

https://dspace.org/

The development of phonological and reading skills in English and Afrikaans children

Cockcroft, Katherine Alexandra Sarah

2014-03-14
http://hdl.handle.net10539/14161

Downloaded from a DSpace repository. https://dspace.org/

The Development of Phonological and Reading Skills

in

English and Afrikaans Children

Katherine Alexandra Sarah Cockcroft

A Dissertation Submitted to the Faculty of Arts

University of the Witwatersrand, Johannesburg

for the Degree of Master of Arts

Johannesburg 1998

Degree awarded with distinction on 10 December 1998

ABSTRACT

Phonological awareness, or the ability to manipulate sounds, has been found to be highly correlated with the acquisition of reading skills. This awareness may be influenced by the orthography or language system in which the child is learning to read. In addition, different aspects of phonological awareness may also apply to different stages of reading development. This study found that depth of orthography does not seem to influence initial levels of phonological awareness. After two years of reading instruction, readers of a transparent orthography are better at phoneme segmentation and blending and reading nonwords than readers of an opaque orthography. Afrikaans children appear to begin reading in an alphabetic stage using a nonlexical strategy of grapheme-phoneme conversion. English beginner readers seem to start reading using predominantly a logographic strategy of visual word recognition. It also seems that some levels of phonological awareness such as onset/rime detection and syllable manipulation are acquired spontaneously by prereaders of both languages, but that the manipulation of phonemic units is dependent on the acquisition of literacy. The introduction of literacy training and/or the maturation of the children's phonological systems results in a change to a greater awareness of small phonemic units than larger units.

DECLARATION

I declare that this dissertation is my own, unaided work. It is being submitted for the Degree of Master of Arts in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other university.

K. Cockcroft

Kate Cockcroft

13th day of March, 1998.

ACKNOWLEDGEMENTS

I would like to thank the following people:

-Yvonne Broom, for her thorough supervision.

-Kirston Greenop, Christina Giessen and Angela Scott for their assistance with the data collection.

-Diane Blades, Mike Greyling and Peter Fridjohn for their help with the statistical analyses and interpretation.

-Heila Jordan, for assisting with the translation of the tests into Afrikaans.

-The children and staff at Greenside Primary and Laerskool Jan Cilliers for their enthusiastic participation in the study.

-Hilton, for his constant encouragement and support.

The financial assistance of the Centre for Science Development (HSRC, South Africa) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the Centre for Science Development

TABLE OF CONTENTS

	PAGE
1. INTRODUCTION	
1.1. What Exactly is Phonological Awareness?	2-3
1.2. The Assessment of Phonological Awareness	3-7
1.3. Phonological Awareness and Learning to Read	7-11
1.4. Phonological Awareness and Theories of Reading Development	11-16
1.5. The Development of Phonological Awareness	17-22
1.6. Cross-linguistic Studies of Phonological Awareness	22-27
1.7. Aims of the Study	27-29
1.8. Hypotheses	30
2. METHODOLOGY	
2.1. Subjects	31-34
2.2. Materials	34-42
2.2.1. Raven's Coloured Progressive Matrices	35
2.2.2. Test of Letter Knowledge	36
2.2.3. Word and Nonword Reading Test	36-37
2.2.4. Oral Repetition of Nonwords Test	37-38
2.2.5. Phonological Awareness Tests	39-42
2.2.5.a Bradley and Bryant's Sound Categorisation Test	39-40

PAGE

2.2.5.b Phoneme Blending Task 40-41

2.2.5.c Phoneme Segmentation Test 41

2.2.5.d Test of Auditory Analysis Skills 42

2.3. Procedure 43

3. RESULTS

3.1. Descriptive Statistics 44-47

3.2. Differences within each Group 48-52

3.3. Differences between the Groups 53-56

3.4. Correlational Analyses 57-60

3.5. Stepwise Multiple Regression Analysis 60-65

4. DISCUSSION

4.1. Cross-linguistic Hypothesis 66-71

4.2. Predictors of Reading Ability 71-78

4.2.1. Predictors of Reading in English 71-73

4.2.2. Predictors of Reading in Afrikaans 73-75

4.2.3. Correlations between the Phonological Awareness Tests in the English Sample 76-77

4.2.4. Correlations between the Phonological Awareness Tests in the Afrikaans Sample 77-78

PAGE

4.3. Predictors of Phonological Awareness 78-83

4.3.1. Predictors of Phonological Awareness in English 80-81

4.3.2. Predictors of Phonological Awareness in Afrikaans 81-83

4.4. Developmental Hypothesis 83-92

4.4.1. Comparisons across the Age Groups 83-84

4.4.2. Comparisons within each Age Group 85-92

4.5. Summary of Main Findings 93-94

4.6. Relevance of this Study 94

4.7. Suggestions for Further Research 95-96

5. REFERENCES 97-119

LIST OF TABLES

PAGE

2.1. Mean Ages in Months (and Years) of Subjects in Each Grade 32

2.2. Distribution of Male and Female Subjects in each Grade 33

2.3. Distribution of Languages Spoken by each Child In each Grade 34

3.1. Means and Standard Deviations for the English and Afrikaans Grade 0 Samples on each Task 45

3.2. Means and Standard Deviations for the English and Afrikaans Grade 1 Samples on each Task 46

3.3. Means and Standard Deviations for the English and Afrikaans Grade 2 Samples on each Task 47

3.4. Analyses of Variance between all English Grades 48

3.5. Analyses of Variance between all Afrikaans Grades 50

3.6. Multivariate Analyses of Variance within each Grade and Language Group 51

3.7. Matched Pairs t tests between the Phonological Awareness Tests within each Grade and Language Group 52

3.8. Analyses of Variance between English and Afrikaans Samples 54

PAGE

3.9. Analyses of Covariance between English and Afrikaans Samples 56

3.10. Correlations between each task for the English and Afrikaans Grade 0 Samples 58

3.11. Correlations between each task for the English and Afrikaans Grade 1 Samples 58

3.12. Correlations between each task for the English and Afrikaans Grade 2 Samples 59

3.13. Stepwise Multiple Regression Analysis to determine the Predictors of Reading Ability for the English and Afrikaans Grade 1 Samples 62

3.14. Stepwise Multiple Regression Analysis to determine the Predictors of Reading Ability for the English and Afrikaans Grade 2 Samples 63

3.15. Stepwise Multiple Regression Analysis to determine The Predictors of Phonological Awareness for the English and Afrikaans Grade 0 Samples 64

3.16. Stepwise Multiple Regression Analysis to determine The Predictors of Phonological Awareness for the English and Afrikaans Grade 1 Samples 65

PAGE

3.17. Stepwise Multiple Regression Analysis to determine The Predictors of Phonological Awareness for the English and Afrikaans Grade 1 Samples 65

