on each row from left to right until all the colours have been named. A stopwatch was used to time each trial, as soon as the participant started naming the colours. Testing was discontinued and no score was recorded if the participant failed to name all the colours correctly after error correction feedback during the practice session and/or if the participant made more than four errors during the test phase. The individual score is the total number of seconds taken to name all the colours. Raw scores were converted to standard scores using age norms.

4.4.1.8 Rapid object naming

The rapid object naming subtest measures the speed with which an individual can name objects (Wagner et al. 1999, 8). The participants were required to name objects presented on an A4 carton board. The CTOPP RAN object naming task contains 36 objects which are randomly arranged into four rows and nine columns. The objects depicted are a pencil, a star, a fish, a chair, a boat and a key. The participants were asked to name the objects on each row from left to right until all the objects have been named. The separate practice item page consists of one row including all six objects. Corrective feedback was given for the practice items.

RAN object naming was also assessed in NS, using the same visual stimuli. [6] The NS version of the task required the participants to name the 36 randomly arranged objects from the CTOPP picture book in NS. The researcher checked for all the possible words used to refer to (for example) a *boat* in NS; and any of these lexical items, including /lekôkgwa/, /leselewatle/, /sekepe/, /seketwana/ were accepted as an accurate response. For both the English and the NS object naming, testing was discontinued if the participant failed to name all the objects correctly after error correction feedback during the practice session and/or if the participant made more than four errors during the test phase. A stopwatch was used to time each trial, as soon as the participant started naming the objects. The individual score is the total number of seconds taken to name all the objects. For the English rapid object naming task, raw scores were converted to standard scores using age norms, but for the NS rapid object naming task, raw scores were used in the analysis (as this test was not standardised).

[6] The rationale for not testing rapid digit naming, rapid letter naming and rapid colour naming in NS is explained in Section 4.8.

4.4.2 Reading assessments

Word reading and fluent text reading tests were used to assess reading. These tests shall be outlined in detail below.

4.4.2.1 Word reading

Word reading proficiency was assessed in English using a standardised reading test and in NS using a tailor made word reading test. English Word reading abilities were assessed using the Diagnostic Test of Word Reading Processes (DTWRP). The DTWRP is an individually administered standardised and norm referenced assessment of single word reading (FRLL, Institute of Education, 2012, 6). The DTWRP consists of three reading tasks which include non-word reading, exception word reading and regular word reading.

In the non-word reading task the participants were given a non-word reading card with alien pictures and were required to read their names. For example, the participant was asked to read non-words like /thent/ and /mave/. In this case, the non-words /thent/ should be pronounced to rhyme with /went/ whilst the /mave/ pronunciation should rhyme with /gave/. In exception word reading, the participants were given a reading card and were expected to read exception words like /monkey/ or /island/. The regular word reading task required participants to read regular words like /sun/ and /made/ from the reading card. Each of the three word reading tasks contained 30 items.

The children were asked to read each word loudly and accurately. For each reading task, testing was discontinued if the participant made five consecutive errors. No feedback was given to the participants on any test items. The researcher recorded the participant's responses on the recording form. The individual score was the total number of words read correctly. The total raw score for each individual in the non-word, exception word and regular word reading were calculated. The total raw score were then converted into a composite standard score using age norms. An average score in word reading shows a normally developed ability to decode English words, whilst a below average score indicates a deficit in word reading ability (FRLL, Institute of Education 2012, 6).

There are no standardised testing materials for NS word reading. In NS the participants were expected to read NS words from a reading card, which exactly resembled the English reading cards in terms of visual lay-out. The NS word reading list started with simple words like /nna/, /ema/ and /bona/ and progressed to more complex words like /phaphamala/, /tshisepere/ and /gwadigwatša/. 30 NS items were administered to participants. The NS word reading test is presented in Appendix G.

4.4.2.2 Text reading fluency

The participants were assessed on text reading fluency abilities in English and in NS. Text reading fluency was assessed in both languages with the so-called *One minute test*. The children were required to read aloud from English and NS graded readers, for one minute. The English reader was entitled *Sindi makes tea for Granny* and is described as a Level 1 Reader in the Bridge Books series, which is published by Oxford University press (Kingwill 1986), while the NS reader was entitled *Ngwana yo moswa*, and is published as a Level 1 reader by New Readers publishers (Brain 2007). The chosen texts were deemed to be within the cognitive reading ability of the children and were age appropriate in terms of content. For each participant, a raw score for fluent text reading was calculated by counting the total numbers of words read in one minute, and then subtracting the number of incorrectly read words. Thus, the number of correctly read words within one minute was used as a measure for reading fluency.

4.5 Data collection procedure

Assessments were conducted in May and June during participants' 3rd school year. Children were assessed individually in a quiet room during normal school hours. Assessments were done in two sessions for the PP and reading tasks. English tests were conducted in one session and NS tests were conducted in another session. Phonological tests were presented in a fixed order for each participant as per CTOPP manual requirements. Testing was completed in approximately 60 minutes (i.e. two 30 minutes sessions), with a break of at least 30 minutes between sessions. Prior to the actual assessments, the participants performed short practice sessions to familiarise them with the tasks and to ensure they understood the instructions. The assessments were administered to children in both groups in English and in NS and responses were scored online. Every test session was also recorded, since some of the data, particularly the NWR, needed to be checked after the test session.

4.6 Ethical considerations

Ethical issues were taken into consideration during the research process in order to protect the psychological and physical well-being of the learners (Altermatt 2011, 2), seeing that the researcher has an obligation to protect the welfare and rights of participants.

The researcher sought permission from UNISA and the DoE to conduct the study. All research involving human participants must receive ethical clearance from an appropriate Ethics Review Committee before it may commence (UNISA Policy on Research Ethics 2007, 3). Furthermore, any students who seek to conduct research in a public school must seek permission prior to the commencement of the research study from the DoE (Gauteng Department of Education 2012, 1). Given these regulations, ethical clearance was obtained from the Department of Linguistics Research Ethics Review Committee (College of Human Sciences, UNISA) as well as from the Gauteng DoE[7]. The ethical clearance documentation is included in APPENDICES E and F.

As argued by Grant and Sugarman (2004, 725), informed consent is the major ethical issue in conducting research. Obtaining informed consent is a way of respecting participants' rights (Hammersley and Traianou 2012, 7). The school principal, affected teachers and learners were informed of the study, its purpose and methodology as well as what's expected from them (Fouka and

[7]The ethical clearance for DoE is included in appendix F. The title: "Auditory processing and reading development in Northern Sotho-English bilingual children" was adapted since the issue of the ethical clearance letter occurred before the topic was changed to better suit the content of the dissertation.

Mantzorou 2011, 4). Informed consent to conduct the research was obtained from the school authorities and from learner's caregivers. On the day of testing, learners were given the opportunity to decide for themselves whether or not to participate (Altermatt 2011, 3; Hammersley and Traianou 2012, 3). Participation was voluntary and no child participated in this study against his/her will – in other words, testing only continued after a learner gave his/her verbal assent. The informed consent letters that had to be signed by parents and the school principals are given in Appendix A, B, C and D.

The researcher ensured the anonymity and confidentiality of the participants in the study. The right to anonymity and confidentiality protects the subject's identity (Fouka and Mantzorou 2011, 6). To ensure confidentiality the personal identity of the participants remains anonymous in the description of the data. Any materials or information linking the subjects to their responses were treated as confidential, and will continue to be treated as confidential in any work that is forthcoming from this dissertation. The identity of the researchers will not be linked with participants' personal responses (Altermatt 2011, 2). The data was kept confidential throughout the research process and was made accessible only to the supervisor.

4.7 Research reliability and validity

Reliability is the extent to which the same measuring instruments can produce the same results under different conditions and on different occasions (Litosseliti 2010, 55). Validity is the extent to which the research instrument actually measures what it is supposed to measure (Dörnyei 2007, 51). Research reliability and validity is important in analysing the appropriateness, meaningfulness and usefulness of a research study (Petersen 1995, 1). Failure to ensure research reliability and validity will render the study useless and a waste of time and resources.

Firstly, well established standardised tests of PP (phoneme deletion, elision, memory for digits, non-word repetition and rapid digit, letter, object and colour naming tasks) from the CTOPP-2 as well as standardised reading assessments from the DTWRP were used as data collection materials. The

CTOPP-2 tests satisfy the demands of standards for reliability with a reliable coefficient of .90 in magnitude (Wagner et al. 1999, 54). The DTWRP also fulfils the standard demands for reliability with a coefficient reliability of more than .90 in magnitude ((FRLL, Institute of Education 2012, 52). Measures yielding scores with a liability of .80 or higher are sufficiently reliable for most research purposes (Drost 2011, 114).

Secondly, the researcher maintained consistency in instructions and in following the research procedures. The test administration and data collection were done in a consistent fashion (Leedy and Ormrod 2004, 13). Pilot testing of instruments was undertaken. Moreover, scoring of participants' results was done during the data collection sessions and standard scores were calculated for a given participant after data collection was completed. Nunnally (1978, in Drost 2011, 113) urge that reliability can be improved by making the rules for scoring as explicit as possible. The standards scores were however, derived from data of English L1 speakers and very low standard scores will thus have to be interpreted with caution since the participants in this particular study are L2 speakers of English.

Thirdly, the researcher considered and implemented supervisor feedback. Drost (2011, 118) and Ayodele (2012, 392) emphasise the need for having experts in the study like supervisors to rate the suitability of the measuring instruments. The opinion of my supervisor on whether a research instrument satisfies its intended use was considered. The NS items used were age-appropriate in terms of linguistic complexity and were developed in the same format as the English items. This was done to ensure that the English data and NS data were as uniform as possible and to make comparisons possible. Some test items in the NS tests have been previously used by Wilsenach (2013), Wilsenach (2016) and by Pretorius and Mampuru (2007).

4.8 The pilot study

A pilot study is a trail run which determines the practicability of conducting a study and which tests the effectiveness of the research methods and instruments (Hassan, Schattner and Mazza 2006, 7; Pilot, Beck and Hungler

2001, 467). Furthermore, pilot testing of research instruments enables the researcher to evaluate and simplify the instruments (Punch 2009, 43). Due to time constraints, a full pilot study was not conducted here, and in fact, Wilsenach (2013) was effectively treated as a pilot study for this project. Even so, pilot testing was conducted with three Grade 3 learners in this study. The aim was to test the NS research instruments and to determine, as far as possible, their accuracy. This exercise was conducted the week before the actual data collection sessions started. Piloting revealed that, in terms of the RAN tasks, it wasn't possible to translate or adapt all the English tests for NS (as they appear in the CTOPP), since the learners didn't have separate lexical items for *blue* and *green* in NS, since graphemes do not have letter names in NS (they are only produced as the corresponding sounds) and since the learners in Group 2 were not familiar with the NS names for digits. Thus, it was decided to only use the object naming task in NS. After piloting, small adjustments were also made to the NS elision and isolation tasks.

4.9 Data analysis

Data was analysed using descriptive and statistical procedures. Tables and graphs are used to present the data. The study used various types of inferential statistical analyses, including group comparisons, correlations and regression analyses. Before proceeding with the main analyses, preliminary analyses were done to remove outliers from the dataset and to check for assumptions of normality, homogeneity of variance and multicollinearity. The Statistical Package for Social Sciences (SPSS) software was used for the statistical analysis of the data. Further details about the exact analytical procedures are given in Chapter 5.

4.9.1 Descriptive statistics

Descriptive statistics for PP and reading measures were used in this study to examine overall group performance, as well as to detect differences between the two groups (Litosseliti 2010, 70; Brown 1988, 65). Group differences in NS-English bilinguals were obtained by calculating the mean scores of children in each group in phoneme isolation, elision, memory for digits, NWR, rapid digit, letter, colour and object naming and reading tasks.

Following the preliminary analyses, the main group and gender effects on phonological and reading tasks were assessed using multivariate analysis of variance (MANOVA) testing.

4.9.2 Correlation between variables

Correlation is defined as a measure of relations between two variables (Litosseliti 2010, 73). In this study, the nature of the relationships between PA, PWM, RAN and reading tasks were established via correlation testing. The correlational analysis indicates the strength and direction of the relationship between variables (Dörnyei 2007, 223). Spearman's rank order correlation coefficient is one technique that was used to measure the relationship between variables in this study. A Spearman's r measurement of greater than .50 is considered a moderately high coefficient, demonstrating a strong relationship between the variables whilst an r of below .30 is indicative of a weak correlation (Jackson 2009, 57). The correlation coefficient is necessary to determine whether or not there is a relationship between different variables measured in NS-English bilinguals.

4.9.3 Predictive contribution of variables to reading

Regression analyses were used to explore the possible predictive relationships between different variables. Regression is a statistical procedure used to evaluate the relative impact of a predictor variable on a particular outcome (Zou, Tuncali and Silverman 2003, 618). Regression analysis was used to assess the predictive power of the phonological variables (independent variables) on reading outcome (dependent variable) in NS-English bilingual children. Data on the relationship between PP and reading shall be analysed within the framework of the phonological deficit theory, which suggest that PP deficits lead to reading failures.

Regression analyses will also be used to assess the contributions of L1 reading skills to L2 reading, L1 language skills to L1 reading, L2 language skills to L2 reading and L2 language skills to L1 reading. Data shall be analysed within the framework of the LIH, LTH, SDH and the CPH. A good performance of NS-English bilinguals in English reading measures will suggest positive transference of L1 skills to L2 reading regardless of orthographic differences. Such a finding will also suggest that NS-English bilinguals have attained sufficient levels of linguistic proficiency, which enables positive transfer of L1 skills to L2 reading.

4.10 Conclusion

The methodology that was utilised in investigating the role of PP in reading development of NS-English bilinguals has been outlined in this chapter. A detailed description of the research design, the selection of the participants, the testing materials and the data collection procedures has been provided. The analytical strategy for the study has been specified. The study shall utilise various types of statistical analyses which includes descriptive statistics, MANOVAs, Spearman's correlation and regression analysis.

The exact data analysis and the results will be presented and interpreted in the next chapter.

CHAPTER 5
DATA PRESENTATION AND INTERPRETATION

This study focused on the relationship between PP and reading development in NS-English bilingual children. PP was assessed using PA, PWM and RAN tasks. Specifically, PA was tested using elision and phoneme isolation tasks, PWM using digit span and non-word repetition (NWR) tasks and RAN using rapid digit naming (RDN), rapid letter naming (RLN), rapid colour naming (RCN) and rapid object naming (RON) tasks. Reading was tested using word reading and fluent reading tasks.

The results are presented in five subsections. The first section presents the results of preliminary assumption testing for normality, homogeneity of variance and multicollinearity. The second section presents the descriptive statistics for the PP and reading measures in NS and English[8]. The third section presents the results of the MANOVA analysis which examine instruction group (i.e. LoLT) and gender effects on PP and reading abilities of NS-English bilingual children. The fourth section presents the correlations among the variables based on Spearman's rank order correlations. The section presents both within language and across-language correlations to examine the relationships of PP to reading performance within and across the languages tested. The fifth section presents the results of multiple regression analyses to examine whether PP skills reliably predict reading outcomes both within as well as across the two language instruction groups.

5.1 Preliminary analyses

Before proceeding with the main data analyses, the data were screened for outliers and missing cases. Following this, preliminary assumption testing was conducted to screen the data for normality, to check for homogeneity of variance and multicollinearity as well as to provide a descriptive analysis of

[8] The abbreviation ENG shall be used before English variables throughout this chapter in the tables (as English will not always fit into one line in the tables) and also in some cases in the actual text. Both ENG and English shall be used interchangeably in this chapter.

the data. Checking whether the data satisfied these assumptions is necessary for using parametric analyses.

The data was cleaned up by excluding data from extreme outliers and missing cases. In this study, extreme outliers were considered to be participants who scored 0 on any of the reading measures or any of the phonological measures. Initially 120 learners were tested, 60 in the NS group and 60 in the English group – as described in chapter four).

In the NS group, 12 participants were excluded from the final data set. Of these participants, five were excluded as they could not read words or texts in either English or in NS. One participant was excluded for not being able to read the English text, NS words or the NS text. One participant was excluded for scoring zero on both English reading measures. Finally, five participants were excluded for scoring zero on the English fluent text reading measure. Participants who scored zero on a phonological measure in the NS group also scored zero on one or more of the reading measure, and were thus already excluded.

In the English group, ten participants were excluded from the final data set. Of these participants, five were excluded as they could not read words or texts in either English or in NS. One participant was excluded for scoring zero on the NS fluent reading measure. One participant was excluded for scoring zero on the NS word reading measure and zero on both fluent reading measures. In terms of missing data cases, one participant was excluded for not completing the RLN task; and one participant was excluded for not completing the NS RON task. In terms of outliers on the phonological measures, one participant was excluded for scoring zero on the NS phoneme isolation task.

Thus, after cleaning up the data, 98 participants remained (48 in the NS group and 50 in the English group). The preliminary assumption testing, reported below, was based on the cleaned up data set; as was the parametric testing (reported in section 5.3 and further).

5.1.1 Tests of normality

Normality is one criterion that has to be met in order to use parametric techniques in data analysis (Field 2000, 93). There are different ways of assessing the normal distribution of scores: by visual inspection of the histograms, by observing the skewness and kurtosis coefficients and by conducting tests of normality, such as the Kolmogorov-Smirnov test and the Shapiro-Wilk test. In this study, a test of normality was conducted to determine how the scores on the different measures were distributed within the two groups (NS and English groups) and within the entire sample. Ghasemi and Zahediasl (2012, 489) recommends the Shapiro-Wilk test as the best choice for testing the normality of data because it is more robust when dealing with medium to small sample sizes and is also reliable with bigger samples of up to 2000. The results of the Shapiro-Wilk tests on all the variables are presented in Table 5.1, for the entire sample and for each group separately.

Normality is met when the results of the tests are non-significant ($p > .05$). Therefore, when a p-value was found to be significant, it was concluded that the data on that particular variable were not normally distributed (Field 2000, 93). In terms of the entire sample, the variables English NWR and NS elision were normally distributed. The assumption of normality was violated for the English variables isolation, digit span, NWR, RLN, RDN, RCN, RON, word- and fluent reading and for the NS variables elision, isolation, RON, word- and fluent reading.

With regards to groups, the assumption of normality was met for the English variables digit span and NWR (NS group), and for the variables isolation, digit span and RDN (English group). For the NS variables, the assumption of normality was met for isolation and NWR in the NS group and for elision, NWR and RON in the English group.

Table 5.1 Shapiro-Wilk Test of normality for all measures for the NS and English groups and for the entire sample

	NS Group				English Group				Entire Sample				
	Skewness coefficient	**Kurtosis coefficient**	**Shapiro Wilk test (p-value)**	**Sig.**	**Skewness coefficient**	**Kurtosis coefficient**	**Shapiro Wilk test (p-value)**	**Sig.**	**Skewness coefficient**	**Kurtosis coefficient**	**Shapiro Wilk test (p-value**	**Sig.**	**Homogeneity of variance**
ENG elision	.71	-.11	.88	.018	.96	.11	.94	.000	.85	.11	.92	.000	.99
ENG isolation	1.40	2.88	.88	.000	.11	-.24	.94	.399	.70	.72	.95	.001	1.34
ENG digit span	-.19	-.77	.96	.081	.63	.51	.90	.090	.4	.38	.97	.036	1.48
ENG NWR	.29	.16	.97	.293	.18	-.87	.94	.052	.06	-.24	.98	.205	.31
ENG RLN	-.93	1.02	.92	.003	-.95	.92	.89	.000	.91	-87	.91	.000	1.5
ENG RDN	.37	1.17	.95	.035	.30	-.04	.90	.241	.24	.48	.96	.011	.25
ENG RCN	1.19	.61	.86	.000	-1.90	5.26	.84	.000	-1.54	2.21	.84	.000	2.26
ENG RON	-.46	1.33	.85	.000	-.82	.91	.93	.008	-1.23	.43	.81	.000	
ENG word reading	1.18	.60	.82	.000	1.31	1.41	.86	.000	1.24	1.07	.85	.000	1.10
ENG fluent reading	.72	-.25	.92	.003	1.21	3.69	.92	.003	.85	1.82	.94	.000	1.33
NS elision	-.70	-.35	.93	.008	-.12	.26	.97	.405	-.33	-.44	.97	.064	1.31
NS isolation	-.66	.24	.95	.059	-.277	-1.04	.95	.026	-.46	-.31	.96	.008	.06
NS NWR	-.56	.053	.97	.169	-.47	.12	.97	.255	-.49	-.01	.97	.036	.25
NS RON	1.24	2.53	.92	.003	.51	1.91	.96	.071	.75	1.27	.96	.013	.86
NS word reading	-1.25	.63	.72	.000	.07	-1.41	.91	.001	-.51	-1.27	.85	.000	2.18
NS fluent reading	.48	-.73	.95	.036	1.49	1.93	.84	.000	.85	-.10	.91	.000	5.50

Overall, the results reveal that not all the variables satisfied the requirements of the normality assumption. However, the number of participants (N = 98) in this study is sufficient for various parametric tests to be robust (Ghasemi and Zahediasl 2012, 486). Due to the sample size in this study it was thus decided to use parametric techniques such as a MANOVA and regression even though not all the data are normally distributed. Visual inspection of the data (by means of histograms) revealed that, while the data for the non-normally distributed variables were typically skewed to the left, it still showed a bell curve. It was thus assumed that the central limit theorem holds, and that given the sample size, the sample means followed the normal distribution even if the respective variable is not normally distributed in the population.

5.1.2 Homogeneity of variance

Parametric techniques assume that the variances in the groups are equal (Field 2000, 98). This implies that the variability in scores for each group is the same. Levene's test can be used for assessing the homogeneity of variance assumption. The assumption for homogeneity of variance is met when the test results are non-significant (p = >.05). Homogeneity of variance was met for the English variables: elision (*F(*3, 94) = .990, p = .401), isolation (*F*(3, 94) = 1.336, p = .267), digit span (*F*(3, 94) = 1.487, p = .225), NWR (*F*(3, 94) = .309, p = .189), RDN (*F*(3, 94) =.146, p = .932), RDN (*F*(3, 94) = .247, p = .863), RCN (*F*(3, 94) = 2.265, p = .086), word reading (*F*(3, 94) = 1.102, p = .352) and fluent reading (*F*(3, 94) = 1.329, p = .270). Additionally, five NS variables also met this assumption: elision (*F*(3, 94) = 1.307, p = .277), isolation (F(3, 94) = .056, p = .982), NWR (*F*(3, 94) = .251, p = .851), RON (*F*(3, 94) = .858, p = .246) and word reading (*F*(3, 94) = 2.181, p = .185). However, this assumption was not met for NS fluent reading (*F*(3, 94) = 5.502, p = .002). The majority of the scores satisfied the requirements of the homogeneity of variance which deems the data appropriate for parametric analysis.

5.1.3 Multicollinearity and singularity

According to Field (2000, 174) MANOVA and regression analyses work best when the dependent variables are moderately or perfectly correlated.

Multicollinearity exists when there is a strong correlation (0.90 and above) between two or more predictor variables in a model. Besides using the tolerance and variance inflation factor statistics, one of the direct ways of identifying multicollinearity is by running a correlation analysis of all the predictor variables to check for the strength of the correlation. According to the correlations matrix (Table 5.5) obtained among the NS and English variables, none of the predictor variables were strongly correlated ($r < 0.9$). This implies that the data satisfied the assumptions of multicollinearity. Hence, in terms of this assumption, it is appropriate to use parametric analysis for this data set.

5.1.4 Randomness

The random assumption indicates that data should be randomly sampled from the population of interest (Field 2000, 592). However, random assignment of subjects was not possible in this study because only participants from the selected schools were used. This assumption is not satisfied in this study. Dörnyei (2007, 117) acknowledges that random sampling is often not possible in real-life research.

5.2 Descriptive statistics

Preliminary analyses were also conducted to obtain descriptive information on the PP and reading measures. In order to clarify how the groups differed on important variables such as PP and reading skills, descriptive statistics on all variables are provided. For every participant, a raw score was awarded on every test, which was converted to a standardised scores (SS) (using age norms) or to a mean percentage correct. Table 5.2 displays the means and standard deviations for all PP and reading tasks separately for each group (NS group and English group) and for the entire sample of Grade 3 children.

Table 5.2 Descriptive statistics per group and for the entire sample`

	NS group (N = 48)			English group (N = 50)			Entire sample (N = 98)		
	M	**SD**	**Range**	**M**	**SD**	**Range**	**M**	**SD**	**Range**
ENG elision Raw	16.20	7.29	5-32	18.34	7.39	3-33	17.24	7.39	3-33
ENG elision SS	6.67	2.98	2-14	7.52	3.24	3-15	7.10	3.13	3-15
ENG isolation Raw	17.21	6.29	2-31	19.36	6.78	1-29	18.31	6.60	1-31
ENG isolation SS	6.17	2.49	2-14	6.84	2.54	1-12	6.51	2.53	1-14
ENG digit span Raw	14.83	2.66	9-19	15.62	3.04	10-24	15.23	2.87	9-24
ENG digit span SS	7.90	2.47	2-12	8.66	2.95	3-17	8.29	2.74	2.47
ENG NWR Raw	15.48	3.44	8-23	17.52	2.77	13-23	16.53	3.27	8-23
ENG NWR SS	8.35	3.48	2-17	10.32	2.87	6-16	9.36	3.31	2-17
ENG RDN SS	7.77	2.27	2-14	8.52	2.11	4-14	8.15	2.21	2-14
ENG RLN SS	6.46	2.50	0-11	6.76	2.90	0-12	6.61	2.70	0-12
ENG RCN SS	9.04	3.57	0-13	10.30	2.50	0-14	9.68	3.12	0-14
ENG RON SS	7.04	4.85	0-14	10.96	1.88	5-14	9.04	4.13	0.14
ENG non-word reading	9.70	7.44	0-24	8.12	6.52	0-26	8.90	6.99	0-26
ENG exceptional word reading	7.52	5.50	0-20	12.18	5.27	0-23	9.89	5.85	0-27
ENG regular word reading	10.15	7.50	0-25	13,92	6.91	0-27	12.07	7.26	0-23
ENG word reading total Raw	27.36	18.79	1-66	34.22	16.79	0-74	30.87	18.04	0-74
ENG word reading SS	78.44	10.17	70-107	81.22	11.04	70-115	79.86	10.66	70-115
ENG fluent reading Raw	30.14	25.02	0-95	52.17	27.19	67-156	41.38	28.28	0-156
NS elision Raw	10.81	4.20	0-17	9.04	3.51	0-17	9.91	3.94	0-17
NS elision %	60.07	23.31	0-94	50.20	19.50	0-94	55.05	21.91	0-94
NS isolation Raw	9.46	3.27	1-15	10.16	3.18	4-15	9.81	3.23	1-15
NS isolation %	63.06	21.83	7-100	67.73	21.23	27-100	65.44	21.54	7-100
NS NWR Raw	12.58	3.75	3-19	11.28	3.76	1-19	11.91	3.79	1-19
NS NWR %	62.92	18.73	15-95	56.40	18.82	5-95	59.59	18.96	5-95
NS RON	51.52	10.97	13-90	60.09	12.02	34-98	55.94	12.22	30.98
NS word reading Raw	23.92	8.29	4-30	15.32	9.99	0-30	39.24	19.09	4-65
NS word reading %	79.72	27.64	13-100	51.07	33.29	0-100	65.10	33.72	0-100
NS fluent Reading	35.20	21.01	5-85	22.07	20.35	67-89	28.83	21.51	1-89

A visual inspection of Table 5.2 shows that the mean scores for most English subtests were higher in the English group than in the NS group. For most NS subtests, the mean scores were higher for the NS group than the English group. This seems to suggest that the LoLT determines children's performance in PP and reading skills. To determine whether the observed differences between the groups are statistically significant, a MANOVA was conducted, which will be discussed in the following section.

5.3 Main effects and group differences

Two two-way MANOVAs were conducted to explore the nature of PP in the two groups of participants and to investigate whether a lack of L1 literacy instruction negatively affect the development of PP and reading skills in NS-English bilingual children. Furthermore, the MANOVAs took into account that gender might contribute to differences in reading achievement of NS-English bilingual children. Although the assumption of normality was violated in some instances, it was decided to use MANOVA models, since there is no non-parametric version of this test. Furthermore, Tabachnick and Fidell (2007) acknowledge that MANOVAs are reasonably robust to violations of normality, except where the violations are due to outliers. The data for this study was checked for possible outliers, and such outliers were removed. The homogeneity of variances and the multicollinearity results do not pose any risks to the outcome of the MANOVAs. Hence, violations of the assumption of normality in this study, is unlikely to lead to type 1 error.

MANOVA models were used to determine the effect of group and gender differences on the PP and reading variables. First, to detect group differences (i.e. the effect of LoLT), a series of multivariate tests were carried out to compare performance on PP and reading skills of the two groups (NS and English). Secondly, a series of tests were also conducted to compare performance on PP and reading measures between girls and boys, in order to establish any significant gender effects. The models used Turkey's post hoc multiple comparison procedures (to which Bonferroni corrections were applied) to determine which means are significantly different from one another (Field 2000, 597). A 95% confidence interval was used.

5.3.1 Additional MANOVA statistical assumptions

5.3.1.1 Homogeneity of Variance-Covariance Matrices

Homogeneity of Variance-Covariance Matrices assumes that the variance-covariance matrices of dependent variables are equal in all groups (Field 2000, 599). This assumption can be assessed using Box's Test of Equality of Covariance Matrices. The assumption of homogeneity of variance-covariance matrices is met if the test statistic is non-significant (p = >.05). The MANOVA reveal that, for the English dependent variables, Box's test was not significant (Box’s M = 172.741, p = .347).

Similarly, Box's test for the NS dependent variables was not significant (Box’s M = 82.116, p = .204). Thus, the assumption of equality of variance-covariance matrices was satisfied. In order to meet this assumption, the variable English RON had to be removed from the MANOVA model that was used to determine group differences with regards to the English variables. Hence, no results are reported for this particular variable beyond the level of the descriptive statistics.

5.3.2 Group and gender differences on English PP and reading measures

The English PP and reading variables (elision, isolation, digit span and NWR, RDN, RLN, RCN, word reading and fluent reading) were entered into the MANOVA model as dependent variables. The raw scores (rather than standard scores) obtained on elision, isolation, digit span, NWR, word reading and fluent reading were used in the analysis, in order to facilitate comparison between the English and NS PP and reading skills (only raw scores were available in NS for the above mentioned measures). For the RAN measures, standard scores were used in the analysis, since these tasks were not mirrored in the NS test battery (with the exception of RON) and thus performance on RAN tasks will not be compared across languages. Group and gender were entered as fixed factors. Table 5.3 shows the multivariate testing for group and gender effects for the English variables. Field (2000, 600) recommends Pillai's Trace as an indicator of overall significant effects, because it is more robust in case of small sample sizes, unequal group sizes and violation of assumptions.

The results of the multivariate testing showed that both group (Pillai's Trace =.259, (*F* (9, 86) = 3.33, p = .002) and gender (Pillai's Trace = .194, (*F* (9, 86) =2.30, p =.023) exhibited overall significant effects on children's performance on the English measures.

Table 5. 3: Group and gender effect on English variables

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Group	Pillai's Trace	.259	3.33	9.00	86.00	.002	.26
Gender	Pillai's Trace	.194	2.30	9.00	86.00	.023	.19
Group *Gender	Pillai's Trace	.093	.977	9.00	86.00	.464	.09

The effect sizes for both group and gender are large (judged by Cohen's criterion (Partial Eta Squared = .26 and .19). Cohen (1992, in Field 2000, 32) suggests the guidelines for interpreting the Partial Eta Squared values as: .01 = small effect, .06 = moderate effect and .14 = large effect. The interaction effect of group/gender is not statistically significant, Pillai's Trace = .093, (*F* (9, 86) = 0.98, p=.464), and the effect size is moderate (Partial Eta Squared=.09).

Tests of between subject effects were performed following the multivariate test. Table 5.3-1 shows the descriptive statistics obtained for the English measures across the different LoLT groups and gender groups, while Table 5.3-2 portrays the inferential statistics associated with the group differences and gender differences.

Table 5.3-1 Descriptive statistics for English PP and reading measures based on group and gender

	Group				Gender			
	Group 1 (48)		**Group 2 (50)**		**Female (55)**		**Male (43)**	
Dependent variable	Mean Raw	SD	Mean Raw	SD	Mean Raw	SD	Mean Raw	SD
ENG elision	16.10	7.3	18.34	7.4	19.3	7.4	14.7	6.7
ENG isolation	17.21	6.3	19.4	6.8	18.6	6.2	17.9	7.1
ENG digit span	14.8	2.7	15.6	3.0	15.7	3.2	14.7	2.4
ENG NWR	15.5	3.4	17.5	2.8	16.7	3.2	16.3	3.3
	Mean SS	SD	Mean SS	SD	Mean SS	SD	Mean SS	SD
ENG RDN	7.77	2.26	8.52	2.11	8.62	2.03	7.56	2.30
ENG RLN	6.46	2.5	6.76	2.90	6.91	2.81	6.23	2.54
ENG RCN	9.04	3.57	10.30	2.50	9.67	3.16	9.70	3.11
ENG word reading	27.4	18.8	34.22	16.8	13.5	7.5	10.3	6.6
ENG fluent reading	30.14	25.02	52.17	27.2	48.6	30.5	32.11	22.30

Group 1. NS LoLT group

Group 2. English LoLT group

Table 5.3-2 Test of Between-Subject effects

Dependent variable	Source	Type III sum of squares	df	Error	Mean square	F	Sig.
ENG elision	Group	48.813	1	94	48.813	0.97	.326
	Gender	451.871	1	94	451.871	9.02	.003
ENG isolation	Group	106.729	1	94	106.729	2.5	.121
	Gender	3.103	1	94	3.103	0.07	.790
ENG digit span	Group	8.240	1	94	8.240	1.02	.316
	Gender	19.789	1	94	19.789	2.36	.128
ENG NWR	Group	109.040	1	94	109.040	11.2	.001
	Gender	0.072	1	94	0.072	0.07	.931
ENG RDN	Group	8.511	1	94	8.511	1.83	.179
	Gender	21.731	1	94	12.731	4.67	.033
ENG RLN	Group	0.897	1	94	0.897	0.12	.729
	Gender	9.762	1	94	9.762	9.76	.254
ENG RCN	Group	38.141	1	94	38.141	3.97	.049
	Gender	1.275	1	94	1,275	0.13	.717
ENG word reading	Group	228.719	1	94	228.719	0.32	.048
	Gender	163.980	1	94	163.980	3.40	.069
ENG fluent reading	Group	9138.412	1	94	9138.412	13.97	.000
	Gender	4156.409	1	94	4156.409	6.36	.013

* $p < .05$; ** $p < 0.01$, ***$p < 0.001$ (95% confidence interval).

5.3.2.1 Group differences for English PP and reading measures

The statistical analysis revealed a significant group difference for English NWR (F (1, 94) = 11.2, $p < .05$), with the English group (M =17.5, SD = 2.8) scoring significantly higher than the NS group (M =15.5, SD = 3.4). A significant difference was found for English RCN skill (F (1, 94) = 3.97, $p < .05$) with the English group (M = 10.30, SD = 2.50) obtaining higher scores than the NS group (M = 9.03, SD = 3.57). No statistically significant group differences were established for any of the other English phonological measures. A significant group difference was established for English word reading (F (1; 94) = 0.32, $p < .05$) with the English group (M=34.22, SD= 16.8) scoring significantly higher than the NS group (M= 27.4, SD=18.8). Significant group differences were also established for English fluent reading (F (1, 94) = 17.25, $p < .05$) with the English group (M = 52.17, SD = 27.19) significantly outperforming the NS group (M = 30.14, SD = 25.02).

5.3.2.2 Gender differences for English PP and reading measures

Tests of between-subjects effects showed a significant gender effect on elision (F (1, 94) = 9.02, $p < .05$), with the female group (M = 19.3, SD = 7.4) performing better than the male group (M = 14.7, SD = 6.7). Gender also shows a statistically significant effect on RDN skill (F (1, 94) = 4.67, $p < .05$) with the female group (M = 8.67, SD = 2.03) scoring higher than the male group (M = 7.56, SD = 2.30). Gender had no statistically significant effect on the other phonological variables.

Gender also showed a statistically significant effect on fluent reading (F (1, 94) = 6.36, $p < .05$) with the female group (M = 46.63, SD = 30.46) scoring significantly higher than the male group (M = 32.11, SD = 22.30). Gender had no statistically significant effect on word reading performance.

5.3.3 Group and gender differences for NS PP and reading measures

A two-way MANOVA analysis was conducted on an array of NS phonological and reading variables (i.e., elision, isolation, NWR, RON, word- and fluent reading) to compare performance between the two LoLT groups and between boys and girls. The NS phonological and reading variables (elision, isolation, NWR and RON, word reading and fluent reading) were entered into the model as dependent variables and group and gender were entered as fixed factors.

Results of the multivariate testing procedure showed that both group (Pillai's Trace = .325, (*F* (6, 89) = 7.14, p = .000) and gender (Pillai's Trace = .114, (*F* (6, 89) = 1.91, p = .048) exhibited overall significant effects on the children's performance on the NS measures. The interaction effect of group/gender for NS variables is not statistically significant (Pillai's Trace = .035, (*F* (6, 89) = 0.54, p = .778) as indicated in Table 5.4 below:

Table 5.4 Group and gender differences in NS PP and reading measures

Effect		**Value**	**F**	**Hypothesis Df**	**Error Df**	**Sig**
Group	Pillai's Trace	.325	7.14	6.000	89.000	.000
Gender	Pillai's Trace	.114	1.91	6.000	89.000	.048
Group* Gender	Pillai's Trace	.035	0.54	6.000	89.000	.778

Tests of between subject effects were performed following the multivariate test. Table 5.4-1 shows the descriptive statistics obtained for the NS measures across the different LoLT groups and gender groups, while Table 5.4-2 portrays the inferential statistics associated with the group differences and gender differences.

Table 5.4-1 Descriptive statistics for NS PP and reading measures based on group and gender performance

	Group				**Gender**			
	Group 1 (48)		**Group 2 (50)**		**Female (55)**		**Male (43)**	
Dependent variable	Mean Raw	SD	Mean Raw	SD	Mean Raw	SD	Mean Raw	SD
NS elision	10.82	4.2	9.04	3.5	10.72	3.7	8.7	4.1
NS isolation	9.46	3.3	10.2	3.2	10.42	3.2	9.05	3.1
NS NWR	12.6	3.7	11.3	3.8	11.93	3.8	11.91	3.8
NS RON	51.6	10.9	60.1	12.03	55.87	13.17	56.04	11.04
NS word reading	23.9	8.3	15.32	10.0	20.04	9.96	18.88	10.39
NS fluent reading	35.2	21.02	22.1	20.4	32.70	24.11	23.88	16.63

Group 1: NS LoLT group
Group 2: English LoLT group

Table 5.4-2 Test of Between-Subject effects for NS variables based on group and gender effects

Dependent variable	Source	Type III sum of squares	Df	Error	Mean square	F	Sig
NS elision	Group	117.335	1	94	117.335	8.50	.004
	Gender	116.942	1	94	116.942	8.47	.005
NS isolation	Group	5.258	1	94	5.258	.514	.475
	Gender	39.356	1	94	39.356	3.85	.053
NS NWR	Group	48.607	1	94	48.607	3.42	.068
	Gender	1.524	1	94	1.524	0.11	.744
NS RON	Group	1807.448	1	94	1807.448	13.40	.000
	Gender	60.945	1	94	60.945	0.45	.503
NS word reading	Group	2066.030	1	94	2066.030	25.05	.000
	Gender	168.976	1	94	168.976	2.05	.156
NS fluent reading	Group	5028.769	1	94	5028.769	12.46	.001
	Gender	2953.958	1	94	2953.958	7.32	.008

* $p < .05$; ** $p < 0.01$, ***$p < 0.001$ (95% confidence interval).

5.3.3.1 Group differences for NS PP and reading measures

Table 5.4-2 shows that the NS group (M = 10.82, SD = 4.2) scored significantly higher than the English group (M = 9.04, SD = 3.5) on NS elision (F (1, 94) = 8.50, $p < 0.05$). Group also had a significant effect on RON performance (F (1, 94) = 13.40, $p < 0.05$) with the English group (M = 60, 01, SD =12.03) taking significantly longer to name objects in NS than the NS group (M = 51.63, SD = 10.97). Group did not significantly affect any other NS phonological variables.

In terms of NS reading, the between-subjects tests show that group had a significant effect on NS word reading performance (F (1, 94) = 25.05, $p < 0.05$), with the NS group (M = 23.9, SD = 8.3) scoring significantly higher than the English group (M = 15.32, SD = 10.0). Likewise, the NS group (M = 35.21, SD = 21.02) scored significantly higher than the English group (M = 22.71, SD = 20.35) on NS fluent reading (F (1, 94) = 12.46, $p < 0.05$).

5.3.3.2 Gender differences for NS PP and reading measures

Tests of between-subjects effects revealed a statistically significant gender effect on NS elision performance (F (1, 94) = 8.50, $p < .05$) with the female group (M = 10.72, SD = 3.7) performing significantly better than the male group (M = 8.7, SD = 4.1). Gender also presents a statistically significant effect on NS phoneme isolation performance (F (1, 94) = 3.85, $p <.05$) with the female group (M =10.42, SD = 3.2) performing significantly higher than the male group (M = 9.05, SD = 3.1). There were no statistically significant gender effects on other NS phonological variables.

In term of NS fluent reading, the female group (M = 32.70, SD = 24.11) obtained significantly higher scores than the male group (M = 23.88 SD = 16.63) (F (1, 94) = 7.32, $p < .05$). However, gender had no significant effect on NS word reading performance.

5.4 Correlations

5.4.1 The relationship between PP and reading skills

Due to the non-normal distribution of some of the data, non-parametric analyses were conducted in order to determine the relationship between phonological and reading variables. To explore the relationship between PP and reading, Spearman rank-order correlation coefficients (two tailed) were calculated between PA (elision, phoneme isolation), PWM (NWR, digit span), RAN (RDN, RLN, RCN and RON), word reading and reading fluency measures, both within and across languages.

Firstly, Spearman's correlations were conducted to determine the within language relationships between PP and reading variables and among the PP variables themselves. Secondly, Spearman's correlations were performed to examine the cross-language relationships between PP and reading measures and also between PP measures themselves across the tested languages. The correlational analyses were conducted by pooling the scores from the two groups, (N = 98) and were also calculated separately for each group to examine the relation between variables within each group. The confidence interval for all the correlations was set at 95%, but correlation coefficients are specified to be statistically significant at the .01 or .05 level. Table 5.5 and Table 5.6 below present the correlations coefficients for the whole group and for each group respectively.

5.4.1.1 Phonological awareness and reading

The within-language correlations indicated that PA was significantly associated with reading variables. ENG elision (r = .60, p = .000) and ENG isolation (r = .51, p = .000) moderately correlated with ENG word reading. Likewise ENG elision (r = .48, p = .000) and ENG isolation (r = 43, p = .000) moderately correlated with ENG fluent reading. The relations between NS word reading and NS elision (r = .65, p = .000) as well as NS isolation (r = .61, p = .000) were moderately strong. NS elision (r = .42, p = .000) and NS isolation (r = .41, p = .000) moderately correlated with NS fluent reading.