LIST OF FIGURES

PAGE

4.1. Mean Percentage Correct on Phonological Awareness Tests: Grade 0 86

4.2. Mean Percentage Correct on Phonological Awareness Tests: Grade 1 89

4.3. Mean Percentage Correct on Phonological Awareness Tests: Grade 2 91

LIST OF APPENDICES

	PAGE
1. Sounding and Naming Letters Test - English and Afrikaans	120-121
2. Word and Nonword Reading Test - English	122
3. Word and Nonword Reading Test - Afrikaans	123
4. Oral Repetition of Nonwords Test - English	124-125
5. Oral Repetition of Nonwords Test - Afrikaans	126-127
6a. Bradley and Bryant's Sound Categorisation Test (First Sound) - English	128
6b. Bradley and Bryant's Sound Categorisation Test (Middle Sound) - English	129
6c. Bradley and Bryant's Sound Categorisation Test (End Sound) - English	130
7a. Bradley and Bryant's Sound Categorisation Test (First Sound) -Afrikaans	131
7b. Bradley and Bryant's Sound Categorisation Test (Middle Sound) - Afrikaans	132
7c. Bradley and Bryant's Sound Categorisation Test (End Sound) - Afrikaans	133
8. Perfetti's Phoneme Blending Task - English	134
9. Perfetti's Phoneme Blending Task - Afrikaans	135

PAGE

10. Yopp-Singer Phoneme Segmentation Test - English 136-137

11. Yopp-Singer Phoneme Segmentation Test - Afrikaans 138-139

12. Rosner's Test of Auditory Analysis Skills - English 140-141

13. Rosner's Test of Auditory Analysis Skills - Afrikaans 142-143

1. INTRODUCTION

Learning to read first became the focus of psycholinguistic study in the 1970s. Research into reading has both practical and theoretical value since many people experience difficulties in acquiring literacy. Such research helps to explain why many children easily acquire the ability to speak and to understand a language, yet do not so readily acquire the ability to read and write it. It also assists with the identification of skills which distinguish good from poor readers, making it possible to detect children at risk for later reading problems and to train them in the necessary skills.

Gleitman & Rozin (1977), Liberman, Shankweiler, Liberman, Fowler & Fischer (1977), Rozin & Gleitman (1977) proposed early on that an awareness of the internal sound structure of words plays an important role in learning to read an alphabetic orthography, or a writing system in which individual letters represent individual sounds (Harris & Coltheart, 1986). In order to learn to read, the child needs to be able to do more than form associations between letters and speech sounds, he must become aware that words are made up of smaller sound segments. This metalinguistic ability has become known as phonological awareness.

1.1. What exactly is Phonological Awareness?

Definitions of phonological awareness are much disputed in the literature, partly because of the varied backgrounds and interests of the researchers. Terms such as "phonemic awareness", "phoneme segmentation", "phonological perception", "phonological analysis" "linguistic awareness", "segmental awareness" and "speech perception" are used interchangeably in many studies. Most researchers attempt to infer the presence or absence of phonological awareness by means of performance on a particular task. A precise definition of phonological awareness needs to be provided.

Spoken language can be analysed at different phonological levels, for example into large speech units such as words and syllables, into intermediate units such as onsets (the initial consonant or consonant cluster in a word, e.g. /br/ in "brush") and rimes (the vowel and final consonant or consonant cluster of a word, e.g. /ush/ in "brush") and into small speech units such as phonemes. Phonological awareness is a term encompassing each of those levels. In addition to those levels, Treiman and Zukowski (1991) suggest that a definition of phonological awareness should also incorporate the cognitive demands of the particular phonological awareness task, as these often differ substantially from task to task. Performance on phonological awareness tasks will differ, for example, according to whether the task taps implicit phonological awareness, which can be assessed in

children who have not yet learned to read, or explicit phonological awareness, which is fostered by learning to read (Frith, 1995; Cataldo & Ellis, 1989).

Phonological awareness is a sensitivity to subword segments from syllables, onsets and rimes, to phonemes as well as an ability to perform certain cognitive tasks. This awareness does not necessarily mean that the individual knows how to read or spell a word (Liberman & Liberman, 1990). Four-year old children are able to demonstrate phonological skills by tapping out syllables (Liberman, Shankweiler, Fischer & Carter, 1974) and three-year old children can perform rhyme tasks (Bryant, Bradley, Maclean & Crossland, 1989). However, there are certain skills such as phoneme deletion, counting and manipulation which emerge much later and may be a consequence of, or strongly influenced by, alphabetic instruction.

1.2. The Assessment of Phonological Awareness

The many different definitions of phonological awareness have resulted in a lack of consensus on how to measure it. There are several ways of assessing phonological awareness, which are related to the levels of this skill, namely syllabic, phonemic and onset/rime. Syllabic tasks focus on the segmentation of words into specified units, while phonemic tasks involve making connections between graphemic representations of written letters or

words and phonemic representations of spoken letters or words (Wimmer et al., 1994). Onset/rime segmentation involves splitting a word such as "brush" into its onset /br/ and rime /ush/, as well as sometimes performing a further division into the nucleus /u/ and coda /sh/. Phonemic segmentation of the same word yields four divisions: /b/, /r/, /u/, /sh/.

The task requirements for phonological awareness tests range from deleting or substituting phonological segments, recalling words and judging whether they have sounds in common, producing sounds in response to a cue, to blending sounds to form a word (Yopp, 1988; Lewkowicz, 1980). Since both the size of the unit tested and the operations required of the child will affect performance on these tasks, interpretation and comparison of research findings is made difficult (Nesdale, Herriman and Tunmer, 1984; Backman, 1983).

Despite the diversity of phonological awareness tasks, McBride-Chang (1995) identified three common elements in these measures. Firstly, the subject must hear one or more spoken item(s). Secondly, the subject must perform some operation on that speech segment, for example, identify a single phoneme, select that item which does not belong with the others or say an item after removing a phoneme from it. This often requires that the item(s) be held in memory. Thirdly, the subject must respond verbally. Sometimes, younger children are asked to point to the correct item or to

indicate it in some other way. All of the above-mentioned operations require that the subject is able to reason well enough in order to think about the item(s) presented and to perform operations on them, an ability which McBride-Chang (1995) calls general cognitive ability. General cognitive ability has been found to correlate significantly with phonological processing tasks (Wagner et al., 1987; Wagner, Torgesen, Laughon, Simmons & Rashotte, 1993). Subjects must also be able to remember items for a certain length of time. Short-term memory is important in the performance of most phonological awareness tasks (Bradley & Bryant, 1985; Wagner et al., 1993). Finally, the item must be manipulated in some specified way, a skill also involving speech perception. Speech perception has been shown to be associated with phonological processing skills in young children (Hurford, 1990, 1991). McBride-Chang (1995) found that all three above-mentioned components, cognitive ability, short-term memory and speech perception, were strong predictors of phonological awareness.

Adams (1990) reviewed the literature on phonological awareness and attempted to rate various tasks in terms of five levels of difficulty. At the most basic level is the ability to remember rhymes or rhyming words. The second level concerns the ability to identify and manipulate patterns of rhyme and alliteration in words and requires more focussed attention to sound components. At the third level is the knowledge that syllables can be divided into phonemes, as well as a familiarity with the sounds of isolated

phonemes. The fourth level of difficulty occurs in tasks that require full segmentation of component phonemes. The most difficult tasks require the child to add, delete or move phonemes.