Table 5.5 Spearman's within and across language correlations between phonological and reading measures for the entire sample (N = 98)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.ENG elision	-	.59**	.32**	.35**	.49**	.46**	.04	.13	.60**	.48**	**.43****	.49**	.27**	-.05	.35**	.37**
2.ENG isolation	.59**	-	.19	.27**	.40**	.52**	.08	.06	.51**	.43**	**.37****	.44**	.05	.20	.17	.24*
3.ENG digit span	.32**	.19	-	.49**	.29**	.32**	.28**	.24*	.23*	.27**	**.20***	.20	.29**	-.16	.14	.24*
4.ENG NWR	.35**	.27**	.49**	-	.37**	.26**	.08	.14	.27**	.27**	.13	.27**	.32**	.10	.04	.08
5.ENG RLN	.49**	.40**	.29**	.37**	-	.53**	.22*	.26**	.52**	.41**	.32**	.41**	.19	-.17	.27**	.36**
6.ENG RDN	.46**	.52**	.32**	.26**	.53**	-	.38**	.26**	.57**	.59*8	.34*	.46**	-.08	-.14	.34**	.37**
7.ENG RCN	.04	.08	.28**	.08	.22*	.38**	-	.40**	.17	.27**	.18	.29**	-.03	.32**	.08	.13
8.ENG RON	.13	.06	.24*	.14	.26**	.26**	.40**	-	.32**	.46**	.07	.29**	.12	-.16	.09	.14
9.ENG word reading	.60**	.51**	.23*	.27**	.52**	.57**	.17	.32**	-	.74**	.44**	.53**	.21*	-.02	.72**	.69**
10.ENG fluent reading	.48**	.43**	.27**	.27**	.41**	.59**	.27**	.46**	.74**	-	38**	.53**	.21*	-.02	.34**	.44**
11.NS elision	.43**	.37**	.20*	.13	.32**	.34*	.18	.07	.44**	.38**	-	.53**	.40**	-.31**	.65**	.61**
12.NS isolation	.49**	.44**	.20	.27**	.41**	.46**	.29**	.29**	.53**	.53**	.53**	-	.23*	.00	.42**	.41**
13.NS NWR	.27**	.05	.29**	.32**	.19	-.08	-.03	.12	.21*	.04	.40**	.23*	-	-.16	.35**	.27**
14.NS RON	-.05	.20	-.16	.10	-.17	-.14	.32**	-.16	-.02	-.06	-.31**	.00	-.16	-	-.32**	-.36**
15.NS word reading	.35**	.17	.14	.04	.27**	.34**	.08	.09	.55**	.30**	.65**	.42**	.35**	-.32**	-	.78**
16.NS fluent reading	.37**	.24*	.24*	.08	.36**	.37**	.13	.14	.61**	.47**	.61**	.41**	.27**	-.36**	.78**	-

** Correlation significant at the 0.01 level (2 tailed: *Correlations significant at the 0.05 level (2 tailed)

Table 5. 6 Spearman's correlations coefficients between phonological and reading measures for the NS group and the English group

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1. ENG elision	-	.56**	.32**	.35**	.46**	.49**	.04	.13	.60**	.51**	.43**	.49**	.27*	-.05	.35*	.37**
2. ENG isolation	**.63****	-	.19	.27**	.40**	.52**	.08	.06	.48**	.43**	.37**	.44**	.05	.20*	.12	.22*
3. ENG digit span	**.33***	**.15**	-	.49**	.32**	.28**	.29**	.24**	.23*	.27**	.20**	.20	.29**	-.16	.14	.24*
4. ENG NWR	**.52****	**.37****	**.52****	-	.37**	.26**	.08	.14	.27*	.27*	.13	.27*	.31**	.10	.04	.08
5. ENG RLN	**.58****	**.47****	**.44****	**.50****	-	.53**	.22*	.26**	.52**	.41**	.32**	.41**	.19	-.17	.34**	.37**
6. ENG RDN	**.51****	**.49****	**.26**	**.59****	**.59****	-	.38**	.26**	.57**	.59**	.34**	.47**	.08	-.14	.27**	.36**
7. ENG RCN	**.08**	**.10**	**.39****	**.25**	**.39****	**.39****	-	.40**	.17	.27**	.18	.28**	.03	-.32**	.08	.13
8. ENG RON	**.09**	**-.14**	**.13**	**.28**	**.05**	**.05**	**.16**	-	.32**	.46**	.07	.29**	.12	-.16	.09	.14
9. ENG word reading	**.52****	**.37****	**.14**	**.30***	**.44****	**.58****	**.19**	**.28****	-	.78**	.44**	.53**	.21*	-.02	.55**	.61**.
10. ENG fluent reading	**.46****	**.36***	**.14**	**.32***	**.43****	**.65***	**.20**	**.26****	**.77****	-	.38**	.53**	.04	-.07	.30**	.47**
11. NS elision	**.62****	**.61****	**.28**	**.29***	**.43****	**.60****	**.24**	**.17**	**.57****	**.70****	-	.53**	.40**	-.31*	.65**	.61**
12. NS isolation	**.53****	**.43****	**.21**	**.39****	**.48****	**.42****	**.31***	**.16**	**.38****	**.54****	**.61****	-	.23**	-.00	.42**	.41**
13. NS NWR	**.39****	**.25**	**.40****	**.55****	**.42****	**.20**	**.08**	**.33***	**.31***	**.16***	**.29****	**.16**	-	-.16	.34**	.27**
14. NS RON	**-.26**	**.09**	**-.37***	**-.16**	**-.40****	**-.41****	**-.39****	**-.37**	**-.17**	**-.18**	**-.17**	**-.11**	**.22**	-	-.32**	-.36**
15. NS word reading	**.32****	**.34****	**.21**	**.21**	**.38****	**.54****	**.32***	**.39****	**.72****	**.71****	**.68****	**.47****	**.17**	**-.20**	-	.78**
16. NS fluent reading	**.47****	**.39****	**.33***	**.26**	**.41****	**.73***	**.41****	**.34***	**.79****	**.80****	**.66****	**.45****	**22**	**-.32***	**.81****	-

** Correlation significant at the 0.01 level (2 tailed): *Correlations significant at the 0.05 level (2 tailed).
Correlations for the NS (Group 1) children are reported below the diagonal and correlations for the English (Group 2) children are reported above the diagonal.

Within language correlations for each group reveal that in the NS group (group 1), ENG elision moderately correlated with ENG word- (r = .52, p = .000) and ENG fluent (r = .46, p = .000) reading. There was a moderately weak correlation between ENG phoneme isolation and ENG word- (r = .37, p = .009) as well as ENG fluent (r = .36, p = .013) reading. A moderately strong correlations was found between NS elision and NS word (r = .68, p = .000) as well as NS fluent (r = .66, p = .000) reading. NS phoneme isolation moderately correlated with NS word (r = .47, p = .001) and NS fluent (r = .45, p = .001) reading abilities.

In group 2 (the English instruction group), ENG elision (r = .60, p= .000) and ENG phoneme isolation (r = .51, p = .000) were moderately to strongly correlated with ENG word reading. ENG elision (r = .48, p = .000) and ENG isolation (r = .43, p = .000) moderately correlated with ENG fluent reading. The relations between NS elision and NS word (r = .65, p = .000) and NS fluent (r = .61, p = .000) reading abilities were moderately strong. NS isolation was moderately correlated with NS word (r = .42, p = .000) and NS fluent (r = .41, p = .000) reading.

5.4.1.2 Phonological working memory and reading

Within language correlations for the entire group show that ENG word reading associated weakly with ENG digit span (r = .23, p = .022) and ENG NWR (r = .27, p = .008). ENG reading fluency weakly correlated with ENG digit span (r = .27, p = .007) and ENG NWR (r = .27, p = .007). NS NWR correlated positively with NS word (r = .35, p = .000) and NS fluent (r = .27, p = .006) reading.

In group 1, ENG NWR weakly correlated with ENG word (r = .30, p = .039) and ENG fluent (r = .32, p = .027) reading. ENG digit span and NS NWR did not correlate with any reading abilities. In group 2, ENG digit span weakly correlated with ENG word (r = .23, p = .022) and ENG fluent (r = .27, p = .008) reading. ENG NWR weakly correlated with ENG word (r = .27, p = .007) and ENG fluent (r = .27, p = .007) reading. NS NWR positively correlated with NS word (r = .34, p = .000) and NS fluent reading (r = .27, p = .006).

5.4.1.3 Rapid automatised naming and reading

There were a moderately strong correlations between ENG RDN and ENG word (r = .57, p = .000) as well as ENG fluent (r = .59, p = .000) reading abilities. ENG RLN moderately correlated with ENG word (r = .52, p = .000) and ENG fluent (r = .41, p = .000) reading. ENG RCN correlated weakly with ENG reading fluency (r = .27, p = .006) but failed to correlate with ENG word reading. ENG RON was weakly associated with ENG word reading (r = .32, p = .001) and moderately associated with ENG fluent reading (r = .46, p = .000). In NS, RON (the raw score time measure) negatively correlated with NS word (r = -.32, p = .001) and NS fluent (r = -.36, p = .000) reading.

In Group 1, ENG RDN positively correlated with ENG word (r = .58, p = .000) and ENG fluent (r = .65, p = .000) reading. ENG RLN moderately correlated with ENG word (r = .44, p = .002) and ENG fluent (r = .43, p = .002) reading. ENG RCN did not correlate with any reading abilities. ENG RON weakly correlated with ENG word (r = .28, p = .053) but failed to correlate with ENG fluent reading. In group 2, ENG word reading was moderately correlated with ENG RDN (r = .52, p = .000) and ENG RLN (r = .52, p = .000), and weakly correlated with ENG RON (r = .32, p = .001). ENG word reading failed to correlate with ENG RCN. ENG fluent reading was moderately correlated with ENG RDN (r = .59, p = .000), ENG RLN (r = .41, p = .000) and ENG RON (r = .46, p = .000) and weakly correlated with ENG RCN (r = .27, p = .006). NS RON negatively correlated with reading abilities in both groups.

5.4.1.4 The relations among PA, PWM and RAN

In NS, within language correlations show that NS elision was associated positively with NS phoneme isolation (r = .53, p = .000) and NS NWR (r = .40, p = .000), but negatively with NS RON. NS phoneme isolation was weakly related to NS NWR (r = .23, p = .024). NS RON negatively correlated with NS NWR but failed to correlate with phoneme isolation.

In English, ENG elision positively correlated with ENG phoneme isolation (r = .59, p = .000), ENG digit span (r = .32, p = .001), ENG NWR (r = .35, p = .000), ENG RDN (r = .46, p = .000) and ENG RLN (r = .49, p = .000), but ENG elision did not correlate with ENG RCN and ENG RON. ENG Phoneme isolation correlated positively with ENG NWR (r = .27, p = .007), ENG RDN (r = .52, p = .000) and ENG RLN (r = .40, p = .000), but failed to correlate with ENG RCN, ENG RON and ENG digit span. ENG digit span correlated positively with ENG NWR (r = .49, p = .000), ENG RDN (r = .32, p = .001), ENG RLN (r = .28, p = .006), ENG RCN (r = .29, p = .005) and ENG RON (r = .24, p = .015). ENG NWR was positively related with ENG RDN (r = .26, p = .009) and ENG RLN (r = .38, p = .000) but failed to correlate with ENG RCN and ENG RON. ENG RLN correlated with ENG RCN (r = .22, p = .033), ENG RON (r = .26, p = .010) and ENG RDN (p = .53, r = .000). ENG RCN correlated with ENG RON (r = .40, p = .000) and ENG RDN (r = .38, p = .000). ENG RON weakly correlated with ENG RDN (r = .26, p = .010).

5.4.2 Transfer of PP skills from L1 to L2

5.4.2.1 Cross-linguistic correlations between PP and reading measures (L1 and L2)

The cross-linguistic results show that NS elision moderately correlated with ENG word- (r = .44, p = .000) and ENG fluent (r = .38, p = .000) reading. NS phoneme isolation moderately correlated with ENG word (r = .53, p = .000) and ENG fluent (r = .53, p = .000) reading. NS NWR positively correlated with ENG word reading (r = .21, p = .038), but not with ENG fluent reading. NS RON failed to correlate with ENG reading abilities.

The relations between ENG elision and NS word (r = .35, p = .000) as well as NS fluent (r = .37, p = .000) reading was moderately weak. ENG isolation weakly correlated with NS fluent reading (r = .24, p = .027) but failed to correlate with NS word reading. ENG digit span weakly correlated with NS fluent reading (r = .24, p = .019) but failed to correlate with NS word reading. ENG RDN positively correlated with NS word (r = .27, p = .008) and NS fluent (r = .36, p = .000) reading. ENG RLN strongly correlated with NS word (r = .34, p = .001) and NS fluent (r = .37, p = .000) reading. ENG NWR, RCN and RON failed to correlate with NS word and fluent reading. NS word reading positively correlated with ENG word (r = .55, p = .000) and ENG fluent (r = .30, p = .003) reading. NS fluent reading positively correlated with ENG word (r = .61, p = .000) and ENG fluent (r = .47, p = .000) reading.

5.4.2.2 Cross-linguistic correlations between PP measures in L1 and L2

NS elision correlated with ENG elision (r = .43, p = .000), ENG phoneme isolation (r = .37, p = .000), digit span (r = .20, p = .048), ENG RDN (r = .32, p = .001) and ENG RLN (r = .34, p = .001), but not with ENG NWR, RCN and ENG RON. NS isolation positively correlated with ENG elision (r = .49, p = .000), ENG isolation (r = .44, p = .000), digit span (r = .20, p = .053), ENG NWR (r = .27, p = 007), ENG RDN (r = .41, p = 000), ENG RLN (r = .46, p = 000), ENG RCN (r = .29, p = .005) and ENG RON (r = .29, p = .004). NS NWR positively correlated with ENG elision (r = .27, p = .007), ENG digit span (r = .29, p = .003) and ENG NWR (r =.32, p = .002), but failed to correlate with ENG phoneme isolation, RLN, RDN, ENG RON and RCN. NS RON positively correlated with ENG isolation (r = .20, p = .043), and negatively correlated with the other ENG PP variables.

5.5 Multiple regression analyses

5.5.1 Predictors of reading development in NS-ENG bilinguals

Multiple linear regression models were used to explore the extent to which PP skills (PA, PWM and RAN) predict the two reading measures (word reading and reading fluency); both within and across the two languages. One of the assumptions for multiple regression analysis is the normal distribution of data; but as reported earlier not all data met normality requirements. However, it was decided to run multiple regression analyses since it is quite robust against violations of normality in bigger samples, and because there is no non-parametric alternative in SPSS. Furthermore, multiple regressions are appropriate for providing direct predictions between two or more variables when there are several predictor variables (Field 2000, 147).

The PP measures (elision, phoneme isolation, NWR, digit span, RDN, RLN, RON and RCN) were entered into the models as predictor variables. The reading outcomes (i.e. NS word reading and NS fluent reading; ENG word and ENG fluent reading) were entered as the dependent variables. Multiple regression analyses were conducted on a collapsed data set to establish whether any of the PP measures reliably predict reading abilities in the NS-English bilingual learner population at large. Separate multiple regressions were also conducted for each group.

A hierarchical method of entering variables was used. PA (elision and phoneme isolation) measures were entered in the first step of the model and PWM (NWR and digit span) measures were entered in the second step. RAN measures (RLN, RDN, RON, RCN) were entered in the third step of the model. Thus, after controlling for PA and PWM in the first and second step, RAN was entered in the third step. This hierarchy was based on existing evidence that PA is a unique and strong predictor of reading abilities, compared to other phonological skills (Chow et al. 2005; Gottardo and Lafrance 2006; Soares De Soussa and Broom 2011; Gottardo et al. 2006; Wei and Zhou 2013; Jongegan, Verhoeven and Siegel 2007).

5.5.2 Within language PP predictors of NS reading

To find the within-language phonological predictors of NS reading, multiple regression analyses were conducted with the NS reading measures as dependent variables and NS elision, NS phoneme isolation, NS NWR and NS RON as predictor variables in the regression model. Firstly, a multiple regression analysis was performed on a collapsed data set. Secondly, analyses were also conducted for each group to find NS predictors of reading in the two instructional groups. The constant values, betas, standard errors and standardised betas for within language phonological predictors of NS reading are provided in Table 5.7 below.

Table 5.7 Summary of within language hierarchical multiple regression with NS reading as dependent variable

	NS word reading			NS fluent reading		
	B	**SE B**	**B**	**B**	**SE B**	**B**
Step 1						
Constant	10.13	9.2		-7.02	5.94	
NS elision	.91	.15	.59*	.53	.10	.54*
NS isolation	.07	.15	.05	.10	.10	.10
Step 2						
Constant	-3.1	10.7		7.21	7.11	
NS elision	.80	.15	.52*	.53	.10	.54*
NS isolation	.05	.15	.03	.10	.10	.10
NS NWR	.35	.15	.20*	.01	.10	.01
Step 3						
Constant	14.4	17.9		15.5	11.7	
NS elision	.75	.16	.49*	.46	.10	.46*
NS isolation	.08	.15	.05	.15	.10	.15
NS NWR	.33	.15	.19*	-.02	.10	-.02
NS RON	-.28	.23	-.10	-.36	.15	-.21*

*Note: For NS word reading predictors-R^2=.38 for Step 1; ΔR^2 =.03 for Step 2 and ΔR^2 =.01 for Step 3. For NS fluent reading predictors R^2=.36 for Step 1; ΔR^2 =.00 for Step 2 and ΔR^2 =.04 for Step 3. * $p < .05$;** $p < 0.01$, ***$p < 0.001$ (95% confidence interval).*

Results of the regression model in Table 5.7 show that 38% of the variance in NS single word reading was predicted by the model in step 1. In step 2 when NS NWR was entered, it accounted for an additional 3% variance in NS word reading. In step 3, NS RON accounted for an additional 1% variance in NS word reading beyond that explained by PA and PWM measures. NS Elision significantly predicted NS word reading at every stage of the model with significant beta weights ($\beta = .59$, $p = .000$ at step 1, $\beta = .52$, $p = .000$ at step 2 and $\beta = .49$, $p = .000$ at step 3). NS NWR also significantly predicted NS word reading at every stage of the model ($\beta = .20$, $p = .025$ at step 1 and $\beta = .19$, $p = .035$ at step 2). NS phoneme isolation and NS RON failed to significantly predict NS word reading.

With regards to NS fluent reading, a multiple hierarchical regression model showed that NS elision and NS isolation predicted 36% of the variance in this outcome variable at the first stage of the model. In stage 2, NS NWR did not account for any additional variance in NS fluent reading. NS RON (stage 3) accounted for an additional 4% variance in the outcome of fluent reading. NS elision significantly predicted NS fluent reading at every step of the model ($\beta = .54$, $p = .000$ at step 1; $\beta = .54$, $p = .000$ at step 2 and $\beta = .46$, $p = .000$ at step 3). NS RON significantly predicted NS fluent reading ($\beta = -.21$, $p = .018$) at step 3 of the model. NS isolation and NS NWR did not significantly predict fluent reading.

In table 5.8 below, the regression statistics for each of the two groups are presented (with regard to NS reading).

Table 5.8 Hierarchical regression for within group PP predictors of NS reading

	Group 1 (NS group)						Group 2 (English group)					
	NS word reading			NS fluent reading			NS word reading			NS fluent reading		
	B	**SE B**	**β**	**B**	**SE B**	**β**	**B**	**SE B**	**B**	**B**	**SE B**	**β**
Step 1												
Constant	34.3	10.5		.49	8.08		14.5	7.03		13.7	8.4	
NS elision	.71	.17	.60*	.50	.13	.55*	.70	.24	.41*	.38	.16	.36*
NS isolation	.04	.18	.03	.09	.14	.10	.45	.23	.29*	.25	.14	.27
Step 2												
Constant	28.5	13.4		2.32	10.3		26.8	14.5		10.7	9.6	
NS elision	.68	.17	.57*	.50	.14	.54*	.58	.25	.34*	.41	.17	.39*
NS isolation	.03	.18	.02	.09	.14	.09	.40	.22	.25	.27	.15	.28
NS NWR	.14	.19	.10	.04	.14	.04	.39	.22	.22	-.10	.15	-.09
Step 2												
Constant	39.3	23.6		30.1	17.3		23.4	24.8		-3.1	16.4	
NS elision	.68	.18	.56*	.45	.13	.50*	.56	.26	.32*	.38	.18	.36*
NS isolation	.03	.18	.03	.10	.13	.10	.40	.23	.26	.29	.15	.30
NS NWR	.12	.19	.08	-.02	.14	-.02	.40	.22	.22	-.09	.14	-.09
NS RON	-.18	.31	-.07	-.52	.23	-.28*	-.06	.33	-.02	.13	.22	.08

*Note: In Group 1, NS word reading predictors -R^2=.38 for step 1; ΔR^2 =.01 for step 2 and ΔR^2 =.01 for step 3 and for NS fluent reading-R^2=.37 for step 1; ΔR^2= .0 for step 2, ΔR^2= .07 for step 3. In Group 2, NS word reading predictors-R^2=.46 for step 1; ΔR^2=.05 for step 2 and for NS fluent reading predictors-R^2=.49 for step 1; ΔR^2=.06 for step 2. * $p < .05$; ** $p < 0.01$, ***$p < 0.001$ (95% confidence interval).*

5.5.2.1 Within-language PP predictors of NS reading in the NS group

The results reveal that in Group 1 (NS group), NS elision and NS isolation accounted for 38% of variance in NS word reading at step 1. NS NWR (entered at step 2) and NS RON reading (entered in step 3) accounted for an additional 2% variance in NS word reading. NS elision significantly predicted NS word reading with significant beta weights at every stage of the model ($\beta = .60$, $p = .000$ at step 1, $\beta = .57$, $p = .000$ at step 2 and $\beta = .56$, $p = .000$ at step 3). NS isolation, NS NWR and NS RON did not significantly predict NS word reading in the NS group.

NS elision and NS isolation accounted for 37% of variance in NS fluent reading at step 1. When NS NWR was entered in step 2, it did not account for any additional variance in NS fluent reading. Adding NS RON as predictor variable resulted in the model explaining 44% of variance in NS fluent reading (i.e. NS RON explained an additional 7% variance in NS fluent reading performance beyond that explained by other phonological measures). NS elision significantly predicted NS fluent reading in every stage of the model ($\beta = .55$, $p = .000$ for step 1, $\beta = .54$, $p = .000$ for step 2, and $\beta = .50$, $p = .001$ for step 3). Neither NS isolation nor NS NWR significantly predicted NS fluent reading. NS RON significantly predicted NS fluent reading ($\beta = -.28$, $p = .028$) in the NS group.

5.5.2.2 Within-language PP predictors of NS reading in the English group

In group 2 (English group), NS elision and NS isolation accounted for 39% of variance in NS word reading at step 1. After adding NS NWR in step 2 the variables accounted for 43% of variance in NS word reading. Adding NS RON into the model at stage 3 did not explain any additional variance in the NS word reading ability of the English LoLT group. NS elision ($\beta = .41$, $p = .006$ at step 1; $\beta = .34$, $p = .025$ at step 2 and $\beta = .32$, $p = .039$ at step 3) and NS isolation ($\beta = .29$, $p = .051$ at step 1) significantly predicted NS word reading. However, NS isolation failed to predict word reading at stages 2 and 3 (after the variables NS NWR and NS RON were entered into the regression model). NS NWR and NS RON did not significantly predict NS word reading in the English group.

NS elision and NS isolation accounted for 32% variance in NS fluent reading ability in stage 1. NS NWR (entered into the model at step 2) and NS RON (entered in step 3) explained an additional 2% variance in the NS fluent reading abilities of the English group. NS elision (β = .36, p = .020 at step 1, β = .39, p = .017 for step 2, β = .36, p = .037 for step 3) was a unique predictor of fluent reading ability in the English group at every stage of the model. NS isolation, NS NWR and NS RON did not uniquely predict NS fluent reading ability in the English group at any stage of the model.

5.5.3 Within language PP predictors of English reading

Multiple regressions were conducted in order to find within-language predictors of English reading. English word and fluent reading tasks were entered as dependent variables and English phonological variables (elision, isolation, NWR, digit span, RDN, RLN, RCN and RON) as predictor variables in the regression equations. Multiple regression analysis was performed on the entire sample and also for each group to find the phonological predictors of English reading. Table 5.9: below presents the within language phonological predictors of English reading for the entire sample.

The results reveal that in the first step of the model, English elision and English isolation accounted for 31% of variance in English word reading. In step 2, English NWR and digit span predicted an additional 1% variance in English word reading. In step 3, English RAN tasks (RDN, RLN, RCN and RON) predicted an additional 12% variance in English word reading beyond that explained by other phonological measures. ENG elision significantly predicted word reading at every step of the model (β = .53, p = .000 at step 1, β = .54, p = .000 at step 2 and β = .42, p = .000 at step 3)

Table 5.9 Hierarchical regression: within language predictors of English reading for the entire sample

	English word reading			English fluent reading		
	B	**SE B**	**Β**	**B**	**SE B**	**Β**
Step 1						
Constant	64.2	2.74		3.7	7.6	
ENG elision	1.8	.33	.53*	3.5	.92	.40*
ENG isolation	.26	.41	.1	2.0	1.13	.18
Step 2						
Constant	65.5	3.6		-4.64	9.9	
ENG elision	1.8	.35	.54*	3.21	.92	.36*
ENG isolation	.27	.41	.1	1.8	1.14	.16
ENG NWR	-.21	.33	-.1	-.03	.92	.04
ENG digit span	.19	.30	.1	1.0	1.1	.14
Step 3						
Constant	55.4	4.2		-41.0	10.9	
ENG elision	1.4	.34	.42*	2.1	.89	.24*
ENG isolation	-.01	.41	-.01	1.2	1.1	.11
ENG NWR	-.40	.31	-.13	-.66	,81	-.1
ENG digit span	-.11	.38	-.03	.39	.97	.04
ENG RDN	1.2	.50	.24*	3.2	1.3	.25*
ENG RLN	.64	.37	.16*	1.13	.96	.11
ENG RCN	.14	.30	.04	.99	.73	.11
ENG RON	44	.21	.17*	2.2	.55	.32*

*Note: For English word reading predictors- R^2=.31 for step 1; ΔR^2 =.01 for step 2 and ΔR^2 =.12 for step 3. For English fluent reading predictors- R^2=.25 for Step 1; ΔR^2=.02 for step 2 and ΔR^2=.21 for step 3. * $p < .05$; ** $p < 0.01$, ***$p < 0.001$ (95% confidence interval)*

Neither ENG isolation, nor ENG NWR or digit span significantly predicted ENG word reading in the entire sample. RDN (β = .24, p = .021); RLN (β = .16, p = .042) and RON (β = .17, p = .042) significantly predicted ENG word reading, whereas RCN made no significant contribution to word reading.