Yopp (1988) calculated the reliability and validity of ten tests (auditory discrimination, phoneme blending, phoneme counting, two tests of phoneme deletion, rhyming, two tests of phoneme segmentation, word-to-word matching and phoneme reversal) that have commonly been used to operationalise phonological awareness. She found that these tests were highly interrelated, indicating that they were measuring a similar construct, and lending construct validity to the concept of phonological awareness. A factor analysis yielded two factors underlying phonological awareness. Each factor was defined by the tests that had high loadings on it. Tests which loaded on factor two, "compound phonemic awareness" (Yopp, 1988, p. 174), required more steps to completion and that a sound be held in memory. Factor one or "simple phonemic awareness" tests (Yopp, 1988, p. 174) required a single operation, such as segment, blend or isolate a given sound, and a response. All of the phonological awareness tests required that the child mentally manipulate individual sounds (Yopp, 1988). This explains the strong correlation between factors, while unique variance is accounted for by the additional operation necessary in tests of compound phonemic awareness, namely holding a sound in memory. The test that had the highest loading on the simple phonemic awareness factor was Yopp-

Singer's (1988) test of phoneme segmentation, which was developed especially for use in that study. Rosner's (1975) test of auditory analysis had the highest loading on the compound phonemic awareness factor. Since rhyming ability was found to be only minimally involved in these factors, Yopp cautions against using such tests to draw generalisations about phonological awareness. It appears that rhyming tests may tap a different ability to other tests of phonological awareness.

1.3. Phonological Awareness and Learning to Read

Phonological awareness has become the focus of many studies in psycholinguistics, because research has shown that English-speaking children with good phonological awareness skills tend to be good readers (Caravolas & Bruck, 1991; Adams, 1990; Goswami & Bryant, 1990; Wagner & Torgesen, 1987). Preliterate phonological awareness predicts the level of achievement in alphabetic reading and spelling at the end of the first year of learning to read. This finding is independent of IQ, initial differences in letter knowledge and reading ability (Wimmer, Landerl, Linortner & Hummer, 1991) and more accurate than age or measures of socio-economic status (Share, Jorm, Maclean & Matthews, 1984). Furthermore, this connection is specific because children's early phonological awareness skills predict their progress in later reading and spelling, but not in arithmetic (Bradley and Bryant, 1983; MacLean, Bryant and Bradley, 1987). Studies in other

languages have confirmed these findings (e.g. in Spanish by De Manrique & Gramingna, 1984; in Italian by Cossu, Shankweiler, Liberman, Katz & Tola, 1988; in Czechoslovakian by Caravolas & Bruck, 1991 and in German by Wimmer & Goswami, 1994).

Evidence that phonological training can facilitate the acquisition of literacy in young children has been found by Blachman, Ball, Black and Tangel, 1994; Cunningham, 1990 and Lundberg, Frost and Peterson, 1988. Remediation based on a combination of phonological and alphabetic training has also been found to improve certain reading difficulties (Bradley & Bryant, 1983, 1985; Hatcher, Hulme & Ellis, 1994; Tunmer, 1994; Lundberg, 1994). Reading problems have been related to poor phonological skills (Catts, 1989; Rack, Snowling & Olson, 1992; Snowling, 1991; Stanovich, 1988). The phonological awareness skills of older, disabled readers or illiterate adults have been investigated and it was found that many older children with reading disabilities have a limited understanding of the phonological structure of words (Morais, Bertelson, Cary & Alegria, 1986; Snowling, Goulandris, Bowlby & Howell, 1986; Snowling, 1981; Bradley & Bryant, 1978).

While the importance of phonological awareness for literacy has been well established, the exact nature of the relationship remains unclear. It is uncertain whether phonological awareness is a necessary precursor to

good reading ability, arising spontaneously as a result of cognitive and linguistic maturation or whether it is a skill resulting from learning to read an alphabetic language. Wagner and Torgesen (1987), Mann and Liberman 1984, Stanovich, Cunningham and Cramer (1984) have found support for the position that awareness of the phonological units of words develops spontaneously and is a precondition for learning to read. Training these skills also enhances the acquisition of literacy (Vellutino & Scanlon, 1987; Bradley & Bryant, 1983). Wimmer, Landel, Linortner and Hummer (1991), Morais, Bertelson, Cary and Alegria (1986), Morais, Cary, Alegria and Bertelson (1979) support the alternative view that phonological awareness is a consequence of learning to read an alphabetic orthography, rather than a precondition for acquiring literacy. Morais, Alegria and Content (1987) found that illiterate adults could neither delete nor add phonemes to nonwords, while such a task is easily performed by literate adults. They also discovered that readers of the non-alphabetic Chinese orthography are less able to demonstrate phonemic segmentation. These results suggest that phonological awareness is not a result of physical maturation but develops as a consequence of learning to read in an alphabetic writing system. Poor reading skills appear to cause poor phonological awareness skills (Wagner & Torgesen, 1987 and Ehri, 1979) .

Bradley and Bryant (1978) and Gough and Juel (1987) make a different suggestion about the relationship between phonological awareness and

early reading. They compared the performance of an older group of poor readers to a younger group of average readers on phonological awareness tasks. Since the two groups were matched in terms of reading level, any differences found between the poor readers and the average readers could not be attributed to differences in orthographic knowledge. Children in each of the groups were given two tasks, rhyme and alliteration detection and rhyme production. The performance of the older poor readers on both tasks was significantly worse than that of the younger matched readers. These results do not support the conclusion drawn by Morais et al. (1979) that phonological awareness develops as a consequence of learning to read, because both groups were at comparable reading levels. Although the phonological awareness task used by Bradley and Bryant (1978) was a much easier task than that used by Morais et al. (1979), Bradley and Bryant's findings suggest that at least some level of phonological awareness is a necessary, but not sufficient, component of early reading skill.

It is possible, though, that both the Bradley and Bryant and the Morais et al. studies are correct. The current position is that the relationship between reading ability and phonological awareness is one of reciprocal causation in which phonological awareness develops as a consequence of having learned to read and write in an alphabetic language. Consequently, teaching phonological awareness accelerates and assists reading acquisition in an alphabetic language (Bryant & Goswami, 1987; Perfetti,

Beck, Bell & Hughes, 1987). The idea of reciprocal causation suggests that the strong correlations between phonological awareness tasks and measures of reading skill mask two different causal patterns (Stahl & Murray, 1994). Exactly how phonological awareness skills and alphabetic literacy interact remains a matter of debate.

1.4. Phonological Awareness and Theories of Reading Development

The reason for the positive correlation between phonological awareness and reading lies in the fact that alphabetic writing represents language mainly in terms of phonemic units. The beginner reader needs to realize that words can be broken down into phonemes and that the phoneme is typically the unit in the speech stream that is represented by symbols (letters) in alphabetic writing. The ability to analyse words into these units is necessary in order to acquire print-to-speech and speech-to-print conversion skills which allow reading of unfamiliar words (Morais et al., 1986). Children in their first year of school who have not yet developed this awareness will have difficulty understanding the systematic correspondences between sounds and letters that make up an alphabetic writing system.

Frith's (1985) theory of reading development holds that the understanding of the relationship between letters and sounds afforded by phonological awareness is a necessary condition for reading development. Her stage

theory of reading progress involves three developmental stages, namely logographic, alphabetic and orthographic, which develop sequentially. During the logographic stage, the child is only able to recognise a small set of highly familiar words from salient visual features, in particular logos such as "Pick 'n Pay Hypermarket" and "Coca-Cola". When an unfamiliar word has to be read at this stage, the child will either produce no response or, if the word occurs in context, he may guess at a possible word. The logographic stage is followed by an alphabetic stage of phonological decoding in which grapheme-phoneme (letter-sound) correspondences are used to assemble pronunciations. By the alphabetic stage, the child has learned how to convert letters into their corresponding sounds and is able to read some unfamiliar, regular words. Phonological awareness may be vital for progressing from the logographic stage of reading to the alphabetic stage as it enables the reader to translate graphemic units into their corresponding phonemic units. The final orthographic stage is characterised by the child's ability to read and comprehend words directly on seeing them, without first having to sound them out. At this stage orthographic word recognition supplements alphabetic reading.

The dual-route theory of reading processes (Morton & Patterson, 1980; Coltheart, 1980; Patterson & Shewell, 1987 and Ellis & Young, 1988) also stresses the importance of phonological awareness since it enables the child to develop the indirect, nonlexical system. These theorists propose

that skilled reading and spelling require the development of two separate processing systems, namely the nonlexical or indirect system and the direct or lexical system. The nonlexical system is used when reading unfamiliar words and operates on a principle of grapheme-to-phoneme conversion. Use of this system predominates during Frith's alphabetic stage of reading development. The lexical system is used when reading very familiar words, the visual representations of which have been encountered many times by the reader, and are stored in the visual input lexicon, to be activated as soon as a familiar word is presented. Lexical reading characterises Frith's orthographic stage of reading development. In terms of phonological awareness, an awareness of the phonemes in spoken words is necessary, but probably not sufficient to reach the alphabetic stage and to develop the lexical route and the visual input lexicon. The expansion of the visual input lexicon in turn, requires increasing reflection on spoken words, thus improving the child's awareness of phonemes. This is in keeping with the view that there is a reciprocal causal relationship between phonological awareness and learning to read.

Analogy models of reading such as Goswami's interactive analogy model (Goswami, 1986), postulate the development of a single lexical system, with onsets and rimes forming the basis for reading both familiar and unfamiliar words. Goswami and Bryant (1990) maintain that phonological awareness for onsets and rimes emerges naturally prior to literacy instruction, and

influences reading development. Without phonological awareness skills, the child would not be able to manipulate onsets and rimes. Phonological awareness enables children to form categories of words that share common onsets and rimes, and later, to make connections between these categories and words that share common spellings (Goswami, 1986, 1988). Children who are learning to read in English use phonological awareness to make inferences about spelling patterns on the basis of rhyme. If they know how to read the word "light", for example, an unfamiliar, yet similar word like "might" may be read by mapping the unfamiliar spelling pattern onto the pre-existing phonological units for "light" (rime analogy). Continued development of phonological analysis abilities leads to the development of a nonlexical route by which both familiar and unfamiliar words can be read, by analogy to familiar items.

Seymour (1987) proposes an information-processing model of reading development consisting of three interacting systems, namely a visual processor, a phonological processor and a semantic processor. The visual processor is concerned with peripheral features enabling the identification of graphemes and morphemes (units of meaning, for example, unhappily has three morphemes, un+happy+ly) and relays this information to the phonological and semantic processors. The phonological processor processes both graphemes and morphemes and includes both a lexical system for storing whole word forms and a non-lexical system for the

manipulation of phonemes, while the semantic processor processes the meanings of morphemes. This model differs from the dual-route model in that it proposes that word recognition is achieved by a single framework which can work out pronunciations for both words and nonwords. Seymour subsequently expanded his model to allow for the simultaneous development of visual and phonological processes as necessary foundations for later orthographic processing (Seymour & Evans, 1994). The orthographic processor is viewed as part of the visual system and is specialised for the analysis of print and writing. According to this model, visual processing may be analytic, breaking down words into segments, or holistic, blending together multi-letter units to form words. Phonological awareness is necessary for the development of the phonological processor, which contains a phonemic store and which assembles segments of speech into words or nonwords. Phonological awareness is also necessary for the ability of the visual processor to segment or blend words. Seymour's dual-foundation model represents a move away from a dual-route account of reading to a single route approach, as modelled by connectionist theories.

Connectionist models of reading (e.g. Seidenberg & McClelland, 1989; Schneider, 1987 and Tanenhaus, Dell & Carlson, 1988) propose that both familiar and unfamiliar words are read by means of a single network of weighted connections between orthographic and phonological units. There are no localised representations of familiar words, instead these emerge as

distributed patterns of activity within the network. Reading occurs through the updating of connection strengths in the network and by a settling of activation after a word or nonword has been presented. Connectionist theories acknowledge the importance of phonological awareness in learning to read, but are not explicit about the size of the phonological units dealt with.

The main distinctions between the various theories of reading development can be viewed as differences in their conceptualisation of lexical recognition as dependent on either localised or distributed mental representations of words, and in their conceptualisation of non-lexical recognition as a separate process to lexical recognition, which is mediated by either a rule-governed conversion system or a process of analogy. The centrality of phonological awareness in literacy acquisition is asserted by all current models of reading. Attention has now turned to more specific issues such as the identification of the developmental progression of phonological awareness.

1.5. The Development of Phonological Awareness

Nothing in our preliterate encounters with spoken language explicitly show it to be a system of discrete, arbitrary sounds. Rather, we are accustomed to hearing and using language in meaningful conversation (Van Kleeck,

1990). Consequently, segmenting words into phonemes is a difficult task for most young children. Before children are able to segment words into their constituent phonemes or syllables, they first become aware that their flow of speech is made up of larger individual units of meaning (sentences and words). This awareness deepens in stages, as discovered by Treiman and Zukowski (1991). They found that Canadian preschoolers (mean age 5.1 years) were able to segment words into syllables, but battled with onset/rime and phoneme segmentation tasks. Children at kindergarten (mean age 5.9 years) were fairly successful with the onset/rime tasks but still experienced difficulty with the phoneme task. By first grade (mean age 7.0 years) the children were able to perform all three types of tasks with relative ease. Since onset-rime segmentation skill has been found to precede phonemic segmentation in children acquiring reading skills in English, except in tasks where onsets are also phonemes (Bowey & Francis, 1991; Kirtley, Bryant, MacLean & Bradley, 1989; Helfgott, 1976), it is argued that English-speaking children will spontaneously use their knowledge of onsets and rimes rather than phonemes when learning to read (Goswami & Bryant, 1990; Goswami, 1993). Seymour and Evans (1994) found that phonological awareness which arises during the first two years of literacy may develop sequentially from smaller (phonemic) to larger (syllabic) units. While this remains unconfirmed by subsequent research, Seymour and Evan's findings are consistent with the ambiguity inherent in Seymour's model of reading development, in which the visual processor

could accommodate the development of phonological units from large to small segments or vice versa.