With regards to ENG fluent reading, ENG elision and ENG isolation accounted for 25% of the variance in this outcome variable at step 1 of the model. At step 2, ENG NWR and digit span explained an additional 1% variance in ENG fluent reading. At stage 3, RAN tasks accounted for an additional 21% of variance in ENG fluent reading beyond that explained by the PA and PWM tasks. ENG elision significantly predicted ENG fluent reading at every stage of the model (β = .40, p = .000 at step 1, β = .36, p = .001 at step 2 and β = .24, p = .000 at step 3). Just as with ENG word reading, ENG isolation, ENG NWR and digit span did not significantly predict the outcome of ENG fluent reading at any stage of the model. RDN (β = .25, p = .016) and ENG RON (β = .32, p = .000) significantly predicted ENG fluent reading, while RCN did not significantly account for ENG fluent reading.

Table 5.10: below presents the within-language phonological predictors of English reading for each group.

Table 5.10 Hierarchical regression for within group PP predictors of English reading

	Group 1 (NS group)						Group 2 (English group)					
	English word reading			English fluent reading			English word reading			English fluent reading		
	B	**SE B**	**B**	**B**	**SE B**	**β**	**B**	**SE B**	**B**	**B**	**SE B**	**β**
Step 1												
Constant	66.9	3.6		1.4	9.3		64.1	4.2		13.3	10.9	
ENG elision	2.03	.49	.59*	4.2	1.3	.50*	1.6	.45	.48*	2.6	1.2	31*
ENG isolation	-.34	.60	-.08	.11	1.5	.01	.73	.58	.17	2.5	1.5	.27
Step 2												
Constant	67.6	5.2		1.2	13.1		67.3	5.8		16.9	14.7	
ENG elision	2.02	.53	.59*	4.3	1.4	.48*	1.7	.47	.49*	2.5	1.1	.29*
ENG isolation	-.34	.60	.04	.06	1.5	.01	.74	.59	17	2.6	1.5	.25
ENG digit span	-.17	.64	-.04	.39	1.6	-.04	.33	.53	.1	2.6	1.3	.28
ENG NWR	-.11	.49	.04	.56	1.2	.08	-.64	.53	-.17	-2.3	1.3	-.24
Step 3												
Constant	56.6	5.5		28.9	13.5		55.6	10.3		45.4	23.8	
ENG elision	1.3	.51	37*	2.0	1.3	.24	1.4	.49	.41*	1.9	1.1	.23
ENG isolation	-.4	.55	-.10	-.29	1.4	-.02	.64	.64	.15	2.4	1.5	.22
ENG digit span	-.71	.69	-.19	-.10	1.5	-.22	.1	.55	.02	1.1	1.3	.11
ENG NWR	-.08	.44	-.03	.10	1.1	.01	-.63	.56	.16	-1.4	1.3	-.14
ENG RDN	2.4	.67	.52*	6.5	1.7	.58*	.09	.18	.02	1.2	1.9	.09
ENG RLN	-.07	.56	-.02	.10	1.4	.0	1.1	.53	.25*	2.3	1.2	25
ENG RCN	.12	.35	.04	.59	.86	.08	.42	.62	.10	-1.2	1.4	-.11
ENG RON	.54	.25	.26*	1.3	.62	.24*	.51	.85	.09	4.9	2.	.34*

*Note: In Group 1 English word reading predictors-R^2=.31 for step 1; ΔR^2=.0 for step 2; ΔR^2=.21 for step 3 and for English fluent reading predictors-R^2=.26 for step 1; ΔR^2=.01 for step 2 ; ΔR^2=.26 for step 3. In Group 2 English word reading predictors -R^2=.32 for step 1; ΔR^2= .02 for step 2, ΔR^2= .10 for step 3 and for English fluent reading-R^2=.24 for step 1; ΔR^2 =.08 for step 2; ΔR^2 =.20 for step 3. * $p < .05$; ** $p < 0.01$, ***$p < 0.001$ (95% confidence interval).*

5.5.3.1 Within-language PP predictors of English reading in the NS group

The results reveal that in Group 1, ENG elision and ENG isolation accounted for 31% variance in ENG word reading ability at step 1. In step 2 ENG NWR and digit span did not account for any additional variance in ENG word reading. When RAN measures were entered at the step 3 of the regression, they contributed an additional unique variance of 21% to explain ENG word reading ability in the NS group. Thus, at step 3, the model explained 52% of the variance in ENG word reading. ENG elision (β = .59, p = .000 at step 1; β = .59, p = .000 at step 2; β = .37, p = .018 at step 3) significantly predicted word reading at every stage of model. RDN (β = .52, p = .001) and ENG RON (β = .26, p = .038) uniquely predicted ENG word reading ability. ENG isolation, digit span, ENG NWR, RLN and RCN did not make any significant contribution to the word reading skills of the NS group.

With regards to ENG fluent reading, ENG elision and ENG isolation accounted for 26% of ENG fluent reading variance at step 1. In step 2, ENG NWR and digit span did not account for any additional variance in ENG fluent reading. When the RAN tasks were added at step 3, they explained an additional variance of 26%. ENG elision (β = .50, p = .002 at step 1; β = .48, p = .005 at step 2), RDN (β = .53, p = .000) and ENG RON (β = .24, p = .050) were highly predictive of ENG fluent reading. ENG isolation, digit span, ENG NWR, ENG RLN and ENG RCN were not predictive of ENG fluent reading abilities in the NS group.

5.5.3.2. Within-language PP predictors of English reading in the English group

In group 2, ENG elision and ENG isolation accounted for 32% of the variance in ENG word reading ability at step 1. ENG NWR and digit span in step 2 accounted for an additional 2% variance in ENG word reading. At step 3, RAN measures improved the model fit significantly, explaining 10% additional variance in ENG word reading ability. At step 3, the predictor variables explained 45% of the variance in ENG word reading. ENG elision (β = .48, p = .001 at step 1; β = .49, p = .001 at step 2; β = .41, p = .007 at step 3) and RLN (β = .29, p = .049) were significant predictors of ENG word reading.

ENG isolation, ENG NWR, digit span, ENG RDN, ENG RCN and ENG RON were not predictive of ENG word reading ability in the English group.

Furthermore, in group 2, ENG elision and ENG isolation accounted for 24% of the variance in ENG fluent reading ability at step 1. When ENG NWR and digit span were entered at step 2, they accounted for an additional 8% variance in ENG fluent reading. At step 3, RAN measures added a unique variance of 20% to ENG fluent reading. ENG elision ($\beta = .31$, $p = .031$ at step 1; $\beta = .29$, $p = .045$ at step 2) was predictive of ENG fluent reading, but did not appear to explain ENG fluent reading ability in step 3. ENG RON ($\beta = .34$, $p = .017$) was highly predictive of ENG fluent reading. ENG isolation, ENG NWR and digit span, RLN, RDN and RCN were not predictive of fluent reading at every stage of model.

5.5.4 Cross language PP predictors of NS reading

In this section, the results of multiple regression analyses (conducted to investigate to what extent PA, PWM and RAN measures in English (L2) predicted word and fluent reading performance in NS (L1) are presented. NS reading measures were entered into the model as dependent variables. English phonological measures (elision, isolation, NWR, digit span, RDN, RLN, RCN and RCN) were entered as predictor variables. Multiple regression analysis for L2 phonological predictors of L1 reading were conducted for each group.

Table 5.11 below presents the cross-linguistics regression statistics for the whole group sample (N = 98).

Table 5.11 Hierarchical regression for cross language predictors of NS reading for the entire sample (N = 98)

	NS word reading			NS fluent reading		
	B	**SE B**	**B**	**B**	**SE B**	**β**
Step 1						
Constant	41.9	9.6		-10.4	6.2	
ENG Elision	4.5	1.6	.42*	2.6	.74	.38*
ENG Isolation	1.4	1.4	.10	.02	.92	.0
Step 2						
Constant	44.4	12.6		8.9	8.	
ENG Elision	4.8	1.2	.44*	2.6	.78	.36*
ENG Isolation	1.3	1.5	.10	.02	.92	.0
ENG Digit Span	.62	1.4	.05	1.2	.88	.16
ENG NRW	-1.1	1.2	-.11	-.99	.75	.15
Step 3						
Constant	-33.8	15.7		-5.1	9.9	
ENG Elision	3.8	1.3	.35*	2.	.80	.29*
ENG isolation	-1.8	1.5	.13	-.70	.95	-.08
ENG Digit Span	.32	1.4	.03	.80	.88	.10
ENG NWR	-1.4	1.5	-.15	-1.2	7.4	-.10
ENG RDN	.95	1.8	.06	2.3	1.1	.24*
ENG RLN	3.4	1.4	.27*	1.2	.89	.15
ENG RCN	.35	1.5	.03	.39	.70	.06
ENG RON	-.67	.80	.08	-.18	.50	-.06

*Note: For NS word reading predictors-R^2=.15 for Step 1; ΔR^2 =.0 for Step 2 and ΔR^2 =.07 for Step 3. For NS fluent reading predictors- R^2=.14 for Step 1; ΔR^2 =.02 for Step 2 and ΔR^2 =.08 for Step 3. * $p < .05$; ** $p < 0.01$, ***$p < 0.001$ (95% confidence interval)*

The results in Table 5.11 reveal that, in the first step of the model, ENG elision and ENG isolation accounted for 15% of variance in NS word reading. ENG NWR and digit span in step 2 did not account for any additional variance in NS word reading. The ENG RAN tasks predicted an additional 7% of variance in NS word reading in step 3. ENG elision (β = .42, p = .000 at step 1, β = .44, p = .000 at step 2 and β = .35, p = .004 at step 3) and RLN (β = .27, p = .015) significantly predicted NS word reading. ENG isolation, ENG NWR, digit span (stage 1, 2 and 3), as well as RDN, RON and RCN made no significant contribution to NS word reading.

With regards to NS fluent reading, ENG elision and ENG isolation accounted for 14% of the variance in this outcome variable at step 1 of the model. At step 2, ENG NWR and digit span predicted an additional 2% of the variance in NS fluent reading. At stage 3, RAN tasks accounted for an additional 8% of variance in NS fluent reading. ENG elision (β = .38, p = .001 at step 1, β = .36, p = .001 at step 2 and β = .29, p = .014 at step 3) and RDN (β = .24, p = .050) significantly predicted NS fluent reading. ENG isolation, ENG NWR and digit span, RDN, ENG RON and RCN did not significantly predict the outcome of NS fluent reading at any stage of the model.

Table 5.12: below presents the cross-linguistic regression statistics for each of the two groups separately.

Table 5.12 Hierarchical regressions for cross-language predictors of NS reading per group.

	Group 1 (NS group)						**Group 2 (English group)**					
	NS word reading			**NS fluent reading**			**NS word reading**			**NS fluent reading**		
	B	**SE B**	**B**	**B**	**SE B**	**B**	**B**	**SE B**	**β**	**B**	**SE B**	**β**
Step 1												
Constant	55.9	11.1		12.4	8.1		14.	12.5		2.	8.5	
ENG elision	3.3	1.5	.35*	3.1	1.	.43*	6.3	1.4	61*	2.6	.92	.46*
ENG isolation	.34	1.8	.03	.38	1.3	.05	-1.5	1.7	-.12	-.16	1.2	-.02
Step 1												
Constant	43.2	15.4		-3.1	10.7		10.2	17.7		2.8	11.9	
ENG elision	2.9	1.6	.32	2.9	1.1	.40*	6.3	1.4	.61*	2.6	.97	.42*
ENG isolation	.39	1.8	.04	.49	1.3	.06	1.6	1.8	.12			
ENG digit span	2.9	1.9	.19	3.1	1.3	.36*	-.71	1.5	.06	-.16	1.2	-.02
ENG NRW	.24	1.5	.03	-.95	1.01	.16	1.4	1.6	.1	.22	1.1	.03
Step 3												
Constant	6.4	16.3		31.4	10.2		30.7.	31.9		27.3	21.6	
ENG elision	.90	1.5	.10	1.1	.95	.15	5.2	1.5	.51*	2.2	1.	.34*
ENG isolation	1.02	1.7	.09	.35	1.03	.04	-2.2	1.9	.17	-.03	1.3	-.01
ENG digit span	.37	1.8	.03	1.2	1.1	.15	-1.8	1.7	-.16	-.72	1.3	-.11
ENG NWR	-.90	1.3	-.11	1.33	.88	-.21	1.4	.07	.12	.25	1.2	.04
ENG RDN	4.5	2.01	.37*	5.8	1.6	.63*	.70	2.4	.04	.25	1.7	.03
ENG RLN	.28	1.7	.03	.53	1.04	.06	2.4	1.6	.28*	1.1	1.5	.22
ENG RCN	1.5	1.04	18	.83	.64	.14	-.04	1.9	-.0	-.18	1.3	-.02
ENG RON	2.3	.76	.40*	1.3	.47	.30*	2.8	2.6	.16	2.3	1.8	.27

Note: For Group 1, cross-language predictors of NS word reading - R^2=.14 for step 1; ΔR^2=.02 for step 2; ΔR^2=.25 for step 3 and cross-language for predictors of NS fluent reading- R^2=.21 for step 1; ΔR^2=.09 for step 2; ΔR^2=.31 for step 3. For Group 2, cross language predictors of NS word reading-R^2=.33 for step 1; ΔR^2=.01 for step2; ΔR^2=.11 for step3 and cross-language predictors of NS fluent reading-R^2=.18 for step 1; ΔR^2 =.0 at step 2 and ΔR^2 =.10 at step 3. * p < .05; ** p < 0.01, ***p < *0.001 (95% confidence interval).*

5.5.4.1. Cross language predictors of NS reading in the NS group

The results reveal that in the NS LoLT group, ENG elision and ENG isolation accounted for 14% variance in NS word reading ability in step 1. In step 2, ENG NWR and digit span accounted for an additional 2% variance in NS word reading. ENG RAN tasks added a unique variance of 25% in NS word reading beyond that explained by other English phonological skills. ENG elision (β=.35, p=.035) at step 1 was predictive of NS word reading but failed to make a significant contribution at stage 2 and 3. RDN (β=.37, p=.030) and ENG RON (β=.40, p=.005) reliably predicted NS word reading. ENG isolation, ENG NWR and digit span, RLN and RCN were not reliable predictors of NS word reading.

With regards to fluent reading in the NS LoLT group, it was found that ENG elision and ENG isolation accounted for 21% of the variance in NS fluent reading at step 1 of the model. ENG NWR and digit span accounted for 9% variance in NS fluent reading at step 2 of the model. ENG RAN tasks added a unique variance of 31% in NS fluent reading beyond that explained by the ENG PA and PWM tasks. ENG elision (β = .43, p = .007 at step 1; β = .40, p = .014 at step 2) and digit span (β = .36, p = .028 at step 2) was predictive of NS fluent reading. ENG isolation and ENG NWR did not predict NS fluent reading at any stage of the model. RDN (β = .63, p = .000) and ENG RON (β = .30, p = .009) was highly predictive for NS fluent reading while RLN and RCN did not.

5.5.4.2 Cross language predictors of NS reading in the English group

In the English group, ENG elision and ENG isolation accounted for 33% of the variance in NS word reading ability at step 1 of the model. At step 2, ENG NWR and digit span accounted for an additional 1% variance in NS word reading. When RAN tasks are entered in step 3 they accounted for an additional 11% variance in NS word reading. ENG elision (β = .61, p = .000 at step 1; β = .61, p = .000 at step 2 and β = .51, p = .001 at step 3) and RLN (β = .28, p = .054) were highly predictive of NS word reading ability in the English group. However, ENG isolation, ENG NWR and digit span (step 1 and 2), as well as RDN, RCN and ENG RON did not predict NS word reading in Group 2.

In terms of NS fluent reading, the results showed that ENG elision and ENG isolation accounted for 18% of the variance in step 1. ENG NWR and digit span at step 2 did not account for any additional variance in fluent reading. When ENG RAN tasks are entered in step 2 they account for an additional 10% variance in NS fluent reading. ENG elision ($\beta = .42$, $p = .007$ at step 1; $\beta = .42$, $p = .010$ at step 2; $\beta = .34$, $p = .042$ at step 3) was predictive of NS fluent reading at every stage of the model. ENG isolation, ENG NWR and digit span (step 1 and 2), as well as RDN, RLN, RCN and ENG RON were not predictive of NS fluent reading in the English group.

5.5.5 Cross language PP predictors of English reading

Multiple regressions were performed to examine whether variance in English word and fluent reading abilities could be accounted for by NS phonological skills. Multiple regressions were conducted with English reading measures as dependent variables and NS phonological variables (elision, isolation, NWR, and RON) as predictor variables. To find the exact nature of cross-linguistic predictors of English reading, multiple regressions were also performed separately for each group. Table 5:13 below show the cross-language predictors of English reading for the entire sample.

The results in Table 5.13 below reveal that in the first step of the model, NS elision and NS isolation accounted for 28% of variance in ENG word reading. NS NWR (entered in step 2) and NS RON (entered in step 3) did not account for any additional variance in ENG word reading. NS isolation ($\beta = .42$, $p = .000$ at step 1; $\beta = .42$, $p = .000$ at step 2 and $\beta = .41$, $p = .000$ at step 3) significantly predicted ENG word reading at every step of the model. NS elision and NS NWR (stage 1, 2 and 3), as well as NS RON made no significant contribution to ENG word reading.

Table 5.13 Hierarchical regression for cross language predictors of English reading for the entire sample

	English word reading			English fluent reading		
	B	**SE B**	**Β**	**B**	**SE B**	**Β**
Step 1						
Constant	61.7	3.1		-6.6	8.3	
NS elision	.08	.05	.17	.14	.13	.11
NS isolation	.21	.05	.42*	.61	14	.47*
Step 2						
Constant	70.	3.7		1.21	9.8	
NS elision	.08	.05	.16	.22	.14	.16
NS isolation	.21	.05	.42*	.63	.14	.48*
NS NWR	.07	.07	.15	-.21	.14	-.14
Step 3						
Constant	60.1	6.3		-10.3	16.4	
NS elision	.08	.06	.17	.24	.15	.19
NS isolation	.20	.05	.41*	.61	.14	.46*
NS NWR	.02	.05	.04	-.20	.14	.13
NS RON	-.01	.08	-.02	.18	.21	.08

*Note: For English word reading cross-language predictors-R^2=.28 for Step 1; ΔR^2 =.0 for Step 2 and ΔR^2 =.0 for Step 3. For English fluent reading cross-language predictors- R^2=.28 for Step 1; ΔR^2 =.02 for Step 2 and ΔR^2 =.01 for Step 3. * $p < .05$; ** $p < 0.01$, ***$p < 0.001$ (95% confidence interval).*

With regards to ENG fluent reading, NS elision and NS isolation again accounted for 28% of the variance in this outcome variable at step 1 of the model. At step 2, NS NWR predicted an additional 2% variance in ENG fluent reading. At stage 3, the NS RAN task accounted for an additional 1% of variance in ENG fluent reading. NS isolation (β = .47, p = .000 at step 1, β = .48, p = .000 at step 2 and β = .46, p = .000 at step 3) significantly predicted ENG fluent reading at every stage of the model. NS elision, NS NWR and NS RON did not significantly predict the outcome of ENG fluent reading at any stage of the model. Table 5.14 below presents the cross-linguistic predictors of English reading for each group.

Table 5.14 Hierarchical regression for cross language predictors of English reading per group

	Group 1 (NS group)						Group 2 (English group)					
	English word reading			English fluent reading			English word reading			English fluent reading		
	B	SE B	Β	B	SE B	Β	B	SE B	β	B	SE B	β
Step 1												
Constant	62.5	4.2		-22.3	8.7		61.7	3.1		-6.6	8.3	
NS Elision	.19	.07	43*	.54	.14	.51*	.08	.05	.11	.14	.13	.11
NS Isolation	.07	.07	.16	.31	.15	.27*	.21	.06	.42*	.61	.14	.47*
Step 2												
Constant	60.4	5.3		-19.2	11.1		60.9	3.7		1.2	9.8	
NS Elision	.08	.07	.41*	.56	15	.52*	.08	.05	.16	.21	.14	.16
NS Isolation	.07	.07	.15	32	.15	.28*	.21	.05	.42*	.63	.14	.48*
NS NWR	.05	.07	.09	.07	.15	.05	.02	.05	.03	-.21	.14	-.14
Step 3												
Constant	63.5	9.4		10.8	19.6		60.1	6.3		10.8	16.5	
NS Elision	.14	.07	.40*	.55	.15	.51*	.08	.06	.16	.24	.15	.09
NS 1solation	.07	.07	.15	.38	.15	.28*	.20	.05	.41*	.61	.14	.46*
NS NWR	.04	.08	.08	.09	.16	.06	.02	.05	.04	-.19	.14	-.13
NS RON	-.05	.12	-.05	-.13	.26	-.06	-.01	.08	-.02	-.18	.21	-.08

*Note: For Group 1 cross-language predictors of English word reading - R^2=.29 for step 1; ΔR^2=.01 for step 2; ΔR^2=.0 for step 3 and for cross-language predictors of English fluent reading- R^2=.49 for step 1; ΔR^2=.0 for step 2; ΔR^2=.0 for step 3. For Group 2 cross language predictors of English word reading-R^2=.28 for step 1; ΔR^2=.0 for step 2; ΔR^2=.0 for step 3 and cross-language predictors of English fluent reading-R^2=.29 for step 1; ΔR^2 =.2 for step 2; ΔR^2 =.1 for step 3. * $p < .05$; ** $p < 0.01$, ***$p < 0.001$ (95% confidence interval.*

5.5.5.1 Cross language PP predictors of English reading in the NS group

In Group 1, NS elision and NS isolation accounted for 29% of variance in ENG word reading at step 1. At step 2, NS NWR accounted for an additional 1% variance in ENG word reading. NS RON in step 3 did not contribute any additional variance in ENG word reading. NS elision (β = .43, p = .007 at step 1; β = .41, p = .014 at step 2; β = .40, p = .018 at step 3) was highly predictive of ENG word reading ability in this group. NS isolation, NS NWR (step 1 and 2) and NS RON were not predictive of ENG word reading.