It has been suggested that phonemic and syllabic aspects of phonological awareness may each apply to different stages of reading development (Duncan, Seymour & Hill, in press). Goswami (1993) suggests that syllable awareness applies to the early stages (e.g. logographic) and phonemic awareness to the later stages (e.g. alphabetic), while Ehri (1992) proposes the opposite. It may be that both types of phonological awareness are independent and alternative routes through which basic literacy can be acquired (Duncan et al., in press). Sensitivity to onset and rime units is believed to constitute an intermediate stage in phonological development somewhere between syllabic and phonemic awareness since onsets and rimes are smaller than syllables but larger than phonemes (Treiman, 1992b). Thus, a single phoneme onset is easier for young children to manipulate than a phoneme which is part of a rime. Children demonstrate particular difficulty in manipulating phonemes which constitute complex onsets, that is, onsets containing two or three consonants (Caravolas & Bruck, 1993). The progression from syllable to onset/rime might occur spontaneously, perhaps with the help of non-alphabetic stimulation such as rhymes, while alphabetic training is necessary to develop an awareness of phonemes (Seymour & Evans, 1994). Or, it could be that explicit awareness of the intermediate units also requires input from reading such as the

isolation of initial letters and consonant clusters or a focus on groups of rhyming words.

The difficulty experienced by children under the age of seven in segmenting words into phonemes has been attributed to the abstract nature of the phoneme (Ball, 1993). Due to the automaticity of our speech processes, we are not consciously aware of the phonemes in words. Instead, we focus our attention on the meaning of speech (Adams, 1990; Liberman & Shankweiler, 1991). However, even if conscious attention is paid to the sound structure of words, individual phonemes are difficult to separate out from the speech stream because they do not correspond to articulatory units or "acoustical bursts" in the way that syllables do (Ball, 1993, p. 150). While there is a natural temporal division of words into syllables, phonemes are completely blended within syllables and words (Liberman, Cooper, Shankweiler & Studdert-Kennedy, 1967; Liberman & Liberman, 1990).

Goswami (1990) and Goswami and Mead (1992) found that phonologically skilled children make more onset and rime analogies than phonologically weak children. Moreover, both German and English beginner readers have been found to be better at detecting rime oddities or differences (e.g. peek, seek, tool) than at detecting onset oddities (pig, top, pin) (Wimmer, Landerl & Schneider, 1994; Bradley & Bryant, 1985). Wimmer et al. relate this finding to the fact that, in most oddity detection tasks, word onsets are

usually single phonemes e.g. "p" or "t", whereas word rimes in these tasks usually consist of several phonemes, e.g. "ool" or "eek" and young children find tasks involving single phonemes more difficult than those with multiple phonemes or syllables (Cossu et al., 1988; Liberman et al., 1974).

Fowler (1991) contends that the inability of preschool children to segment at the level of the phoneme is not due to a lack of conscious awareness of phonemic units or an inability to access the phonological representations of these units, but a result of the development of the phonological system during the early years. This developmental process is only complete around the age of seven. Fowler's suggestion is in keeping with research (Bryant et al., 1989; Treiman, 1993) showing that preschoolers may be sensitive to onset, rime and syllable segments but not to phonemic segments. Fowler (1991) proposes that throughout the preschool years the child's phonological lexicon undergoes constant reorganisation. Since very young children know only a few words, they need only a few articulatory patterns to express these (Nittrouer & Studdert-Kennedy, 1987). As the child's vocabulary increases, words with similar articulatory patterns start to cluster together. In both speech comprehension and production, the preschool child pays more attention to the articulatory patterns distributed over the syllable than on the initial consonant (Fowler, 1991). Further expansion of the phonological lexicon results in words with similar sounding and similarly pronounced patterns clustering together and eventually the child is able to

use these clusters to derive "coherent units of sound and gesture that we know as phonetic segments" (Fowler, 1991:107). Fowler also points out that his model is consistent with the finding that poor readers' phonological difficulties tend to extend to perceptual, lexical and articulatory areas. Difficulties with speech rates (Catts, 1986), word finding (Miles, 1983) and repetition (Snowling et al., 1986) all point to an underlying impairment in the organisation of phonological representations.

While this view may seem to indicate that phonemic segmentation is contingent upon maturation of the phonological system rather than exposure to an alphabetic orthography, this is not necessarily the case. Maclean et al. (1987) found that three year old children's knowledge of nursery rhymes was an important predictor of later reading ability and hypothesised that exposure to informal linguistic tasks, for example language games, fosters awareness of shared sounds. Consequently, the child's ability to segment syllables into phonemes appears to reflect both a maturing of the phonological system as well as the impetus provided by exposure to reading instruction. Bradley and Bryant (1983) contend that an awareness of rhyme is a developmental precursor to phonological awareness and that it makes an independent contribution to reading at a later stage.

Treiman (1992b) suggests that instructional emphasis (whole word or phonics) may be critical in determining the order of the stages through which the beginner reader passes and consequent skill on phonological awareness tasks. Vellutino (1991), Adams (1990), Perfetti et al. (1987) and Alegria, Pignot and Morais (1982) found that first grade children who were taught by means of a phonics approach performed better on phonological awareness tasks than children of the same age who had been taught by means of a whole-word approach. Thus, it may not necessarily be orthography that determines phonological awareness, but method of instruction used to teach reading, or a combination of both.

1.6. Cross-linguistic Studies of Phonological Awareness

The English orthography is often blamed for many reading problems. The complex and irregular relationship between the sound and spelling of English words is believed to present an insurmountable difficulty to some beginner readers. Liberman (1973) noted that while the irregularities in the English language do make things harder for a beginner reader, those readers with problems can often not even read regular words or simple nonwords. Mann (1986) has shown that children learning nonalphabetic Japanese script find phoneme manipulation more difficult than English children, and Read, Zhang, Nie and Ding (1986) obtained similar results with Chinese adults. So one's skill at manipulating speech sounds is largely

dependent on knowing an alphabetic language. Liberman (1973) concluded that the main source of difficulty for English children with reading problems is a failure to become aware that words can be analysed as sequences of phonemes, that is, failure to grasp the alphabetic principle. Cross-linguistic studies examine whether this fact is universal across languages, and so reflecting some general principles of language development, or whether difficulties with phonological awareness are mediated by language specific factors.

Cossu, Shankweiler, Liberman, Katz and Tola (1988) compared the phonological awareness skills of Italian- and English-speaking children. At preschool, kindergarten and first grade, the Italian children outperformed the English children, with the largest differences between languages occurring in the first grade. Cossu et al. speculated that this was due to Italian phonology being characterised by many open syllables, which may emphasise the syllable unit, hence speeding up the development of phonological awareness for Italian children. A further contributing factor was that English and Italian possess different orthographies or writing systems. Orthographies are defined as being either "opaque" or "transparent", depending on the ease with which a word's pronunciation can be predicted from its spelling (Besner & Smith, 1992). In a transparent orthography, the spelling-sound correspondence is direct, that is, words are generally spelled exactly as they sound. Languages such as Italian, Czechoslovakian,

German and Afrikaans are all transparent orthographies. In contrast, the spelling-sound relationship in an opaque orthography, such as English, is less direct, and readers have to learn unusual spellings of irregular words such as "yacht" and "steak". Treiman (1992a), Kyostio (1980) and Downing (1972) propose that learning to read and write in a transparent writing system may speed up the acquisition of literacy and, by extension, the development of phonological awareness (Cossu et al, 1988; Wimmer and Hummer, 1990). Caravolas and Bruck (1993) found that preschool, kindergarten and grade one Czechoslovakian-speaking children performed consistently better than English-speaking children of the same ages on phonological awareness tasks of sound isolation, oddity detection and phoneme deletion. It is likely that a transparent language may advance the development of phonological awareness of children who speak that language.