NS elision and NS isolation accounted for 49% of the variance in ENG fluent reading at step 1. NS NWR (entered at step 2) and NS RON (entered at step 3) did not account for any additional variation in ENG fluent reading. NS elision (β = .51, p = .000 at step 1; β = .52, p = .000 at step 2; β = .51, p = .001 at step 2) and NS isolation (β = .27, p = .040 at step 1; β = .28, p = .040 at step 2; β = .28, p = .040 at step 3) were predictive of ENG fluent reading in the NS group, whereas NS NWR (step 1and 2) and NS RON were not predictive of ENG fluent reading.

5.5.5.2 Cross language PP predictors of English reading in the English group

In Group 2, NS elision and NS isolation accounted for 38% of variance in ENG word reading at step 1. NS NWR (entered at step 2) and NS RON (entered at step 3) did not contribute any additional variance in ENG word reading. NS isolation (β = .42, p = .000 at step 1; β = .42, p = .000 at step 2; β = .41, p = .000 at step 3) was predictive of ENG word reading. NS elision, NS NWR (step 1 and 2) and NS RON were not predictive of ENG word reading ability.

With regards to ENG fluent reading, NS elision and NS isolation accounted for 29% of variance in ENG fluent reading at step 1 of the model. NS NWR entered at step 2 accounted for additional 2% variance in ENG fluent reading. NS RON entered at step 3 contributed an additional 1% variance in ENG fluent reading. NS isolation (β = .47, p = .000 at step 1; β = .48, p = .000 at step 2; β = .46, p = .000 at step 3) was predictive of ENG fluent reading.

However, NS elision and NS NWR (step 1 and 2) and NS RON were not predictive of ENG fluent reading.

5.6 Conclusion

This chapter provided the results of the statistical analyses, including the MANOVAs, Spearman rho correlations and hierarchical regressions. These statistical tests were conducted to determine the effect of LoLT (i.e. instruction group) and gender on the development of PP skills in NS-English bilingual children, to establish the relationships between PP skills and reading, and to determine the predictive value of PP skills in reading development both within and across the languages tested.

The results show that reading development in NS-English children are, to a certain extent, influenced by the LoLT. The results indicate that the NS-English bilingual children fared best on the tasks given in their respective LoLT. The English group performed better on English tasks, whilst the NS group performed better on NS variables. The results also indicate that PP predicts both word and fluent reading abilities in both languages. Different relations were found between PA, PWM and RAN measures and reading skills in both languages tested. The results show the evidence of transfer of L1 reading abilities to L2 reading and vice versa. The results also revealed that gender had a significant impact on children's development of PP and reading abilities with girls outperforming boys on most measures.

CHAPTER 6
DISCUSSION OF FINDINGS AND CONCLUSIONS

In exploring the relationship between PP skills and reading development in NS-English bilingual children, two groups of participants were assessed in three domains of PP skills (PA, PWM and RAN) and on word and fluent reading abilities. The data were statistically analysed using SPSS. This chapter discusses the findings that resulted from the MANOVAs, correlations and multiple regression analyses. The first part of this chapter discusses the results in relation to previous empirical findings and also in light of the research questions of this study. The second part of this chapter concludes the study by summarising the key research findings, describing the methodological limitations, suggesting recommendations for further study and discussing the practical implications of the findings.

6.1 The relationship between PP skills and reading development

The first research question asked whether there is a relationship between PP and reading abilities in NS-English bilingual children. Correlation and multiple regression results for the entire sample and also for each group were used to answer this question. The study hypothesised that PP skills will predict RD of NS-English bilingual children. The results on the relations between PP and reading skills will be discussed in relation to the PP Model (Wagner and Torgesen 1987; Wagner et al. 1994; Wagner et al. 1997), the Developmental Model of AP (Zhang and McBridge- Chang (2010), and the Causal Path Model of AP (Boets et al. 2008).

6.1.1 The relationship between PA and reading

PA was found to be associated with reading abilities of children. Spearman's correlations indicated that the relations between PA and reading abilities ranged from moderately weak to moderately strong within each of the two languages. Hierarchical regression analyses confirmed that PA skills significantly predicted reading outcomes in both languages.

When data was analysed using the entire sample (N = 98), PA tasks accounted for significant variance in NS word (38%) and NS fluent (36%) reading as well as English word (31%) and English fluent (25%) reading. Within language data indicate that, in the NS LoLT group, NS PA accounted for significant variance in NS word (38%) and NS fluent (37%) reading. In the same group, English PA accounted for 31% of the variance in word reading and 26% variance in English fluent reading. In the English instruction group, NS PA measures accounted for a unique variance in NS word (39%) and NS fluent (32%) reading, whereas English PA accounted for 32% of the variance in English word reading and 24% of the variance in English fluent reading. This finding suggests that NS-English bilingual children relied on PA skills in order to decode and understand written symbols. This is consistent with many research findings that have shown that PA plays a unique role in reading development across orthographies (Wagner and Torgesen 1987, 192; Wagner et al. 1994, 84; Wagner et al. 1997, 468; Wilsenach 2013, 28; Soares De Soussa and Broom 2011, 10; Antony and Lonigan 2004, 43; Boets et al. 2008, 37; Siok and Fletcher 2001, 29; Lesaux and Siegel 2003, 1017).

Clearly, this finding does not support findings that demonstrate no reliable relationship between PA abilities and reading (Babayiğit and Stainthorp 2007, 24; Babayiğit and Stainthorp 2011, 43). Babayiğit and Stainthorp (2007, 24) followed Turkish children from preschool to grade 2, using various PA tasks (syllable tapping, syllable deletion, onset and rime awareness and phoneme deletion) and spelling and reading tasks. Similarly, Babayiğit and Stainthorp (2011, 43) followed Turkish children from grade 2 to grade 3 and from grade 4 to grade 5 respectively, using PA tasks (sound oddity, phoneme deletion and spoonerism tasks) and reading and spelling tasks. In both these studies, PA was strongly correlated with spelling development, rather than with reading. It is possible that these diverging findings about the role of PA in reading are due to language specific and/or methodological factors – more specifically it may be task related

It may be premature to identify with certainty those PA skills that reliably predict reading abilities of the NS-English bilingual learner population at large, seeing that the study found slightly different relational patterns between PA measures and reading abilities in the two groups. For example, NS phoneme isolation skill was only predictive of NS word reading abilities in the English group. Even so, the regression results for each group indicated that elision, in both languages, significantly predicted NS and English word and fluent reading abilities. The performance of the children on the phoneme isolation tasks was unexpected, but they indicate that (i) phoneme isolation skills are not as good a predictor of reading as elision skills (in line with Siok and Fletcher 2001, 125) and (ii) isolation skills in itself did not seem to cause improved reading. Thus, one could also conclude that even though the learners' isolation skills are sort of intact, their reading does not reflect this (i.e. the reading levels are in fact lower than expected).

NS-English bilingual children showed greater sensitivity to syllable awareness (SA) (as evidenced by their performance on the elision task, which required syllable-level manipulations at the beginning of the task and phoneme manipulations as the task progressed in terms of difficulty). Most learners found manipulations at the phoneme level a lot more taxing. NS-English bilingual children mastered the skill to segment words like *cowboy* into its syllabic components /cow-boy/ in both languages, but they found it difficult to split the words like *fish* into its phonemic units /f-i-ʃ/. While this pattern was visible in the data, it was not analysed specifically, given the fact that the CTOPP treats SA and phoneme awareness as a composite skill in the elision task and does not provide separate standard scores at the syllable and at the phoneme level. Even so, the relatively low average SS (7.10) on the English elision task, and relatively low average raw score on the NS elision task, do indicate that learners, generally speaking, did not progress much past the SA level.

This finding suggests that larger grain sizes such as syllables are more accessible to and more easily acquired by NS-English bilingual children than phoneme level units, in both NS and in English. The result contradicts existing knowledge on the nature of PA awareness in bilingual African children; particularly Milwidsky (2008, 116) who showed that the phoneme level is more salient in transparent languages like Sotho, whilst SA is more salient in English, and De Soussa et al. (2010, 528), who found that SA is more salient in transparent Zulu, whilst phonemes are more salient in English.

Emerging research has argued that to understand the nature of PA that affects reading acquisition, it is important to consider how orthography is mapped onto phonology in the written language (Ziegler and Goswami 2005, 19). This implies that the phonological 'grain sizes' used by the children in reading may differ depending on differences in orthography-phonology correspondences. The present study does not provide clear evidence to support the Psycholinguistics Grain Size Theory (PTSG). The nature of PA affecting NS reading did not appear to be different from that in English. An important factor to consider here is the phonological structure of the language. The CVCV structure of Bantu languages (Demuth 2007, 529) could explain why children are more sensitive to the syllable (they hardly ever have to attend to information at the phoneme level) and thus it is possible that the syllable is in fact the grain size. While it seems clear that syllables were more accessible in NS in this study, most likely because of the simpler phonological structure of NS and its transparent orthographic nature, a more systematic analysis of this particular aspect of the data needs to be undertaken before final conclusions are reached.

The results are compatible with the PA developmental model (Anthony et al. 2003, 481; Anthony and Francis 2005, 256; Anthony et al. 2002, 68; Nation and Hulme 1997, 154; Bentin 1992, 167) and the causal connections theory (Ziegler and Goswami 2005, 4; Goswami 2006, 10) which assume that SA skills develop earlier in children and do not depend upon reading instruction, whilst phoneme awareness develops later, as a consequence to adequate reading instruction. Treiman and Zukowski (1991, 5) suggested that PA instruction should proceed from the analysis of words into syllables, to onset and rimes and then to phoneme analysis.

A study done by Soares De Soussa et al. (2010, 528) on emergent Zulu-English grade 2 bilingual children also showed that children had greater sensitivity to the syllable and onset-rime levels of PA than to phoneme units.

Likewise, Diemer's (2016, 106) study with Xhosa-speaking children revealed that syllables were more readily available to children than phonemes. Early PA instruction (and possibly intervention), with special focus on explicit phoneme awareness, should thus receive much greater attention in the RSA basic education system. The reason for this is that, when phoneme awareness is not explicitly taught as part of reading instruction, it might not develop or it may develop slowly (McBridge-Chang et al. 2010, 107). Phoneme awareness sets the basis for understanding the alphabetic principle (Pang et al. (2003, 9) and a deficit in alphabetic knowledge may impede the development of an efficient letter-sound decoding routine which facilitates reading development (Pugh et al. 2012, 2). Research studies have shown that an intensive period of classroom PA instruction focusing on phoneme level units improves literacy skills (Carson et al. 2012, 147, Kjeldsen et al. 2003, 349; Lesaux and Siegel 2003, 1018). Including intensive phoneme-level PA instruction in NS-English bilingual children is thus likely to have a positive impact on their reading skills.

However, teaching phoneme awareness (particularly in English) might be a challenging task for many teachers in RSA, due to the opaque nature of the orthography. It is clear that many teachers in RSA have an inadequate understanding of how to teach reading (DoE 2008a, 8; DoE 2008b, 13; Naidoo et al. 2014, 264; Nel 2011, 51). In many cases, no formal reading instruction is given, and reading is assumed to just "develop incidentally" (Muter and Diethelm 2001, 214). These factors affect the effectiveness of reading intervention programmes in RSA.

Overall, despite the fact that phoneme isolation was a poor predictor of reading, the results clearly indicate that NS and English syllable and phoneme elision skills, which presuppose the ability to segment and manipulate various phonological grain sizes, do facilitate reading development in NS and in English. Elision skills in both NS and in English were a consistent and strong predictor of reading skills in the associated language and thus do play an important role in the reading development of NS-English bilinguals. It would be worthwhile to explore other aspects of PA, such as segmentation and blending, to establish whether they better predict reading than isolation skills in NS-English bilingual children.

6.1.2 The relationship between PWM and reading skills

The correlation and multiple regression results obtained in this study suggest that the development of reading abilities do depend on children's PWM skills, but that PWM has less of an effect on reading development than PA skills. Spearman's correlations indicated that the associations between PWM measures and reading in NS-English bilingual children ranged from weak to moderate. Multiple regression results for the entire sample (N = 98) reveal that PWM skills accounted for a total of 2% of the variance in English word and fluent reading and to 3% of the variance in NS word reading. However, PWM made no contribution to NS fluent reading. Within language regression results for each group reveal that NS PWM tasks accounted for 1% variance in NS word reading. However, NS PWM made no contribution to NS fluent reading. In the same group, English PWM made no contribution to English word and fluent reading abilities. In the English group, NS PWM measures accounted for significant variance in NS word (4%), NS fluent (1%) reading, and English PWM accounted for 2% of the variance in English word reading and 8% of the variance in English fluent reading. This shows that PWM skills to some extent play a role in the reading abilities of NS-English bilingual children.

The results replicate studies that have shown PWM to play an important role in the development of children's reading abilities (Gathercole and Baddeley 1993, 259; Gathercole 1995, 83; Ferreira et al. 2013, 7; Kormos and Sárfár 2008, 261; Dahlin 2010, 11, Babayiğit and Stainthorp 2007, 22) and confirm the PWM model proposed by Baddeley and Hitch (1974) and Baddeley (2000) which states that PWM is an essential cognitive tool in learning to read. This is inconsistent with studies that failed to establish any predictive links between PWM and reading (Wilsenach 2013, 28; McBride-Chang and Ho 2000, 54; Chow et al. 2005, 85).

A close examination of the regression results for the entire sample shows that PWM tasks varied with regard to their importance for reading development. NS NWR was a significant predictor of NS word reading with significant beta weights (β =.20* and β=.19* at step 1 and 2 respectively) while digit span was not predictive of any reading abilities in either of the languages. The failure of the English PWM skills to predict English reading skills was unexpected. It may be reasonable to suggest that the children in the NS instruction group may not have acquired adequate English proficiency to enable them to make accurate phonetic representations for handling, in particular, the English NWR task.

Several studies show the importance of language proficiency for PWM tasks, especially for NWR, where children do rely (to some extent) on their knowledge of existing words (Kormos and Sárfár 2008, 269; Miettinen 2012, 151). The poor English NWR performance of L2 learners in this study can thus be explained by lower levels of L2 proficiency (Jongejan et al. 2007, 845; Lesaux and Siegel 2003, 1017). This is because the completion of a PWM task in an AL is likely to place additional demands on the PWM capacity of an L2 learner due to language proficiency issues (Chiappe et al. 2002a, 114).

It is not clear why digit span failed to predict the reading abilities of this sample, but the results support the idea that NWR provides a more sensitive measure of PWM capacity than digit span, arguably because of the absence of any stored lexical specification of the phonological structure of a non-word (Gathercole 1995, 89; Gathercole 1999, 415, Gathercole and Baddeley 1990, 357). When scoring the digit span task, most children had difficulties recalling the digits when the number of items in the digit set increased to five or more characters. This fits well with the view that the crucial determinant of complex span performance is not processing difficulties, but the amount of time that elapses between presentation of a memory item and its subsequent retrieval (Hitch, Towse and Hutton 2001, 194; Cowan, 1998; 184) and that younger children are more likely to have prolonged processing duration on span tasks, leading to quick temporal decay of information and subsequent lower span scores (Gathercole et al. 2004, 178).

Task specific factors might also partly have contributed to the weak relationship between NWR tasks and reading in both languages. It is believed that the recalling performance of word or non-word sequences presented auditorily deteriorates as the constituent words in the sequence become longer (Gathercole and Baddeley 1990, 344; Montgomery 2003, 222). The word length effect of NWR items was noticeable as NS-English bilingual children had no difficulties repeating one or two syllable items but as the number of syllables increased, as in the NS non-words items *Katôngwaloshane* or *Narulongwakhubasi* or the English non-words *Mawgeebooshernooshiek* or *Botrajmiplompatbolaps* children's repetition accuracy began to decrease. The poorer repetition of longer items versus the shorter items in the NS-English bilinguals suggests a reduced PWM capacity in children, which is in line with existing evidence that PWM develops with age and with cognitive maturity (Gathercole et al. 1991, 365; Gathercole 1998, 2; Gathercole and Baddeley 1993, 25-26).

Another task related factor that influences performance accuracy on the NWR is the word likeness of the non-word. It has been argued that repetition of highly word like non-words is usually highly accurate because it is mediated by retrieval of both short term and long term phonological representations (Gathercole 1995, 91; Gathercole et al. 1991, 349), compared to those that are low in word likeness which are mediated only by short term representations. For instance, it is easier for a child to repeat highly word like non-word such as *ballop* which is phonological similar to familiar words like *gallop* and *ballot* (Gathercole and Adams 1994, 674).

The present findings do not provide clear evidence to support the effect of the familiarity or unfamiliarity of non-words on the children's performance on the NWR task. However, it is possible to speculate that the challenges related to the processing and storage demands of the NWR task would have contributed to the children's performance. The generally poor performance of children on the PWM tasks (especially on the English tasks) therefore may suggest the children's difficulties to cope with the overall processing demands of the tasks. It is clear that overall, the children fared better on the NS repetition task, which is to be expected seeing that NS is their L1. The NS task items are highly word like, which would also have helped the children, while the word likeness of the English non-words are less likely to have much effect on the performance of the children (especially of the NS group), considering their low L2 proficiency. The results further indicated that the English group performed significantly better on the English NWR task than the NS group. The performance of the English group on the NWR task was possibly mediated by their existing vocabulary knowledge in English. This is in line with researches that have shown that NWR performance can be mediated by long term phonological and lexical knowledge (Gathercole et al. 1991, 349; Gathercole and Adams 1994, 674, Kornacki 2011, 19; Miettinen 2012, 162). Thus, while it seems to be the case that learners in the English group had, overall, better PP skills in English, and while this can explain their enhanced performance on the NWR task, another explanation would be that the English group completed the English NWR task by drawing comparisons between the non-words and phonologically similar words in their existing English vocabulary (Goswami 2000, 139). Following this argument, the NS group performed poorer on the English NWR task since they had to rely more heavily on their phonological store to temporarily mediate NWR.

The pattern of results demonstrates that, in this particular sample, PWM measures were weak predictors of reading. The findings are consistent with studies reporting a small contribution of PWM towards reading abilities (Wagner et al. 2004; Babayiğit and Stainthorp 2011, 40). The fact that PWM did not account for a unique independent variance in reading abilities fits well with the view that PWM may be better conceptualised as a component of PA rather than as a primary PP skill (McBride-Chang 1995, 179; McBridge-Chang and Ho 2000, 54; Brady 1991, 17; Stanovich et al. 1984, 175). The correlation results of this study further supports this notion, as the PWM tasks were found to be significantly correlated with the PA tasks, which is consistent with research reporting a significant correlation between PA and PWM tasks (Wagner and Torgesen 1987, 206; Gathercole et al. 2006, 17; Brady 1986, 138). However, caution needs to be applied in drawing firm conclusions about whether PWM is a subcomponent of PA or whether it is a primary PP skill, given the fact that the correlations between the various PWM tasks and PA task (in this study) were moderate at best.

The children's relatively poor performance on PWM tasks might be an indication of a developmental delay in PWM capacity. The PWM developmental theory assumes that the development of PWM skill is a gradual process which begins when the phonological loop emerges at age 3, followed by the rehearsal component which becomes more efficient from the age of 7 and that children's PWM skills are likely to reach adult levels at about the age of 12 (Gathercole et al. 1991, 365; Gathercole 1998, 2; Gathercole and Baddeley 1993, 25-26). The results on the PWM tasks indicate that the children's rate of development was slower than would be expected at their age. This might suggest that they are still at a stage where they are less able to use the sub-vocal rehearsal system effectively (Gathercole and Baddeley 1990, 348). The effective use of the rehearsal system means that more phonological information can be recycled leading to greater PWM capacity. Given the fact that PWM tasks is influenced by age (Ferreira et al. 2013, 11; Gathercole 1999, 417; Gathercole et al. 2004, 187), it is likely that, as age increases, children may be able to take greater advantage of their PWM capacity to execute other cognitive functions such as reading.

Although memory deficits are prominent in poor readers they are not consistently linked to reading disability (Brady 1991, 10). Even so, PWM limitations do indicate at-risk status in learners (Dahlin 2010, 11). There thus is a need to ensure that PWM abilities of NS-English bilingual children are adequately developed to avoid exposing children to risks of reading failure. PWM plays an essential role in the child's early stages of reading development when letter-sound relationships are acquired (Gathercole and Baddeley 1990, 358). Reading intervention targeting PWM in schools should be implemented early in the schooling system. This may be easier said than done, since PWM is a cognitive skill that cannot be taught as directly as PA skills. Still, teaching children using concrete examples (i.e. through the use of visual symbols) rather than using abstract generalisations (Beech 1997, 157);

playing rhyming games and teaching paraphrasing, summarising and rehearsal techniques (Montgomery 2003, 228; Hollander 2011, 176) can help them to improve PWM abilities. Since PWM is trainable (Dahlin 2010, 11); early screening of PWM abilities in lower grades might be beneficial in identifying children who might benefit from PWM training (Alloway et al. 2009, 242; Gathercole 1999, 417).

Overall, the findings reveal that PWM is associated with reading abilities in the present sample of children, though its predictive role is rather weak. The associations between PWM and reading abilities reveal that at least, to some extent, the children do rely on their PWM skills to facilitate reading development. The weak predictive role of PWM on reading in this study might be due to methodological issues. A longitudinal study is needed to determine the exact nature of relationship between PWM skills and reading in the NS-English bilingual children. There are many other factors such as age and language proficiency that may determine PWM performance that should be taken into consideration as much as possible in future research.

6.1.3 Rapid automatised naming and reading

RAN was found to be related to the reading abilities of NS-English bilingual children. Spearman's correlations show that the associations between RAN and reading ranged from weak to moderately strong. The regression results for the entire sample (N = 98) shows that RAN tasks were reliably predictive of reading abilities of children. Results for the entire sample reveal that English RAN accounted for a significant variance in English word (12%) and fluent (21%) reading. NS RAN explained a small but significant variance in NS word (1%) and fluent (4%) reading. The small contribution of RAN tasks in NS might be due to the fact that only one task was used to assess RAN in NS. Within language results for each group reveal that, in the NS group, the NS RAN task accounted for significant variance in NS word (2%) and NS fluent (7%) reading. In the same group, English RAN accounted for 21% of the variance in English word reading and 26% of the variance in English fluent reading abilities. In the English group, the NS RAN task contributed to NS fluent reading (1%), but made no contribution to NS word reading. In the same group, English RAN tasks accounted for 10% of the variance in English word reading and 20% of the variance in English fluent reading. The overall findings are consistent with studies showing that the skills associated with RAN tasks make a reliable contribution to reading development across orthographies (Wimmer et al. 2000, 668; Kirby et al. 2003, 4; Wagner, et al.1994, 83; Furnes and Samuelson 2011, 25; Georgiou et al. 2008, 32).