English reading and spelling achievement after a year's schooling appears to be related to onset and rime awareness (Bradley & Bryant, 1985; Wimmer et al., 1991). Wimmer et al. (1991) discovered that rime awareness in German preschoolers was only weakly related to reading and spelling success at the end of one year at school and became more predictive of good reading and spelling later on. The reason underlying this difference is that the two languages possess different orthographies. Wimmer et al. (in press) also found that children who were learning to read an

orthographically transparent language such as German, did not seem to pass through an initial stage of logographic reading, but rather started off in an alphabetic stage of reading by assembling pronunciations using a strategy of grapheme-phoneme conversion, which resulted in successful reading (Wimmer and Hummer, 1990). English beginner readers, however, cannot rely on an indirect, alphabetic strategy when reading, as this would result in incorrect pronunciation of the many irregular words in the language. It is thus appropriate that English children who are learning to read start with a logographic stage of visual word recognition. This finding implies that Frith's (1985) stages of reading development do not necessarily follow in the same sequence for all languages and explains why onset and rime awareness was not a good predictor of early reading success for German children. When reading German, there would be no need to use onset and rime based analogies to read new words, because the pronunciation of these words can easily be assembled by grapheme-phoneme translation and blending (Wimmer et al., 1994). However, these researchers suggest that onset and rime awareness become important at a later stage of orthographic reading in German. English beginner readers, however, show much reliance on onset and rime analogies since the first (logographic) stage of reading development in English is based on the formation of visual recognition units of words which can be used as analogies for reading unfamiliar words. Since German beginner readers first acquire an indirect, alphabetic word recognition system, onset and rime awareness is of limited

importance initially, whereas English beginner readers first acquire a direct, logographic word recognition system, which would be facilitated by an awareness of onsets and rimes.

Onset and rime awareness has been found to be important for later orthographic reading in German for the same reason it is important for early logographic reading in English - it enables the reader to build up visual memory representations for written words (Wimmer et al., in press). These memory representations act as recognition units in reading, allowing for direct access to pronunciation and meaning. Wimmer et al.'s finding that early rime awareness is predictive of success, not with early indirect word recognition, but with later direct word recognition supports the view that phonological factors are involved in the establishment of word recognition units during direct reading (Ehri, 1992; Perfetti, 1992; Stuart & Coltheart, 1988).

Most evidence relating to phonological awareness todate has been obtained from studies conducted in America and the United Kingdom. It would be useful if the findings concerning English beginner readers could also be shown to reflect the fundamental importance of phonological awareness for all alphabetic languages. The current study is based on the hypothesis that the different orthographies of the English and Afrikaans languages may give rise to differential rates and/or patterns of development in phonological

awareness. Afrikaans, one of the eleven official language of South Africa, is a blend of many languages, mainly Malay, Portuguese, German, French, Dutch and English (Ponelis, 1993). It is a transparent language in which the grapheme-phoneme mappings are regular and predominantly one-to-one, as opposed to English, which is opaque, with many irregular grapheme-phoneme mappings (Besner & Smith, 1992). Most Afrikaners tend to be bilingual, since English is carried into the home via radio, television, magazines and newspapers. Often more English is heard in the home, via these media, than Afrikaans. As a result, colloquial Afrikaans borrows extensively from English. Subsequently, most Afrikaans children can speak some English, and also learn it from a young age at school, while Afrikaans plays a minor role in the English-speaking child's environment. Both languages are taught at school, with one being the medium of instruction for all subjects and the other a language subject.

1.7. Aims of the Study

Since languages may differ widely in phonological characteristics, phonological awareness may vary in rate and pattern of development in speakers of different languages. The focus of this study is the development of phonological awareness and reading in English- and Afrikaans-speaking children. The study investigates whether there is a difference between speakers of a relatively straight-forward, transparent orthography, such as

Afrikaans, and speakers of a relatively complex, opaque orthography, such as English, in terms of their acquisition of phonological awareness. If the development of phonological awareness is contingent upon instruction in alphabetic literacy alone, no differences should be observed between the English and Afrikaans children. On the other hand, if the development of phonological awareness is dependent on the depth of orthography alone or in combination with reading instruction, significant differences should be found between the English and Afrikaans children at all levels.

The phonological awareness tests selected for this study each conform to different levels of levels of difficulty (Adams, 1990). At the second level of difficulty, is Bradley and Bryant's (1983) oddity test, which is also commonly viewed as an onset/rime task (Kirtley et al., 1989). Bradley and Bryant (1983) found that children who are poor readers have difficulty categorising words on the basis of common sounds, even in comparison with younger children who read at the same level. Perfetti et al.'s (1987) phoneme blending task was selected as an example of Adams' third level of difficulty. Phoneme blending is one of the easier phonemic awareness tests for young children (Yopp, 1988). At the fourth level of difficulty is Yopp-Singer's (Yopp, 1988) phoneme segmentation task. Share et al. (1984) and Stanovich, Cunningham and Feeman (1984) report that phoneme segmentation at school entry was the best out of thrity-nine measures in predicting reading success after two years. To assess the final level of difficulty, Rosner's test

of auditory analysis skills (1974) was chosen. This task requires the deletion of syllables and phonemes. These tests can also be grouped according to Yopp's (1988) two factors underlying phonological awareness: Yopp-Singer's (1988) test of phoneme segmentation and Perfetti et al.'s (1987) test of phoneme blending would be measures of simple phonemic awareness, while Bradley and Bryant's (1983) oddity test and Rosner's (1975) test of auditory analysis are measures of compound phonemic awareness. These tests formed the battery of phonological tests in English and Afrikaans for the current study. Since other skills often underlie performance on phonological awareness tasks (McBride-Chang, 1995), letter naming ability, letter sound knowledge and short-term phonological memory were also assessed and their predictive relationship to phonological awareness and reading determined. Letter name and letter sound knowledge refer to the child's learning which name or sound a given letter represents respectively. Research has shown that letter sound awareness is one of the strongest predictors of children's success in reading (Adams, 1990). Short-term phonological memory has also been positively correlated with phonological awareness (McBride-Chang, 1995) and was assessed in this study by means of Gathercole, Willis, Baddeley and Emslie's (1994) Oral Repetition of Nonwords task.

1.8. Hypotheses

To determine how the orthography of a language influences the relationship between phonological awareness and reading, the following hypotheses will be investigated:

a) There will be a difference between the English- and Afrikaans-speaking children in terms of their performance on the phonological awareness tasks and on the reading task.

b) Phonological awareness will correlate with and be a predictor of reading ability for both the Afrikaans- and English-speaking children.

c) Letter knowledge and phonological memory will correlate with and be predictors of phonological awareness for both the Afrikaans- and English-speaking children.

d) There will be a difference with age in performance on the phonological awareness tasks within the Afrikaans sample and within the English sample.

2. METHODOLOGY

A three group cross sectional design was implemented to compare the phonological awareness and reading levels of Afrikaans and English children at grades 0, 1 and 2. The variables under investigation were phonological awareness, reading ability, age, letter knowledge, nonverbal IQ, phonological memory and orthography.

2.1.Subjects

In total, 248 children were the subjects for this study. Written permission was obtained from the parents or guardians of each child that participated in the study. The children were receiving their education at either an English- or Afrikaans-medium school. The mean ages of the English and Afrikaans children together were 6.12 years at Grade 0, 7.22 years at Grade 1 and 8.17 years at Grade 2. The mean ages, standard deviations and sample sizes for each of the English and Afrikaans groups is shown in Table 2.1.

Table 2.1 Mean ages in months (and years) of subjects in each grade

	Mean Age	S D	n
Grade 0 English	70.3 m (5.9 yrs)	5.4 m	39
Grade 0 Afrikaans	76.6 m (6.4 yrs)	3.7 m	40
Grade 1 English	85.3 m (7.1 yrs)	6.0 m	50
Grade 1 Afrikaans	88.4 m (7.4 yrs)	3.1 m	40
Grade 2 English	96.5 m (8.0 yrs)	5.9 m	42
Grade 2 Afrikaans	99.7 m (8.3 yrs)	4.3 m	37

The sample was drawn from two primary schools situated in the same geographic area in order to limit differences due to socio-economic status and method of reading instruction. Subjects were assessed midway through the school year, so that the children in grades 1 and 2 had already been exposed to some reading instruction. The English grade 0 children had no formal exposure to the alphabet, while the Afrikaans grade 0 children had learnt three letters of the alphabet. Both English and Afrikaans schools used a combination of phonics and whole word methods to teach reading in

grades 1 and 2. There was an approximately equal distribution of males and females (Refer to Table 2.2 below).

Table 2.2 Distribution of male and female subjects in each grade

	Number of Males	Number of Females
Grade 0 English	21	18
Grade 0 Afrikaans	20	20
Grade 1 English	23	27
Grade 1 Afrikaans	25	15
Grade 2 English	20	22
Grade 2 Afrikaans	19	18

The different languages spoken by the children in each grade are shown in Table 2.3. Children with known auditory, visual, language or motor deficiencies were not included in the sample.

Table 2.3 Distribution of languages spoken by children in each grade

	English	English & Afrikaans	English & African Lang	Eng/Afrikaans & Other Lang
Grade 0 Eng	26	2	11	0
Grade 0 Afr	0	40	0	0
Grade 1 Eng	38	2	10	0
Grade 1 Afr	0	39	0	1
Grade 2 Eng	25	0	16	1
Grade 2 Afr	0	37	0	0

2.2. Materials

Eight tests were administered to each child. All of the tests existed in English, but only one (the reading test) existed in Afrikaans and the other Afrikaans tests were constructed by the researcher to follow their English counterparts as closely as possible. The Afrikaans items were as similar as possible to the English items in terms of number of syllables, word length, part of speech and word frequency. Word frequencies were taken from Kroes (1984) for the Afrikaans items and from Kucera and Francis (1967) for the English items. Cronbach's coefficient alpha was computed for each test to determine whether the tests were reliable or consistent in what they are measuring. These are reported with the description of each test.

2.2.1.Raven's Coloured Progressive Matrices (RCPM) (Raven, Curt & Raven, 1977)

The RCPM was designed for use with young children (under the age of 11 years) to assess mental development. It was included in this study in order to assess nonverbal intelligence and to provide a baseline measure to determine whether the English and Afrikaans samples were comparable in this respect. The test is presented as three sets of twelve coloured illustrations (A, Ab and B) printed in a book, and minimal verbal explanation is needed in order to understand the task. It was administered according to the instructions in the manual (Raven et al., 1977). The child was required to select, from a number of possible alternatives, that piece that would correctly complete the matrix. He needed only to indicate which figure he wants to insert in the problem to be completed. A practice example was given to assess whether the child understood the instructions. The child's score on the RCPM was the number of correctly chosen pieces, with a range from 0 to 36 points. The re-test reliability is $\alpha = 0.9$, with no difference for ethnicity or gender (Raven et al., 1977).

2.2.2.Test of Letter Knowledge

This test assessed the child's knowledge of the sounds and names of letters and consists of all the letters of the alphabet. The child was asked whether he knew the letter that his name began with. The difference between a letter's name and its sound was then explained and the child was presented with fifty-two cards, on which each letter was written once in lower case and once in upper case (on separate cards). The child was asked to give a name and a sound for the letter on each card. The cards were presented to each child in the same fixed, random order. One point was allocated for a correct response and 0 for an incorrect response, with a range from 0 to 52 points each for letter names and letter sounds. (See Appendix 1 for test items).

2.2.3. Word and Nonword Reading Test (Klein, 1993)

Reading aloud may occur via concurrent semantic processing (lexical processing) or by concurrent grapheme-phoneme conversion (nonlexical processing) (Coltheart, 1984). This test was used to assess reading ability and the use of the two processes, since the nonword items tap the use of a nonlexical strategy and the real words test the use of a lexical strategy. Klein's (1993) test was shortened from thirty-two items to ten words and ten nonwords for this study. The English and Afrikaans items were matched for

frequency and word length. All of the words used for this study were of a high frequency (Kucera and Francis, 1967; Kroes, 1984). The nonwords were matched to the words in length and were constructed by changing the initial letter of each word such that the nonwords all remained orthographically legal, that is they conformed to the phonological rules of English or Afrikaans. (Refer to Appendices 2 and 3 for the items).

Ten cards were given to the child. He was told that something was written on each card, sometimes a word and other times a made up, nonsense word. In the case of the nonwords, the child was asked to try to read the item as best he could. The cards were presented to each child in a fixed, random order, with the nonwords randomly interspersed among the words. One point was allocated for an item read correctly and 0 for a mispronunciation, with a range of points from 0 to 20. For the English test, nonwords were scored correct if they were read by analogy to regular or irregular words.

2.2.4. Oral Repetition of Nonwords Test (Gathercole, Willis, Baddeley and Emslie, 1994)

The aim of this test was to assess short-term phonological memory. It consists of forty single unfamiliar nonwords such as "barrazon", which the child hears and must repeat immediately. Of the forty nonwords, there

ten each containing one, two, three and four syllables. The sequence of the phonemes in the nonwords are orthographically legal. The same items were used for the Afrikaans children with some minor alterations. First, the nonwords were all pronounced with an Afrikaans accent. Second, letter combinations that are not orthographically legal in Afrikaans, for example "th"at the beginning of a word or "st" at the end of a word were changed to letter combinations that occur frequently in the language (See Appendices 4 and 5 for the items).

Each child was told that he will hear some "funny made-up words", which he should listen to carefully and then try to repeat. The experimenter then gave an example of a nonword, and explained how the child should attempt to make the same sound. The nonwords were presented in a fixed random order to the children. Each child was read the nonword sequence in a neutral English/Afrikaans accent, with a pause after each item for the child to repeat it. The child was allowed as much time as needed to respond and each response was immediately scored by the experimenter as either phonologically correct (score 1) or incorrect (score 0). The score range was from 0 to 40. Allowance was made for differences in accent where an individual may pronounce one phoneme as another. The test-retest reliability of this test with 5 year old British children was $\alpha = 0.77$, and $\alpha = 0.80$ for 7 year old British children (Gathercole et al., 1994).