RAN was found to be a powerful predictor of fluent reading. Regression results for each group reveal that RAN accounted for a greater amount of significant variance in fluent reading than in word reading (in both languages). The results replicate previous findings which indicated that RAN is one of the best predictors of reading fluency (Babayiğit and Stainthorp 2011, 36; Lervåg and Hulme 2009, 1040; Arnell et al. 2009, 9; Park 2013, 173). RAN seems to primarily affect reading abilities that are related to and dependent on speed of processing. It is believed that the strong relationship between RAN and reading is based on the fact that both processes taps into rapid processing of orthographic/phonological representations (Protopapas et al. 2013, 194; Georgiou et al. 2012, 70; Stringer et al. 2004, 892 and Norton and Wolf 2012, 430.

RAN (English RDN, English RLN, English RON and NS RON) significantly contributed to the reading abilities of children independent of other PP (elision, phoneme isolation, digit span and NWR) skills. RAN accounted for a significant variance in reading, even after the variance due to PA and PWM was accounted for. This is in line with studies showing that RAN and other phonological skills account for independent variances in reading achievement (Cristo and Davis 2008, 14; Wimmer et al. 2000, 678; Kirby et al. 2003, 4; Schatschneider et al. 2004, 265). This suggests that RAN tasks assess a different underlying construct than those assessed by other PP measures. The finding supports the views that RAN should be treated as an independent cognitive component (Norton and Wolf 2012, 437; Wolf and Bowers 1999, 415; Wolf and Bowers 2000, 323) and also supports the developmental models of AP and reading which assumes that the impact of RAN on reading is direct and is not mediated by other phonological skills (Zhang and McBridge-Chang 2010, 334).

RAN however, probably does have a phonological component, as argued by Wagner and Torgesen (1987, 192) and Wagner et al. (1994, 75). The correlational results in this study indicate a moderate relationship between RAN (RLN, RON, RDN and RCN) and other PP (elision, phoneme isolation, digit span and NWR) skills, suggesting that RAN (at least to a certain extent) should be understood as a PP skill. Thus, the data seem to also partially support the causal path model (Boets et al. 2008, 31), which assumes that the relationship between RAN and reading can be mediated by other PP skills. The present study however does not provide clear support to adequately distinguish between these two views of RAN. Further investigation is warranted to make strong claims of whether RAN represents a phonological component or an independent construct that taps more into orthographic components of reading.

The results revealed that the children had difficulty in colour naming compared to digit, letter and object naming. Overall, naming of letters, digits and objects predicted various aspects of reading (in the same language) - both within the entire sample and in the two groups. In the entire sample, digit naming predicted English word and fluent reading; letter naming predicted English word reading while English RON predicted English word and fluent reading. Colour naming failed to predict any of the reading outcomes. NS RON only predicted NS fluent reading, most likely as a result of the regression results found for the NS group. The results are consistent with studies suggesting that alphanumeric RAN (letters and digits) is a better and more robust predictor of reading ability than non-alphanumeric RAN (colours and objects) (Stringer et al. 2004, 905; Wagner et al. 1997, 476; Schatschneider et al. 2004, 265). This finding supports the assumption that alphanumeric RAN and reading depend largely on common neural mechanisms (Lervåg and Hulme 2009, 1047) and that the development of non-alphanumeric RAN may diverge from alphanumeric RAN (Waber et al. 2000, in Arnell et al. 2009, 174). The data do not support previous studies, like Arnell et al. (2009, 9), which found evidence that non-alphanumeric RAN is a stronger predictor of reading abilities that alphanumeric RAN.

Poor performance in the colour naming task could be explained on account of the fact that colour naming has longer articulatory durations that require more coordinated planning (Stringer et al. 2004, 907). Children usually take a relatively long time to identify the appropriate colour category (resulting in slower processing) which might be the reason why RCN did not predict reading. Another reason could be that the NS group might not have had much exposure to the colour terms, and thus even if they knew the colour and the term, lack of productive use of these terms would mean that they have not been acquired fully, and thus access to these lexical forms would not be automatic at all. Another issue is that colour is perceived differently in different cultures, which has an influence on how colour concepts are lexicalised (Stringer et al. 2004, 907). For instance, in NS, speakers do not differentiate between blue and green (in the sense that they use the same lexical item for both colours). This might have affected the categorisation process when the children had to deal with English items. In other words, not having conceptualised colours in a 'Western' manner from an early age, the children had to more or less re-learn these concepts when they are introduced to the English items, which would negatively impact on speed of lexical access and on the processing speed in a task like this. Speed of lexical access might also be the reason why NS RON only explained a small amount of variance in NS fluent reading – the English group had notably more difficulties with the NS RAN task than the NS group, in that they often first named an object with the associated English term (e.g. *hlapi* would become *fish*) before correcting themselves. This resulted in a significantly slower average naming speed in the English group on this particular task; and possibly their slower processing of objects (when required to do so in NS) resulted in this RAN task not being a particularly strong predictor of reading skills. The overall impression from the results is that RAN is uniquely related to reading processes in NS-English bilingual children.

In summary, as predicted, the results of this study have shown that PP abilities play an important role in the reading development of NS-English bilingual children. The findings provide support for the PP model of reading acquisition that emphasise the central role of PP skills in reading development (Wagner and Torgesen 1987; Wagner et al. 1994; Wagner et al. 1997), but it seems clear from the present results that the three PP skills (PA, PWM and RAN) make different contributions to reading acquisition. In addition, the results are also in line with Zhang and McBridge-Chang (2010) developmental model of AP and reading which assumes that PP skills develops prior and helps in shaping reading development and also Boets et al. (2008) causal path model which assumes that PP does have direct relations with reading development. However, a longitudinal study is warranted to determine the exact developmental nature of PP skills in the NS-English bilingual population. Finally, it should be mentioned here that not all of the variance in the reading outcomes in this study was accounted for by the PP model. It is possible that some of the variance that was not explained by the PP model were caused by other factors (such as socioeconomic status, intellectual ability and general language proficiency) which were not the focus of this study. Hence, future research should ideally consider a broader range of factors that could influence reading development.

6.2 Cross-linguistic transfer of phonological skills

The second question asked whether PP skills predict variance in word and fluent reading across languages. The study hypothesised that NS PP skills will predict reading development in NS and English, since transfer of PP skills from the L1 to the L2 is a well-documented phenomenon. The cross-linguistic transfer of PP skills from L1 to L2 and also from L2 to L1 was assessed. Correlations and regression results for the entire sample and also for each group were used to answer this question. The cross-linguistic results in each language are discussed in relation to four hypotheses in bilingual reading, namely the LIH (Cummins 1991a, 2005), LTH (Bernhardt and Kamil 1995), CPH (Geva and Siegel 2000) and SDH (Geva and Siegel 2000).

6.2.1 Cross-linguistic phonological predictors of English reading

Spearman's correlations showed that NS PP skills were related to English reading. The correlational data showed that the associations between L1 PP skills and L2 reading abilities ranged from no association whatsoever to moderate. This is confirmed by regression results which show that NS PP variables were predictive of English reading abilities. In terms of the entire sample, NS PP variables accounted for a significant variance of 28% in English word reading and 31% in English fluent reading. This is consistent with studies showing that PP skills are transferred cross-linguistically and that they predict reading development in the other language even when the two languages are different in terms of their orthographies (Chow et al. 2005, 86; Gottardo and Lafrance 2005, 574; Gottardo et al. 2006, 389; Dickinson et al. 2004, 336; Wei and Zhou 2013, 11; Veii and Everatt 2005, 250; Chuang 2010, 90; Chuang et al., 2013; Keung and Ho 2009, 26; Durgunoglu, 2002, 194). This suggests the presence of a language-universal processing mechanism (Cummins 1991a, 84).

The findings support the LIH which assumes that L1 and L2 reading abilities are interdependent (Cummins 1991a, 84; Cummins 2005, 4) and that once L1 reading ability has been acquired, the same operation does not have to be reacquired in the L2 (Bernhardt and Kamil 1995, 17). The evidence of positive transfer of skills partly provide support to the LTH which assumes that L1 reading skills can only transfer to L2 reading ability when learners have reached an adequate linguistic proficiency in the L2 (Bernhardt and Kamil 1995, 17; Alderson 1984, 31). However, this study does not provide enough evidence to support the existence of a language threshold. A language proficiency test would be warranted to determine how the contribution of L1 reading ability to L2 reading changes according to the level of learners' L2 proficiency.

L1 PA was found to be a strongest predictor of L2 reading abilities. In the NS group, L1 elision skill significantly predicted L2 word and fluent reading whilst L1 phoneme isolation was predictive of only L2 fluent reading. In the English group, L1 phoneme isolation was predictive of both word and fluent reading. The findings accord with studies showing that PA can be transferred across languages with different orthographies (Gottardo and Lafrance 2005, 573; Wilsenach 2013, 27; Gottardo et al. 2001, 388; Wei and Zhou 2013, 11; Milwidsky 2008, 17), suggesting that PA is a universal skill that can be acquired once (Durgunoglu 2002, 201). The findings support the CPH which suggests that specific cognitive and linguistic processes like PA transfer across languages and are basic to reading in any language (Geva and Siegel, 2000). Thus, the results do not accord with research demonstrating the language-specific nature of PA skills (Wang et al. 2003, 143).

L1 PWM and RAN skills were not significantly predictive of L2 reading abilities. This is in line with research findings that have shown little evidence of positive transfer on cognitive skills, such as RAN and PWM (Keung and Ho 2009, 28; Gottardo and Lafrance 2005, 573) suggesting that these skills may be language-specific and not transferrable. These results provide support for language-specific explanations of reading development which suggest that the script of a language can be used to explain relationships between reading and underlying processing skills (Geva and Siegel 2000). In other words, the orthographic differences determine which skills are transferrable or not between languages. NS is transparent in nature whilst English has an opaque orthography and such differences could hinder the successful transfer of some skills from one language to another.

As an aside, it is worth noticing that even if a child has more or less intact PWM and RAN abilities in the L1, these L1 skills will not be operational in the L2 if the child does not have sufficient L2 vocabulary knowledge. Research in support of the LTH has shown that lexical knowledge of the L2 is important for successful transfer of L1 skills to L2 reading (Yamashita 2002b, 84; Bossers 1991, 55; Verhoeven 2000, 313, Droop and Verhoeven 2003, 78; Lee and Schallert 1997, 736; Brisbois 1995, 581).

6.2.2 Cross linguistic phonological predictors of NS reading

Spearman's correlations showed that the associations between L2 PP skills and L1 reading abilities ranged from no association whatsoever to moderately strong. The regression results confirm that English PP abilities predicted NS reading abilities. In terms of the entire sample, L2 PP variables accounted for a unique shared variance in L1 word (22%) and fluent (24%) reading. This finding provides some evidence that developing reading-related cognitive skills in L2 may have facilitative effects on L1 reading development. The findings are consistent with evidence showing that PP skills acquired in L2 are also related to L1 reading performance (Gottardo and Lafrance 2005, 574; Dickinson et al. 2004, 336; Veii and Everatt 2005, 250). The study demonstrates that L1 reading relied on PP skills acquired in the L2, supporting the LIH.

This kind of transfer was particularly evident in the English group, as the learners in this group had received more opportunities in their schooling context to develop L2 PP skills than L1 PP skills. This group showed that they clearly relied on their L2 PP skills to decode NS words and texts in the absence of L1 literacy instruction. However, given the low NS reading levels in the English group, it is also clear that this facilitative process might not be without its difficulties, which is in line with the view that although it is possible for children schooled only in the L2 to transfer their knowledge and skills to the L1, the process is highly inefficient and difficult (Benson 2005, 2). The findings also revealed that L2 PP variables significantly contributed to the L1 reading abilities of the NS group. This finding was somewhat unexpected considering that the NS group had exposure to L1 literacy instruction, and not much L2 instruction. There is however some evidence that, providing explicit instruction in L1 foundational skills may assist English AL learners in smoothly transitioning to L2 reading (Cárdenas-Hagan, Carlson and Pollard-Durodola 2007, 253) which can facilitate proper transfer of L2 skills to L1. This is in line with the views that emphasise the development of learners L1 skills before intense instruction in L2 (Cummins 2001, 4).

The results indicated that L2 PA is strong predictor of L1 reading abilities. However, the only significant evidence found in the regression analysis for cross-linguistic predictions between L2 PA skills and L1 reading came from the elision task. Thus, L2 phoneme isolation was not a significant predictor of L1 reading, indicating that the ability to identify and isolate phonemes in English is not an important factor in explaining reading ability in NS. The findings partially replicate studies showing L2 PA skills as a unique predictor of L1 reading abilities (Dickinson et al. 2004, 336; Veii and Everatt 2005, 250).

L2 RAN measures were also uniquely predictive of L1 reading abilities. Regression results for each group revealed that RAN contributed uniquely to word and fluent reading abilities in both languages. This finding suggests that NS and English RAN skills share some common underlying mechanism, probably related to speed of processing, which makes cross-linguistic predictions possible. L2 PWM skills were also predictive of L1 reading. However, the only clear evidence for a significant prediction of this skill was found in the digit span task (β=.36* at step 2) in the NS group. This suggests that PWM skills may be independent of language, but only when measured with items which already have a stored phonological representation in the lexicon. This is inconsistent with findings showing PWM not being language-specific (Miettinen 2012, 153). However, the poorer performance of the NS group on the English NWR task provided evidence for a language instruction effect on PWM; it was clear that the learners in the English group were significantly better at repeating English non-words, a finding that can only be explained as a result of their increased exposure to English.

In summary, L1 skills were found to predict L2 reading abilities and vice versa. The findings are consistent with research showing that the relationship between the transfer of L1 and L2 PP skills and L1 and L2 reading skills is bidirectional (Dickinson et al. 2004, 336; Veii and Everatt 2005, 250) which provide support for the LIH. This finding suggests that a child with better L1 reading abilities will have better L2 reading abilities and vice versa (Chuang 2010, 89). The same cognitive processes that underlie L1 reading abilities are crucial for L2 reading development supporting the notion that L2 reading process is to some extend an imitation of the L1 reading process (Singhal

1998, 1; Bernhardt 2005, 133). The fact that the NS-English bilingual children were able to transfer skills across languages, suggests that bilingualism may have a facilitative impact on children's reading development (Bialystok 2002, 190), even if the transfer process is not entirely without difficulties. The fact that positive transfer of skills are possible, suggests that bilingual education is not, in principle, a bad practice, as bilingual learners can use their reading-related skills in one language to benefit reading abilities in another. However, to actually benefit from bilingual education and to reach acceptable reading levels, learners' PP skills must be developed more explicitly in both the L1 and the L2.

6.3 Group differences on PP and reading measures performance

The third question aims to investigate any performance differences in PP and reading skills of NS-English bilingual children who received their initial literacy instruction in their L1 and those who received instruction in English. The study hypothesised that, NS-English bilingual children receiving instruction in NS will have better PP and reading outcomes in NS compared to English. To determine group performances, MANOVA analyses were conducted.

6.3.1 Group differences on the English measures

With regards to performance in English, the results indicated a main group effect on the outcome of PP skills and reading tasks. The multivariate analysis indicated that learners in the English group performed significantly better on English NWR, RCN, word and fluent reading task than the NS group. These results are not unexpected because the learners had more exposure to English and they may have acquired adequate proficiency in the language enabling them to perform better in the tasks. Interestingly, no significant group differences were established for English elision, isolation, digit span, RDN and RLN variables. The lack of differences in these measures may be attributed to floor effects which occurred when the tests were difficult (many learners scored very low) (Field 2000). It is possible that the children might have been unable to complete many items on the English PP tasks due to the items' level of difficulty. Even so, in terms of these English PP measures, the

English group showed no significant advantages being instructed in English here. In addition, the fact that the NS group performed significantly poorer on English word and fluent reading tasks, suggests that in the NS group, the skills related to attaining word reading, reading fluency and automatisation were not as well developed in the NS group (as in the English group).

The poorer performance pattern of the NS group on the English NWR and the RON task seem to suggest that they have not reached adequate L2 *oral language proficiency* to handle cognitive-linguistic tasks related to fluent reading in an L2, as performance on both these tasks (and on fluent reading) will be affected negatively by low levels of L2 vocabulary. This is consistent with studies revealing that children who acquire literacy skills in a non-native language encounter difficulties in acquiring L2 reading abilities (Ehler-Zavala 2005, 656; Strauss 2008, 19; Yildiz-Genc 2009, 407; Charles et al. 1999, 47; Segalowitz et al. 1991, 16). It is worthwhile to note here, that the English group also significantly outperformed the NS group in English RON, again pointing to an oral language deficit in the NS group – however, English RON was removed from the MANOVA model in order to meet the assumption of homogeneity of variance-covariance matrices, and thus this point is mentioned here as an aside. Overall, it seemed as if the learners in the NS group have not acquired sufficient L2 proficiency to support their L2 reading; and it is therefore possible that their L1 PP skills could also not fully assist them in their L2 reading. Adequate L2 language proficiency is crucial in developing L2 PP skills (Chiappe et al. 2002a, 113; Esmaeeli 2012, 71) and subsequent L2 reading abilities (Alderson 1984, 133; Yamashita 2000, 2; Yamashita 2002b, 91; Lee and Schallert 1997, 736; Clarke, 1978, 147). This suggests that children must attain an adequate level of L2 oral proficiency before learning to read in the L2.

A postponement of L2 formal reading instruction in NS-English bilingual children might therefore be appropriate until L2 learners have attained an adequate level of L2 oral proficiency (Snow et al. 1998, 238). However, seeing that these children (NS group) have to study the school curriculum in English from Grade 4, this might not be a viable solution. Rather, English instruction (alongside NS instruction) should start as early as possible. This suggestion is in line with recent developments in the Department of Basic education's policy which, as of 2013, indicates that learners studying in their mother tongue in the foundation phase must be introduced to English in Grade 1.

6.3.2. Group differences on the NS measures

With respect to NS measures, the NS group performed significantly better on NS elision skill, NS RON, word reading and fluent reading abilities. The finding is consistent with research revealing that bilingual children find it easier to develop reading skills in their L1 than in their L2 (Bialystok, 2007, 45; Droop and Verhoeven, 2003, 99). This was an expected finding since the NS group's exposure to NS was far more extensive than to English. The NS tasks required children to manipulate NS phonological grains, which proved difficult for the English group.

No statistically significant group differences were observed for NS isolation and NS NWR measures, indicating that the English group was as successful in identifying NS phonemes as the NS group and that NS PP (i.e. the encoding, storing and retrieval of novel lexical items) was not significantly impaired in these children, despite their lack of NS literacy instruction. Thus, unlike Wilsenach (2013) this study found no clear evidence that L1 PP and memory skills, particularly those measured with NWR, are at risk of falling behind when children do not receive instruction in their first language. It is also possible that the lack of differences in these NS measures may be attributable to the test instruments' lack of sensitivity to differences in skills at this particular age, seeing that the instruments are not standardised (Joy 2011, 13; Jongejan et al. 2007, 844).

6.3.3 Intermediate summary

In summary, the results indicate that there are differences in the PP and reading abilities of NS-English bilingual children who have received their initial literacy instruction in their L1 and those who received their initial literacy in English only. The results indicate that the NS-English bilingual children fared best on the tasks given in their respective LoLT. The English group performed better on some English tasks, and on English fluent reading, whilst the NS group performed better on some NS PP tasks and on NS word and fluent reading. This suggests that bilingual children acquire PP and reading skills in the language in which they receive their literacy instruction, and that reading skills in their other language (regardless of whether this is their L1 or L2) tends to lag. This finding emphasises the importance of language proficiency – a child must have adequate control of the linguistic structures of the language in which reading acquisition is intended (Verhoeven 1991, 72). The results support the prediction that NS-English bilingual children receiving instruction in NS will have better PP and reading outcomes in NS, compared to English.

6.4 L1 literacy instruction and the development of PP and reading skills

The fourth question aims to investigate whether a lack of L1 instruction will negatively affect the development of PP and reading skills in NS-English bilingual children. The study hypothesised that NS-English bilingual children receiving instruction in L2 (English) will show poorer PP and reading skills in NS. Before answering this question, it is worthwhile looking into the overall reading achievement in the tested population, in order to better contextualise the levels achieved in the sample as a whole, and in the two groups.

6.4.1 Development of literacy and PP skills in the entire sample

The results for the whole sample revealed that although NS-English bilingual children were able to acquire the cognitive-linguistic skills necessary for reading in both NS and English, their performance seems to be below the expected reading ability. The mean scores for the whole group indicate a general low level of fluent reading abilities in both languages. In English, the mean score for ‘words read correct per minute’ was 41.38 (SD = 28.27) and in NS, the mean score for ‘words read correct per minute’ was 28.82 (SD = 21.51). Only a few learners were able to read more than 100 words per minute while most of the children were in the range of 0-100 words. A reading speed below 100 words per minute indicate a difficulty in reading ability and the readers in this category will have very little understanding of what they have read (Turboread 2013, 1).

Based on the overall performance, the learners might be categorised to be in Chall's (1983) initial reading stage, placing the children at least one stage behind the expected stage, given their age and grade level. According to Chall (1983), children in the initial reading stage can read about 600 words and they rely on direct decoding instruction to support their reading skills. The learners in this study ought to be in the confirmation and fluency reading stages as propounded by Chall's (1983) model of reading development. If analysed systematically (using individual fluency reading scores), individual learners in this population will thus be characterised as falling in the initial reading stage more often than in the expected confirmation and fluency stage. According to Ehri (2005; 2011) model of reading development, the learners may be assumed to be in the pre-alphabetic and partial alphabetic phases, again pointing to a disconcerting lag.

The learners' reading abilities remain a cause for concern. Future studies are recommended to ascertain the actual reading stages according to Chall's (1983) and Ehri's (2005) models of reading development and design a reading remedial programme that might be used to teach reading to the learners. According to Chall's (1983) model of reading development, the NS-English bilingual children in this study have clearly not reached the confirmation and fluency stage, which is the expected reading stage for them based on their age and grade. Learners were not expected to be fully developed readers, but were expected to recognise words automatically and to read simple texts fluently (Chall 1983, 2). A few learners showed promise, indicating that they have acquired fluent reading abilities in their LoLT (regardless of whether the LoLT was their L1 or L2). Overall, the learners need to engage in more effective reading practices, to adequately develop their automatic word processing abilities and to facilitate fluency and comprehension (Kuhn and Stahl 2003, 19) which is the ultimate goal for reading.

6.4.2 Development of literacy and PP skills in the English group

The English group typically demonstrated higher scores on the English measures, and significantly outperformed the NS group on some of the English measures. The English group's limited exposure to their mother tongue (in a formal schooling context) did not constrain their acquisition of some emergent reading-related skills such as PP skills. This is consistent with findings that demonstrate that L2 learners are able to acquire cognitive skills related to reading despite limited exposure to L1 (Chiappe et al. 2002a,113; Chiappe et al. 2002b, 369; Esmaeeli 2012,78). Thus, it is possible for bilingual children to acquire cognitive-linguistic skills essential for reading even if instruction is offered in an AL.

Although the English group (in particular) fared better on many of the cognitive-linguistic measures, the SS's on the English tasks suggest that their performance on PP and reading tasks were not age appropriate. The English group's performance was below average on most PP tasks, as indicated in Wagner et al.'s (1999, 34). This suggests that the group might not have adequately acquired the cognitive-linguistic skills needed for reading development. Most learners also performed below their expected level on the reading tasks. The English word reading score of most learners fell within a standard score range of 84-and-below, which indicates some level of reading difficulty according to the DTWRP (FRLL, Institute of Education 2012, 6). The mean reading fluency score (words read per minute) in the English group was 52.17 (SD = 27.19). These results indicate that the English group might be behind in terms of their reading achievement, when compared to L1 English learners. This is naturally to be expected, given the fact that English is not their L1, but the lag remains worrying, given that the learners tested here have to cope with the demands of studying the curriculum in English. The generally low standard scores suggest that PP and reading skills might be developing at a slower rate than would be expected for their age. The children may however, need to be studied on a developmental course to determine exactly how far behind they might be in terms of reading achievement.

The weak performance of the English group might have been caused by a variety of factors, including the fact that (i) instruction is delivered by non-native speakers of English, which makes learning and teaching difficult, as the language of instruction is also foreign to the teacher (Benson 2005, 1); (ii) L2 exposure for this group is limited to classroom instruction and children have no/very little oral exposure to English once they are out of school and (iii) overall weak L2 language proficiency.

As was predicted, the English group performed relatively poorly on NS PP and reading tasks. This finding supports the hypothesis that NS-English bilingual children receiving instruction in L2 will show poorer PP and reading skills in their home language (NS). This is at odds with the theoretical and empirical research which supports the conception that children develop better on PP and reading skills in their L1 language than in any L2 (Bialystok, 2007, 45; Droop and Verhoeven, 2003, 99). Wilsenach (2013, 27) suggests that general L1 PP abilities are weakened when children do not receive L1 literacy instruction, and the advantage advocated by Bialystok (2002) is perhaps only true in contexts where leaners receive their primary literacy instruction in their L1 .

In recent years, emerging data from cross-linguistic comparisons have shown that learning to read develops more slowly in languages with less transparent orthography like English than in a language with a more transparent orthography like NS (Wilsenach 2013, 28; Veii and Everett 2005, 239). The development of PP and reading skills in NS-English bilingual children should be easier in the L1 (NS), even if instruction was given in the L2 (English) (that is, one could argue that if NS children acquire English PP skills, which facilitate decoding in English, with its opaque orthography, it should be easy for them to transfer decoding skills to their mother tongue, NS, with has a transparent orthography). However, it is clear from the weak performance of the English group on NS reading, that automatic transfer of decoding skills did not take place in all the learners in the English group.

The study reaffirms previous studies with NS-English bilingual children showing that learners who are instructed in English group had weak PP and reading skills in both NS and in English (Wilsenach 2013). Based on the current findings (even though the English group showed more gains in developing their English skills), it cannot be concluded that L2 instruction (in the absence of L1 instruction) is best. The performance of the learners receiving L2 instruction, in both the L1 and L2 tasks, is not satisfactory enough to show the absolute gains of L2 instruction. This is consistent with the view that when learners L1 knowledge is not sufficient, and are given instruction in L2 only, their L1 knowledge may weaken and they may have difficulty acquiring the L2 properly (Cárdenas-Hagan et al. 2007, 250). Most learners in RSA do not live in environments where English is a functioning language of wider communication (Heugh 2010, 97) and as a consequence the emergent bilingual's L2 may not be adequately developed. Thus, an English-only education policy may not be appropriate and would not serve the educational needs of young children best (De Sousa and Broom 2010, 46).

6.4.3 Development of literacy and PP in the NS group

The current findings also do not clearly show the theoretical advantages of mother-tongue education. The performance of the bilingual group receiving L1 instruction is not convincing enough to conclude that mother tongue instruction is always best. The performance of the NS group on both L1 and L2 tasks suggests that they have not adequately developed the cognitive-linguistic skills essential for reading, as evidenced by the mean reading fluency score of 35.2 (SD = 21.01) words per minute for NS, and 30.14 (SD = 25.02) words per minute for English. While it has to be conceded that reading norms for NS do not exist, and that it is therefore difficult to speculate what an acceptable reading speed in this language would be, 35 words per minute seems too low to facilitate reading comprehension.

Skills that were acquired in NS were also not necessarily transferred to English. In line with Wilsenach (2015, 19), it is argued here that mother tongue education that fails to develop a wide range of L1 cognitive-linguistic skills in a young child is not better for a child. The findings are not consistent with main stream literature, which promotes a strong emphasis on mother tongue instruction and which claims that L1 always leads to better literacy results in the L1 with no retardation of literacy results in L2 (Verhoeven 1991,72). The finding suggests that the success of mother tongue instruction in a bilingual child depends (amongst other things) on effective implementation and sound teaching practices (Cummins 2001, 3).

It has been suggested that mother-tongue instruction should happen in a context where the learners get parental support at home in a way that develops their mother tongue vocabulary and conceptual thought (Cummins 2005, 3). Adequate support for the learners L1 both at home and at school enhances the development of cognitive skills in the learners L1 and L2. There are however, indications that, in most RSA homes, insufficient time is spent on reading activities or on formal reading instruction (Howie et al. 2006, 57; Pretorius 2008, 78). RSA therefore, needs to cultivate a reading culture whereby both teachers and parents get involved in the learners' reading practices. Essentially, reading improves reading (Pretorius and Ribbens 2005, 145).

6.4.4. Intermediate summary

In light of the present findings, one can conclude that a lack of (quality) L1 instruction to some extent does constrain adequate development of the cross-linguistic PP and reading skills of an emergent bilingual child. The results suggest that the choice between either L1 instruction or L2 instruction may not benefit all learners in a multilingual context (Cárdenas-Hagan et al. 2007, 256). This provide support for Heugh's (2002, 19) view that the choice between English or an African language is a false dichotomy, because developing the L1 and adding an L2 is the best possible manner to ensure the successful learning of an L2. Some scholars suggested that to become and remain proficient in an L2, emergent bilinguals need early reading instruction in L1 followed by reading instruction in L2 (Soares De Sousa and Broom 2010, 46).

It was not immediately clear that the learners in this study benefited from the facilitative effects of bilingualism. While some scholars claim that bilingualism does have an enhancing effect on cognitive and metalinguistic concepts, giving L2 learners a good leverage in reading compared to monolinguals, (Lesaux and Siegel 2003, 1006 Verhoeven 1991, 73), some have found no bilingual advantages (Bialystok et al. 2003, 27; Inceçay and Soruç 2013, 114). Bilingualism might not have been adequately supportive of reading acquisition in NS-English bilingual children due to linguistic differences (Bialystok's 2002, 189) between NS and English which limits adequate transfer of skills from one language to another. More likely, however, only children in a balanced bilingual position can benefit from the facilitative effects of bilingualism (Cummins 1991b, 85) and there was no evidence of balanced bilingualism in this sample.

Overall, the results confirm the prediction that NS-English bilingual children receiving instruction in an L2 will show poorer phonological and reading skills in NS. However, this hypothesis was only partially borne out, seeing that there was no significant difference between the LoLT groups on NS phoneme isolation and RON. Even so, the English group performed significantly poorer on NS elision, which was shown to be a strong and consistent predictor of reading ability in the L1. This finding suggests that a lack of mother tongue instruction can inhibit the development of essential reading-related skills (such as phoneme and syllable elision) in the L1, which might have negative repercussions on development of L1 and L2 reading abilities.

6.5 Gender differences in reading achievement

The fifth question asked if gender differences contributed to differences in the RD of NS-English bilingual children. The study hypothesised that girls will outperform boys on PP and RD in NS and English. To determine gender differences, MANOVA analyses were conducted for the English and NS variables. The gender differences in PP and reading abilities are discussed here in relation to two mainstream theories: the biological theory

(Gunzelmann and Connell 2006, 2; White 2007, 3; Watson et al. 2010, 357; Sauver et al. 2001, 787) and the AP based theory (Limbrick et al. 2011, 2).

The MANOVA results proved that gender was statistically significant in predicting learners' PP and reading achievement. The results demonstrate a significant female advantage in reading abilities in English (fluent reading) and in NS (fluent reading). This is consistent with research findings revealing that girls outperform boys in reading achievement (Lynn and Mikk 2009, 10; Martino and Keller 2007, 407; Howie et al. 2012, 28; Van Staden and Howie 2012, 95; Klinger et al. 2010, 5; Rutter et al. 2004, 5; USAID 2013, 1). The findings suggest that boys are lagging behind in terms of reading achievement. However, there were no statistically significant gender differences on English and NS word reading abilities; suggesting that boys had acquired adequate cognitive-linguistic abilities to handle simple decoding skills in their L1 and L2.

The findings are in line with biological explanations which points to an early developmental maturity in girls (Klinger et al. 2010, 4) and to the left brain strength of girls (Alloway et al. 2002, 54; Gunzelmann and Connell 2006, 6; Gurian and Stevens 2012, 2). The female advantage on reading performance is also in line with the AP explanation, which suggests that gender differences in reading abilities are caused by the fact that phonological/auditory abilities of girls develop earlier than those of boys (Limbrick et al. 2011, 2; Chuy and Nitulescu 2009, 5). The results show a female advantage for English PP variables (elision and RDN skill) and on NS variables (elision and phoneme isolation). This is an important finding, as it proves that PP differences between boys and girls are important for explaining the gender gap in reading abilities. This finding is consistent with research proving that girls show more advanced PP skills than boys (Rowe and Rowe 2006; Rowe et al. 2005, 16; Krizman et al. 2011; Burman et al. 2008, 11).

The findings suggest that boys and girls process phonological/auditory information differently and also suggest a delay in the PP capacity of boys. Studies reveal that the delay in the development of PP skills in boys continue up to the age of 10 (Rowe and Rowe 2006, 4; Rowe et al. 2005, 16) resulting in girls and boys starting school with diverging phonological strength (Gunzelmann and Connell 20006, 6). Many NS-English bilingual children were under the age of 10 in this study, implying that the boys might still be acquiring PP skills (and this might have resulted in their poor performance compared to girls). It is possible that gender differences in reading abilities of NS-English bilingual children will disappear with increasing age, since gender differences in reading abilities typically do not persist into adulthood (Burman et al. 2008, 11; Phillips, Norris, Osmond and Maynard 2002, 10). According to some scholars, gender differences in reading disappear when the development of the auditory capacity in boys catches up with those of girls (Commonwealth of Australia 2002, 105).

Interestingly, performance on some PP skills in English (isolation, digit span NWR, RLN and RCN) and NS (NWR, RON) were comparable for both genders. This is in line with research demonstrating no significant gender differences on different PP capacities in learners (Teleb and Awamleh 2012, 37; Fasanya et al. 2015, 246). This finding suggests that boys to some extent had acquired cognitive skills to support reading similarly to girls. There is however, no instance where boys outperformed girls in this study, and this is noteworthy. It is clear that gender differences in reading abilities of children should never be ignored (Rowe et al. 2005, 16; Klinger et al. 2009, 21; Watson et al. 2010, 360; The Education Alliance 2007, 9). Early reading intervention will benefit boys and reverse such gender disparities. Early diagnosis and targeted support of boys with reading difficulties is critical in the South African context.

Curbing gender gaps in reading require that the teacher be equipped with this knowledge on PP and RD. Primary school teachers need to be trained and sensitised on how to identify children with reading difficulties and on proper classroom management skills to address learners' needs (Rowe et al. 2005, 17). However, this is not an easy task. According to Naidoo et al. (2014, 160) most teachers in RSA are usually left to cope with overcrowded classroom. Teaching learners with reading difficulties requires that the teacher-pupil ratio allows the teacher to engage in one-on-one activities with learners. Research in RSA has also indicated that even when teachers are aware of learners with reading difficulties in their classrooms, they fail to identify and apply appropriate teaching strategies to remedy the problems (Pretorius and Ribbens 2005, 145; Van Staden and Howie 2012, 95). According to the DoE (2008, 8) many teachers in the foundation phase do not know how to help struggling readers. Particularly boys that cannot read are ignored and placed at one side of the classroom. Under these circumstances, assistance for many children with reading difficulties is delayed. Children may proceed through primary and secondary education without getting the help they need to succeed in reading achievement.

National reading interventions should be aimed and targeted at boys to ensure the needs of boys are addressed (Van Staden and Howie 2012, 95; Watson et al. 2010, 360; White 2007, 556; The Education Alliance 2007,6-8; Booth et al. 2009, 7; USAID 2013, 2) if gender disparities are to be reduced. Gender differences in reading abilities of boys and girls can also be influenced by other educational factors and macro-societal factors (Lynn and Mikk 2009, 9) and they may vary within a country and can be context-specific (USAID 2013, 2; Hyde 2005, 589). Reading interventions to address gender disparities in NS-English bilingual children should be addressed taking into account the research context. Future research in the RSA context should also consider these other factors and how these factors contribute to gender gaps in reading abilities.

Overall, the findings did support the prediction that girls will outperform boys on PP and RD in NS and English. The results suggest that PP differences are important in explaining differences in reading abilities between boys and girls. This provides support for the AP based theory in accounting for gender differences in reading. The present findings suggest that more boys are at risk of not acquiring the PP skills necessary for reading achievement. Adequate intervention, especially targeting boys in the RSA context, is essential to ensure that gender gaps in reading achievement are reduced. Further research is warranted to investigate the exact nature of gender differences in the NS-English bilingual population.

6.6 Summary of key findings

The relationship between PP and reading skills in two groups of NS-English bilingual children was investigated. The study provides insight into the development of PP and reading skills in bilingual children. Below are the key findings of the study.

PP skills reliably predict reading development in NS-English bilingual children.

PP skills were associated with and uniquely predicted the L1 and L2 reading performance of NS-English bilingual children. PA and RAN were found to be strong predictors of reading abilities in NS-English bilingual children while PWM made a very small contribution to reading outcomes. The finding replicates studies which reveal that PP skills reliably predict reading in bilingual children (Durgunoglu 2002, 201, Gottardo and Lafrance 2005, 574; Gottardo et al. 2006, 389 Jongejan et al. 2007, 847; Wilsenach 2013, 28). This finding also supports the PP model of reading acquisition (Wagner and Torgesen 1987; Wagner et al. 1994; 1997), the developmental model of AP and reading (Zhang and McBridge-Chang 2010) and the causal path model (Boets et al. 2008). The finding emphasises the importance of adequately developing PP skills in children since they are the basic foundation for the development of children's reading abilities. The finding builds on previous findings by Wilsenach (2013) who examined NS-English bilingual children on a similar battery of PP measures. However, as mentioned before, the findings of this dissertation show that reading is not predicted entirely by PP, as not all variance is captured by including only PP measures. These findings are in line with Pennington, Santerre-Lemon, Rosenberg, MacDonald, Boada, Friend, Leopold, Samuelson, Byrne, Willcut and Olson (2012, 212) who established that phonology is not always involved in literacy achievement. There are other factors that play a role in literacy development (such as socioeconomic and cognitive factors) that should also be taken into consideration.

Some PP skills transfer cross-linguistically from the L1 to the L2 and vice versa.

PP skills were found to transfer across languages. The finding supports the LIH (Cummins 1991) and the CPH (Geva and Siegel, 2000). The study demonstrates that phonological transfer is not only limited to languages with similar phonological and orthographic structures (Chow et al. 2005, 86; Gottardo et al. 2001; Dickinson et al. 2004, 336; Wei and Zhou 2013, 11; Veii and Everatt 2005; 250; Chuang 2010, 90; Keung and Ho 2009, 26). Phonological skill transfer can occur in languages with different orthographies, that is, from a transparent orthography like NS to a deep/opaque orthography like English. PA (elision in particular) was found to be the strongest unique cross-language predictor of word and fluent reading abilities in L1 and L2 and it is transferred bi-directionally.

NS-English bilingual children acquired PP and reading skills in the language in which they received literacy instruction.

The NS and English groups performed better on tasks presented in their respective languages of instruction. This finding suggests that the developmental pattern of cognitive-linguistic abilities in bilingual children may differ depending on the language of instruction used. The study supports the idea that reading proficiency develops from a firm foundation of oral language proficiency (Eskey and Grabe 1988, 226; Strauss 2008, 20; Verhoeven 1991, 72, Yamashita 2002b, 91). It is clear from this finding that some of the reading problems in RSA are stimulated by issues pertaining to lack of language proficiency.

Lack of L1 instruction has negative repercussions on children's development of reading skills in both their L1 and L2.

L2 learners' limited exposure to formal L1 instruction to some extent constrained their acquisition of adequate reading skills in their L1, and L2 reading skills also seemed under-developed. The finding supports and extends research findings that have shown that the development of PP skills in L1 and

L2 are constrained if the learner does not receive L1 instruction (Wilsenach 2013, 27; Soares De Soussa and Broom 2011, 1; Cárdenas Hagan et al. 2007, 250). The finding emphasises the importance of adequately developing the L1 reading abilities of emergent bilingual children before formal reading instruction in L2 is introduced, as the potential benefit of L1 skill transfer will only then be realised (Snow et al. 1998, 238). However, this should be implemented in a manner that ensures that the delay in L2 reading instruction have no serious effects on the children's schooling in general (Cummins 1981, 135).

Mother-tongue instruction is not a determinant for educational success.

Regardless of whether the learners in this sample received their literacy instruction in the L1 or in the L2, they all struggled with reading, and did not obtain adequate reading levels. Although the English group performed relatively better than the NS group, all groups performed below average. This proves that, factors related to language of instruction are only partly responsible for the literacy problems experienced in the RSA schooling system. The finding questions the notion that only one language of the bilingual child is best for classroom practices in all educational contexts (Banda 2014, in Naidoo 2014, 158) because the choice between either LI or L2 instruction may not be universally beneficial for all bilingual learners (Cárdenas-Hagan et al. 2007, 256).

There are gender disparities in the reading abilities of boys and girls, in that boys lag behind girls in term of reading performance.

The finding supports previous studies in the RSA which acknowledge the existence of gender differences in RD of children (Howie et al. 2006, 20; Howie et al. 2011, 37; Van Staden and Howie 2012, 95). The study provides clear evidence that assessing PP abilities of children may give insight about gender differences in reading abilities, providing support for the auditory based explanation for gender differences in reading abilities (Limbrick et al. 2011, 2). Assessing PP abilities is viable in understanding the nature of gender disparities in reading abilities among children in RSA.

6.7 Limitations and recommendations for future research

While the results of this study certainly add value to the existing literature on the role of PP skills to reading development in RSA, the study was not without its limitations. There are a few methodological limitations to the study, which are described below. The study is based on a cross-sectional design which means that causal relationships between PP skills and reading abilities cannot be established. Future studies should examine the relationship between PP and reading skills in emergent bilingual children over time, to elucidate a clearer understanding of the developmental nature of PP and reading skills.

The PP measures of NS were not standardised (no standardised language tests exist for NS). The use of unstandardised NS measures may have had a negative effect on the accuracy of the results of this study. To moderate this effect however, the researcher tried as much as possible to use previous tests designed and used by other experts in the field (i.e. the elision task adapted from Pretorius and Mampuru (2007) and the NWR NS test adapted from Wilsenach (2013).

The English standardised tests used in data collection cannot be assumed to be context appropriate since none of these tests were developed for RSA English L2 learners. The applicability of the CTOPP in the South African context may be questioned, but again, given the absence of a more appropriate testing instrument; it was decided to use a language test that was standardised in a Western context. It is recommended for future research to focus on the development of standardised English PP and reading tests that are more appropriate for the RSA context. The findings of this study indicate the urgent need for the development of tests to evaluate South African learners' PP and reading skills. Linguistic, cultural and context appropriateness should be aimed at when designing such tests (Van Dulm 2013, 54).

The language proficiency of the children could not be determined as no measures of NS and English oral knowledge were included (this was due to time constraints). Language proficiency measures might have been helpful for the interpretation of some of the results. It can be assumed that the children had limited English proficiency since they entered school with little or no oral English proficiency. The researcher tried to compensate for this by working with Grade 3 learners, who, at the time of testing, had more than two years of exposure to English. Also, since none of the tests required the children to spontaneously produce English words or sentences, it was assumed that oral language proficiency was not critical in order to complete the PP tasks. Even so, it is recommended that future research should aim to include such language proficiency measures, to further support the interpretation of some of the results.

6. 8 Practical Implications

The results of the present study have a number of practical implications. The findings demonstrate that a model of early identification and intervention for children at risk of not developing adequate PP and reading skills is essential in the South African context. PP skills, particularly elision skills, (which presupposes an ability to segment and manipulate various phonological grain sizes in words) and RAN skills were found to be of great importance for the development of reading skills. Thus PP skills and literacy development must be part of language teacher professional training in the country.

The findings indicate that NS-English bilingual children experienced delays in their PP and reading abilities and point to the importance of early phonological and phonemic training that benefits early and subsequent RD in children. More classroom-based intervention is needed to ensure that reading-related cognitive skills of learners are adequately developed. Early intervention in improving PP skills is crucial since these skills develop from as young as three years of age. Teachers need to receive professional training which provides them with an in depth understanding of the relationship between PP and reading abilities and also the importance of developing these skills in learners.

Drastic measures need to be taken to address gender differences in PP abilities for effective development of reading abilities. Making gender issues an integral part of the curriculum may generate opportunities to create learning environments in which both boys and girls are free to interact and therefore improve their literacy skills (Watson et al. 2010, 360). Strategies to curb gender differences in RD include the use of boy-friendly reading materials, adoption of technology-based programmes and experimentation with single-gender schooling (White 2007, 556; The Education Alliance 2007, 6-8).

Efforts to support and improve boys' literacy achievement should however, not create a situation where girls are neglected and disadvantaged (Booth et al. 2009, 7). Reading interventions must engage all children and the curriculum must have appropriate content which facilitates the development of PP and reading skills. Teachers must be equipped with the professional knowledge on how to identify children with PP difficulties and how to help them effectively. Education policies must be centred on improving the PP skills of learners in the classroom, if RSA is to realise an improvement in literacy development in the foundation phase. An inclusion of an auditory assessment procedure that teachers can administer at school entry (Rowe et al. 2005, 16) might be helpful in assessing the phonological/auditory capacities of children so that they can get early support where necessary. Early screening diagnostic tools are necessary for teachers to identify children at risk of not acquiring basic reading skills.

The findings show that issues on the language of learning and teaching needs to be addressed to improve overall literacy levels of all RSA learners. Emergent bilingual learners might require an early mother tongue reading instruction followed by gradual introduction to L2 reading instruction (Soares De Sousa and Broom 2010, 46; Heugh's 2002, 19). The choice of either L1 or L2 instruction may not be beneficial to all learners in bilingual conditions. Crucially, addressing LoLT issues do not lead to automatic improvement in literacy abilities, since there are several other factors that affect literacy development in the country. LoLT issues should be addressed in conjunction with other social and educational issues to reap positive benefits in terms of reading achievement.

6.9 Conclusion

This study established that PP skills reliably predict reading abilities in NS-English bilingual children. The study confirms that cross-linguistic transfer of certain PP skills from L1 to L2 reading and vice versa does happen in bilingual learners. The study also found that a lack of L1 instruction has negative repercussions on the children's development of reading skills in their L1 (and possibly L2); that mother-tongue instruction is not a determinant for educational success and that there are gender disparities in the reading abilities of boys and girls. The study is preliminary in nature due to its cross-sectional approach, resulting in some of the aims of the study being only partially achieved. Longitudinal research on the relations between PP and reading skills will provide a clear understanding on the relationship between PP and RD in bilingual children.

The study adds knowledge to the fields of psycholinguistics and applied linguistics in RSA, as the findings contribute towards an understanding of the relationship between PP and reading abilities in emergent bilingual children. The findings are crucial in providing educational insight on policies shaping the education system in the country, in general, and more specifically in language teacher training, and the development of context-appropriate English and NS standardised language and reading materials.

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APPENDIX A: PARENTS CONSENT FORM-NORTHERN SOTHO

Department of Linguistics
PO BoxUNISA,0003
Tel: +27-72-102 1459
53669703@unisa.ac.za
Tel: +27-12-429 6045
wilseac@unisa.ac.za
2015

Motswadi/Mohlokomedi yo a rategago

Yunibesithi ya Afrika Borwa e tlile go šoma le baithuti ba Kereiti ya 3 mo Sekolong sa Poraemari sa Bathokwa go ithuta go gontši ka ga polelo le ka ga go bala ga bana ba bannyane. Ngwana wa gago le yena a ka no tšea karolo mo go protšeke ye. Mošomo wo o dirwago ke yunibesithi o ka se ke wa kweša ngwana wa gago bohloko eupša o tla huetša tšwelopele mo mošomong wa ngwana wa sekolo. Boitsebišo bja ngwana wa gago bo tla swarwa sephiri ge mošomo wo o tšwago mo protšekeng ye o ahlaahlwa mo foramong efe goba efe.

O kgopelwa go tlatša le go bušetša lengwalo le go morutiši wa ngwana wa gago.

Ke a leboga!

Ka tlhompho

Patricia Makaure

(Researcher)

____

Nna, motswadi/mohlokomedi wa____ (tlatša leina la ngwana mo sekgobeng se sa ka godimo)

Ka fao ke fa tokelo ya gore ngwana wa ka a ka tšea karolo mo go thuto ya UNISA.

_________________________________ ____________________

Tshaeno ka Motswadi/Mohlokomedi Letšatšikgwedi

APPENDIX B: PARENTS CONSENT FORM-ENGLISH

Department of Linguistics
PO Box 392, UNISA, 0003
Tel: +27-72 102 1459
53669703@unisa.ac.za
Tel:+27-12-4296045
wilseac@unisa.ac.za
2015

Dear Parent/Caregiver

The University of South Africa will be working with Grade 3 learners in Bathokwa Primary School to learn more about language and reading in young children. Your child can also participate in this project. The work done by the university will not harm your child and will not influence your child's progress in school. Your child's identity will be kept confidential if work from this project is discussed in any forum.

Please complete and return this letter to your child's teacher.

Thank you!

Kind regards

Patricia Makaure
(Researcher)

I, parent/caregiver of

____

(fill in child's name in above space)

hereby give permission that my child can participate in the UNISA study.

______________________ ____________

Signature of Parent/Caregiver Date

APPENDIX C: CHILD'S VERBAL ASSENT FORM

Title of the study and researcher: My name is Patricia Makaure and I am from the University of South Africa. I am a student and I need your help with my studies.

Purpose of the study: I am asking you to take part in the study because I am trying to find out how children learn to read in two languages. I am inviting you to participate in this study because you speak Northern-Sotho and English. This study may help teachers learn better ways to help learners improve their reading skills.

Details of participation: If you agree to participate you will be asked to listen to sounds in English and in Northern Sotho and you will also be asked to do reading activities. The activities will take about 45 minutes.

Voluntary participation: You do not have to be in this study if you do not want to. You can stop participating at any time if you want. You will not get into trouble with your teacher or school if you decide not to participate in this study.

Confidentiality: If you decide to take part in the study I will not tell anyone how you performed. I will only show your answers to your parents and teachers if they ask me to.

Your parents know about this study and you can also discuss with them before you decide whether or not to participate. Signing here means that you have understood this form and that you are willing to participate in this study.

APPENDIX D: LETTER TO THE PRINCIPALS

Dr Carien Wilsenach
Department of Linguistics
PO Box 392, UNISA, 0003
Tel: +27-12-429 6045
wilseac@unisa.ac.za

Dear Madam

RE: POSSIBILTY OF DOING RESEARCH IN YOUR SCHOOL

My name is Carien Wilsenach and I work as a senior lecturer in the department of Linguistics at UNISA. You may remember me: I was introduced to your school in 2009 by Prof Lilli Pretorius, who was doing research in your school at the time.

I am now permanently employed at UNISA and I would very much like to return to your school to do some more research. The aim of my new research project is to understand better the role and importance of various phonological skills in the acquisition of literacy skills. As you are probably aware, South African pupils are still not reading at age-appropriate levels (even though we are seeing some improvement due to interventions from the Department of Basic Education). Understanding the various building bricks which contribute to reading achievement in the African context therefore remains very important.

The purpose of this letter is to ask your permission to do research in your school for a 3-year period, starting (most likely) in the third term of 2014 and continuing until the end of 2016. I would like start studying the Grade 1 group at your school this year and I want to revisit the same children in 2015 and in 2016. Each child will be tested on vocabulary, phonological processing, phonological awareness and reading in both Northern Sotho and in English. Some of the tests will be standardised English tests, but the Northern Sotho tests will be tailor made for this research project. I plan to test each child two or three times per year; each testing session will last around 30 minutes. I will naturally adhere to ethical principles of research and will force no learner to participate in the study. I have drawn up a provisional research plan, but I am of course most willing to plan my visits to your school in accordance with the school's calendar and teaching activities. I will aim not to disrupt classes and will not rely on your teaching staff to help me with the testing of the learners.

I attach to this letter the research proposal, which contains more information on the project's objectives and planned outcomes. I also attach the provisional research plan. I will contact you soon to discuss your school's availability to participate in this research project. If you have any questions, I am happy to come and visit you to discuss them.

Kind regards

Dr Carien Wilsenach

I, ____, the principal , hereby grant permission to Dr Carien Wilsenach, from UNISA, to conduct her research study entitled

The relationship between phonological skills and literacy achievement in Northern Sotho-English bilingual children: a longitudinal investigation

in the above-mentioned school. I understand that the research will be conducted over a period of three years and that every child participating in the project will be tested at least twice a year, starting in 2013 and ending in 2015. The research has been explained to me and I am satisfied that no child will suffer any harm from participating in this research project.

Signed on this ___________day of _______________2014 at ____.

_________________________ _________________________

Signature of Principal Signature of Researcher

APPENDIX E: ETHICAL APPROVAL CERTIFICATE-UNISA

UNISA university of south africa

DEPARTMENT OF LINGUISTICS AND MODERN LANGUAGES:
RESEARCH ETHICS REVIEW COMMITTEE

15 April 2015

Ref #: AL_ZPM01_2015
Mrs ZP Makaure
Student #: 53669703

Dear Mrs Makaure

Decision: Ethics Approval

Name: Mrs ZP Makaure
4 Prins Park, Dr Malan Street, Stellenbosch, Cape Town 7600
53669703@mylife.unisa.ac.za
+27721021459

Supervisor: Dr CA Wilsenach

Proposal: AUDITORY PROCESSING AND READING DEVELOPMENT OF NORTHERN SOTHO-ENGLISH BILINGUAL CHILDREN

Qualification: MA

Thank you for the application for research ethics clearance received *on 23 February 2015* by the Department of Linguistics and Modern Languages Research Ethics Review Committee (RERC) for the above mentioned research. Final approval is granted for the research undertaken for the duration of your MA studies.

For full approval: *The application was reviewed in compliance with the Unisa Policy on Research Ethics by the Department of Linguistics and Modern Languages Research Ethics Review Committee on 09 March 2015.*

The proposed research may now commence with the proviso that:

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

1) *The researcher will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Department of Linguistics and Modern Languages Research Ethics Review Committee Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*
3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

Note:

The reference number (top right corner of this communiqué) should be clearly indicated on all forms of communication (e.g. Webmail, e-mail messages, letters) with the intended research participants, as well as with the Department of Linguistics and Modern Languages RERC.

On behalf of the departmental RERC, we wish you everything of the best with your research study. May it be a stimulating journey!

Kind regards,

EJ Pretorius

Prof EJ Pretorius

Chair: Department of Linguistics and Modern Languages RERC
Tel: (012) 429 6028
pretoej@unisa.ac.za

APPENDIX F: ETHICAL APPROVAL CERTIFICATE-GAUTENG DOE

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no: D2016 / 020

GDE RESEARCH APPROVAL LETTER

Date:	**13 April 2015**
Validity of Research Approval:	**13 April 2015 to 2 October 2015**
Name of Researcher:	**Makaure-Chimboza Z.P.**
Address of Researcher:	**14 Prins Park; Dr Malan Street; Stellenbosch; 7600**
Telephone / Fax Number/s:	**072 102 1459**
Email address:	**53669703@mylife.ac.za**
Research Topic:	**Auditory processing and reading development of Northern Sotho-English bilingual children**
Number and type of schools:	**TWO Primary Schools**
District/s/HO	**Tshwane North**

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. A separate copy of this letter must be presented to the Principal, SGB and the relevant District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted. However participation is VOLUNTARY.

The following conditions apply to GDE research. The researcher has agreed to and 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:

CONDITIONS FOR CONDUCTING RESEARCH IN GDE

1. The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter;
2. A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB);

2015/04/14

1

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

3. 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;
4. The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, SGBs, teachers and learners involved. Participation is voluntary and additional remuneration will not be paid;
5. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal and/or Director must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage;
6. 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;
7. 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.
8. It is the researcher's responsibility to obtain written parental consent and learner;
9. 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;
10. 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;
11. On completion of the study the researcher must supply the Director: Education Research and Knowledge Management with one Hard Cover, an electronic copy and a Research Summary of the completed Research Report;
12. 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; and
13. Should the researcher have been involved with research at a school and/or a district/head office level, the Director and school 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: 2015/04/14

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
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APPENDIX G - TEST ITEMS FOR NORTHERN SOTHO ASSESSMENTS

1. Northern Sotho Elision Task

Derived from Wilsenach (2013) and Pretorius and Mampuru (2007).

1	Say	Raga	Now say it again but don't say /ra/
2	Say	Bolo	Now say it again but don't say /lo/
3	Say	Bolelo	Now say it again but don't say /bo/
4	Say	Gabotse	Now say it again but don't say /ga/
5	Say	Morago	Now say it again but don't say /go/
6	Say	Batswadi	Now say it again but don't say /di/
7	Say	Borena	Now say it again but don't say /na/
8	Say	Fetola	Now say it again but don't say /la/
9	Say	Polelo	Now say it again but don't say /le/
10	Say	Basadi	Now say it again but don't say /sa/
11	Say	Garafo	Now say it again but don't say /ra/
12	Say	Bana	Now say it again but don't say /b/
13	Say	Wena	Now say it again but don't say /w/
14	Say	Dira	Now say it again but don't say /d/
15	Say	Yena	Now say it again but don't say /y/
16	Say	Bona	Now say it again but don't say /b/
17	Say	Bofe	Now say it again but don't say /e/
18	Say	Gauta	Now say it again but don't say /u/
19	Say	Taolo	Now say it again but don't say /a/
20	Say	Seabe	Now say it again but don't say /a/

Practice Item

The word "bina" has four sounds /b-i-n-a/. What is the first sound of the word "bina"?

Test items

1. The word "aba" has three sounds /a-b-a/. What is the first sound in the word "aba"? /a/______

2. The word "efa" has three sounds /e-f-a/. What is the first sound in the word "efa"? /e/______

3. The word "poso" has four sounds /p-o-s-o/. What is the first sound in the word "poso"? /p/______

4. The word "moeng" has three sounds/m-o-e-ng/. What is the first sound in the word "moeng"? /m/______

5. The word "katse" has five sounds /k-a-t-s-e/. What is the first sound in the word "katse"? /k/______

6. The word "neo" has three sounds /n-e-o/. What is the last sound in the word "neo"? /o/______

7. The word "paka" has four sound /p-a-k-a/. What is the last sound in the word "paka"? /a/______

8. The word "pedi" has four sounds /p-e-d-i/. What is the last sound in the word "pedi"? /i/_______

9. The word "leba" has four sounds /l-e-b-a/. What is the last sound in the word "leba" /a/_______

10. The word "koloi" has five sounds /k-o-l-o-i/. What is the last sound in the word "koloi"? /i/_______

11. The word "ela" has three sounds /e-l-a/. What is the second sound in the word "ela" /l/_______

12. The word "mosa" has four sounds /m-o-s-a/. What is the second sound in the word "mosa"? /o/______

13. The word "lema" has four sounds /l-e-m-a/. What is the second sound in the word "lema"? /e/_______

14. The word "sena" has four sounds /s-e-n-a/. What is the third sound in the word "sena"? /n/______

15. The word “rata” has four sounds /r-a-t-a/. What is the third sound the word “rata”? /t/________

3. Northern Sotho Non-Word Repetition

(Derived from Wilsenach, 2013).

Four-syllable words	**Five-syllable words**	**Six-syllable words**	**Seven-syllable words**
Sêpokari	Makêpodiri	Môgisirolêtha	Hlôdikilêswagoba
Sêlumaka	Nesodiwakô	Katôngwaloshane	Nôrakulêswibisi
Ntômbuwêka	Môfugatsadi	Batêraphôtwana	Nasibhêkarabilê
Nthufobila	Bosithirangwê	Basêtswêgôkoela	Narulongwakhubasi
Hlatoyana	Balobadikwe	Kuratshifodiri	Neratomkibangwane

4. Northern Sotho Rapid Object Naming

(Adapted from the CTOPP (Wagner, Torgesen and Rashotte’s 1999

phênsêlê	nalêdi	hlapi	setulo	sekepe	khii	nalêdi	phênsêlê	khii
hlapi	sekepe	setulo	khii	setulo	star	sekepe	hlapi	phênsêlê
nalêdi	setulo	khii	phênsêlê	hlapi	sekepe	nalêdi	khii	hlapi
setulo	sekepe	phênsêlê	hlapi	khii	setulo	phênsêlê	nalêdi	sekepe

5. Northern Sotho Word Reading List

Some words were derived from Pretorius and Mampuru (2007).

Test items

Nna	Ema	Tee	Moo	Eng
Bona	Yena	Dira	Kudu	Fase
Batho	Mahlo	Leina	Phela	Swara
Ngwana	Mathomo	Meetse	Bolela	Morena
Gopola	Bošego	Mantšu	Kgopela	Batswadi
Gosenaselo	Hlodimela	Phaphamala	Tshisepere	Gwadigwatša

6. Northern Sotho Text Reading

The text was selected from children's Northern Sotho grade three text reader entitled *Ngwana yo moswa*, and is published as a Level 1 reader by New Readers publishers (Brain 2007).

APPENDIX H - TEST ITEMS FOR ENGLISH ASSESSMENTS

1. English Elision Task

CTOPP, Wagner, Torgesen and Rashotte's (1999)

1	Say	Toothbrush	Now say it again but don't say /tooth/
2	Say	Cowgirl	Now say it again but don't say /girl/
3	Say	Popcorn	Now say it again but don't say /corn/
4	Say	Baseball	Now say it again but don't say /base/
5	Say	Sunshine	Now say it again but don't say /sun/
6	Say	Airplane	Now say it again but don't say /plane/
7	Say	Always	Now say it again but don't say /all/
8	Say	Doughnut	Now say it again but don't say /dough/
9	Say	Spider	Now say it again but don't say /der/
10	Say	Cup	Now say it again but don't say /k/
11	Say	Meet	Now say it again but don't say /t/
12	Say	Farm	Now say it again but don't say /f/
13	Say	Mat	Now say it again but don't say /m/
14	Say	Bold	Now say it again but don't say /b/
15	Say	Tan	Now say it again but don't say /t/
16	Say	Time	Now say it again but don't say /m/
17	Say	Mike	Now say it again but don't say/k/
18	Say	Snail	Now say it again but don't say /n/
19	Say	Sling	Now say it again but don't say /l/
20	Say	Winter	Now say it again but don't say /t/
21	Say	Powder	Now say it again but don't say /d/
22	Say	Faster	Now say it again but don't say /s/
23	Say	Silk	Now say it again but don't say /l/
24	Say	Driver	Now say it again but don't say /v/
25	Say	Tiger	Now say it again but don't say/g/
26	Say	Flame	Now say it again but don't say /f/
27	Say	Strain	Now say it again but don't say /r/
28	Say	Splat	Now say it again but don't say /l/
29	Say	Planes	Now say it again but don't say /n/

30	Say	Split	Now say it again but don't say /p/
31	Say	Stride	Now say it again but don't say /s/
32	Say	Banks	Now say it again but don't say /k/
33	Say	Pixel	Now say it again but don't say /s/
34	Say	Fixed	Now say it again but don't say /k/

2. English Phoneme Isolation

CTOPP, Wagner, Torgesen and Rashotte (1999)

Practice items

1. The word man has three sounds /m/-/a/-n/. What is the first sound in the word man? /m/_____

2. The word cat has three sounds /c/-/a/-/t/. What is the first sound in the word cat? /k/______

3. The word fish has three sounds /f/-/i/-/sh/. What is the last sound in the word fish? /sh/_____

4. The word bean has three sounds /b/-/e/-/n/. What is the middle sound in the word bean? /e/______

Test items

5	What is the first sound in the word fan?	/f/
6	What is the first sound in the word net?	/n/
7	What is the first sound in the word tape?	/t/
8	What is the first sound in the word sun?	/s/
9	What is the first sound in the word bat?	/b/
10	What is the last sound in the word rat?	/t/
11	What is the last sound in the word mop?	/p/
12	What is the last sound in the word dog?	/g/
13	What is the last sound in the word laugh?	/f/
14	What is the last sound in the word made?	d/
15	What is the middle sound in the word not?	/short i/
16	What is the middle sound in the word mine?	/long i/
17	What is the second sound in the word train?	/r/

18	What is the second sound in the word find?	/long i/
19	What is the second sound in the word toast?	/long o/
20	What is the third sound in the word frog?	/au/
21	What is the second sound in the word flat?	/l/
22	What is the third sound in the word past?	/s/
23	What is the fourth sound in the word trips?	/p/
24	What is the second sound in the word island?	/l/
25	What is the second sound in the word three?	/r/
26	What is the third sound in the word split?	/l/
27	What is the third sound in the word point?	/n/
28	What is the third sound in the word watch?	/ch/
29	What is the third sound in the word music?	/z/
30	What is the fourth sound in the word waves?	/z/
31	What is the fourth sound in the word laughed?	/t/
32	What is the fourth sound in the word mixed?	/s/

3. **English Non-word Repetition**

CTOPP, Torgesen and Rashotte (1999))

Test Items

Ral	Sart	Ballop
Teeg	Zid	Jup
Pate	Nibe	Boke
Chaseedoolid	Bieleedoge	Meb
Wudoip	Nigong	Lisashrul
Voesutoov	Wulanuwup	Teebudieshawlt
Burloogugendaplo	Viversoomouj	Gakiziesaked
Mawgeebooshernooshiek	Dookershatupietazawn	Shaburiehuvoimush
Shruledojzigootbursetoos	Samoupodschasartraleeg	Botrajmiplompatbolaps
Tavowgoandozjounipelaukof	Mesidospregoudegounjopnas	Mesidospregoudegounjopnas

4. English Memory for Digits

CTOPP, Wagner, Torgesen and Rashotte (1999)

5	2							
7	3							
9	7	1						
6	1	5						
1	6							
7	2							
9	4							
5	2	1						
6	4	8						
8	3	6						
5	3	1	8					
3	7	4	1					
7	5	9	6					
4	1	8	3	9				
6	3	2	5	8				
9	2	4	8	3				
8	4	9	7	1	3			
6	4	1	3	9	7			
4	3	8	9	7	5			
3	1	9	7	4	2	6		
9	2	5	1	6	3	8		
7	1	4	5	2	8	3		
4	6	3	5	9	2	7	1	
9	7	4	1	2	5	3	6	
4	9	2	7	3	1	6	5	
9	2	8	1	3	7	5	4	6
8	2	4	7	9	1	3	6	5
4	7	5	1	8	2	3	6	9

5. English Rapid Digit Naming

CTOPP, Wagner, Torgesen and Rashotte (1999)

2	7	4	5	3	8	4	2	5
8	3	7	2	8	4	3	5	7
4	8	2	7	5	3	5	2	8
3	4	7	3	2	5	8	7	4

6. English Rapid Letter Naming

CTOPP, Wagner, Torgesen and Rashotte (1999)

S	t	N	a	k	c	t	c	s
K	a	N	C	k	t	a	n	s
T	k	C	S	n	a	t	c	n
K	a	S	n	c	k	s	t	a

7. English Rapid Colour Naming

CTOPP, Wagner, Torgesen and Rashotte (1999)

blue	red	green	black	brown	yellow	red	black	blue
yellow	green	brown	blue	red	green	black	yellow	brown
green	yellow	black	red	brown	blue	green	red	blue
black	brown	yellow	brown	green	red	yellow	blue	black

8. English Rapid Object Naming

CTOPP, Wagner, Torgesen and Rashotte (1999)

pencil	star	fish	chair	boat	key	star	pencil	key
fish	boat	chair	key	chair	star	boat	fish	pencil
star	chair	key	pencil	fish	boat	star	key	fish
chair	boat	pencil	fish	key	chair	pencil	star	boat

9. English Word Reading

(Diagnostic Test of Word Reading Processes (2012).

Item	**Non-word reading**	**Exception word reading**	**Regular word reading**
1.	Un	His	Up
2.	Wup	Come	Sun
3.	Wem	Ball	Them
4.	Mon	Some	Went
5.	Keet	Who	Us
6.	Mave	There	Made
7.	Thent	Monkey	Dragon
8.	Sade	Half	Well
9.	Dragell	Ghost	Mouse
10.	Pertle	Know	Gave
11.	Sus	Many	Elephant
12.	Gouse	Sugar	Street
13.	Netrich	Want	Corner
14.	Piclin	Giant	Kettle
15.	Gobner	Island	Noise
16.	Cortue	Station	Ostrich
17.	Turmness	Soup	Chimpanzee
18.	Chimpister	Cousin	Picnic
19.	Stroise	Machine	Perhaps
20.	Marzentrate	Stomach	Goblin
21.	Statnic	Vehicle	Banister
22.	Banifice	Restaurant	Statue
23.	Sacranzee	Parachute	Marzipan
24.	Anecoil	Reservoir	Experimental
25.	Audimental	Mosquito	Turmoil
26.	Concipan	Sovereign	Concentrate
27.	Wilderdote	Treacherous	Sacrifice
28.	Ostant	Horizon	Wilderness
29.	Elephaps	Speciality	Auditorium
30.	Experorium	Miscellaneous	Anecdote

10. English Text Reading List

The English text was derived from children's grade 3 English reader entitled *Sindi makes tea for Granny* and is described as a Level 1 Reader in the Bridge Books series, which is published by Oxford University press (Kingwill 1986).