2.2.5.Phonological Awareness Tests

2.2.5.a Bradley and Bryant's Sound Categorisation Test (1983)

This test measured the child's onset and rime awareness. It consists of strings of four three-phoneme words. There are ten strings of words to assess awareness of sounds in three different phoneme positions, namely beginning sound, middle sound and end sound. In each string of words, all words have in common one phoneme in one position and each differs in one other phoneme-position. Three of the words in the string share a third phoneme, while the fourth word is "odd" in relation to the critical phoneme-position (beginning, middle or end). As seen in Appendices 6 and 7, all of the items are mono-syllabic, with the majority conforming to a consonant-vowel-consonant structure.

The child was encouraged to tell the tester some nursery rhymes that he knew. Then the tester gave the child some individual words and asked him to find a word that rhymes with it (e.g. pill, will etc.). The tester pointed out to the child any of his responses that did not rhyme with the target word. It was then explained to the child that he will hear four words and must say which is the odd one out. There were two practice items for each phoneme position tested. The position of the odd-word-out was matched in the Afrikaans and English tests. The child was given a score out of ten for his

performance on each of the different phoneme positions, as well as a composite score out of thirty for the entire task. The reliability of this test was $\alpha = 0.88$ for the Afrikaans sample and $\alpha = 0.91$ for the English sample.

2.2.5.b Phoneme Blending Task (Perfetti, Beck, Bell & Hughes, 1987)

This task assessed the child's ability to combine isolated phonemes into words and nonwords. There are eight real words followed by four pronounceable nonwords. The words represent an ordering of difficulty starting with a common, two-segment word (*see*), and ending with two four-segment words (*stop* and *Stan/stok*). The words are all short and common in each language. Two have two segments, four have three segments and two have four segments. The nonwords include two of two segments and two of three segments. (See Appendices 8 and 9 for the items).

The child was told that the tester would say the sounds and that the child had to put the sounds together and say the word "the right way". For each word, the tester spoke the segments in isolation, with a brief intersegmental interval of approximately one second. Four practice items were used to check that the child understood the instructions. The nonword task was introduced by telling the child that the next sounds would "make a pretend word". Several of the words remained the same for the English and Afrikaans tests, for example "see", "is" and "stop". All of the nonwords were

the same for the English and Afrikaans tests. The child was given a score out of eight for his blending of the words and a score out of four for his blending of the nonwords, as well as a composite score out of twelve for the entire task. This test was highly reliable, with $\alpha = 0.98$ for the Afrikaans sample and $\alpha = 0.96$ for the English sample.

2.2.5.c Phoneme Segmentation Test (Yopp, 1988)

The aim of this test was to measure the child's ability to articulate the sounds of a word separately, in their correct order. There are twenty-two test items and four practice items. The items are all real words ranging from two to four letters in length. The child was given a word and shown how to break it up into its component sounds. Then he was asked to do so on his own with a different word. If the child understood what to do, three more practice items were given, followed by the test items, otherwise further explanation on how to perform the task was given. Scores had a possible range from 0 to 22 correct. (Refer to Appendices 10 and 11 for the items). A few of the words remained the same for the English and Afrikaans tests, for example "man", "is" and "in". Yopp (1988) found that the English test has a reliability of 0.95. Within the current sample, this test was found to have a reliability of $\alpha = 0.97$ for the English sample and $\alpha = 0.98$ for the Afrikaans sample.

2.2.5.d. Test of Auditory Analysis Skills (Rosner, 1975)

This test assesses the child's ability to delete phonemes and syllables from words. It begins with the analysis of two-syllable, compound words into syllables ("*Say sunshine without the shine*"), and progresses to more difficult items such as deleting a syllable from a multisyllabic word ("*Say cucumber without the /cul*") and deleting a phoneme from the beginning, end or middle of a word. As an example of the phoneme deletion part of this test, the child may be told: *"Say take without the /t/ sound"*. To respond correctly, he must search for the /t/ sound in the word *"take"*, delete it and say what is left ("ake"). The position of the sound is controlled, starting with the easiest (the beginning sound as in the above example), then the final sound ("*Say game without the /m/ sound*"), then part of a consonant blend ("Say *stale* without the /t/ sound"). There are fifteen items in this test, two practice items and thirteen test items. The child's score was the number of items correct, with a possible range from 0 to 13. In the current study, the reliability coefficient for this test was 0.84 for the English sample and 0.88 for the Afrikaans sample. Test items are shown in Appendices 12 and 13.

2.3. Procedure

A pilot study was conducted with ten children from each language group (English/Afrikaans) at each age level in order to determine the suitability of the tests selected. The tests were all found to be suitable, that is, not too difficult or too easy, except the reading test, which was not administered to the grade 0 children as they had not yet learned how to read.

Children were tested individually over as short a time interval as possible, typically within one school month, so that disruption from normal school activities was minimal. The researcher was assisted by three trained, bilingual testers to facilitate this. The testers underwent a training session to establish uniformity of procedure. To avoid tiring the children, the administration of the tests was divided into two sessions, one comprising the screening tests, namely the RCPM, the tests of letter knowledge, the reading test and the oral repetition of nonwords test and the other consisting of the phonological awareness tests. The order of the tests within each session remained fixed, but the order of presentation of the sessions was arranged in such a way that half received the screening tests in the first session and the other half received the phonological awareness tests first.

3. RESULTS

Descriptive statistics for the independent variable (language of instruction/orthography) and dependent variables (age, phonological awareness, reading ability, nonverbal IQ, phonological memory and letter knowledge) will be presented first, followed by an investigation of any significant differences within and between the English and Afrikaans groups. In the second section, the relationship between the phonological and reading tests and the dependent variables for each of the six groups of subjects will be investigated by means of correlations and stepwise multiple regression analyses. The data was analysed by means of SAS version 6.12.

3.1. Descriptive Statistics

Tables 3.1, 3.2 and 3.3 give the mean performance and standard deviations for the English and Afrikaans grade 0, 1 and 2 samples respectively on each task. The number of subjects contributing to each task is also given in the tables. There is clearly an incremental progression in performance from grade 0 to grade 2, for both English- and Afrikaans-speaking children, with the grade 0 children performing the poorest and the grade 2 children performing the best on all tasks.

Table 3.1 Means and standard deviations for the English and Afrikaans Grade 0 samples on each task

	English			Afrikaans		
	M	SD	n	M	SD	n
Ravens	14.39	2.94	39	19.75	3.46	40
Letter Sounds	12.64	16.23	39	16.60	13.89	40
Letter Names	15.51	18.86	39	4.90	8.73	40
Oral Repetition	33.67	3.29	39	35.35	2.32	40
Bradley & Bryant	11.49	4.39	39	12.4	4.91	40
Initial Sound	3.77	1.72	39	4.80	2.17	40
Middle Sound	4.10	2.15	39	4.15	1.83	40
End Sound	3.62	1.55	39	3.45	1.87	40
Perfetti Test	0.95	2.25	39	2.03	3.00	40
Perfetti Words	0.74	1.55	39	1.83	2.42	40
Perfetti Nwords	0.21	0.80	39	0.23	0.77	40
Yopp-Singer Test	0.85	3.17	39	4.78	7.13	40
Rosner Test	5.85	2.23	39	4.60	1.90	40

Table 3.2 Means and standard deviations for the English and Afrikaans Grade 1 samples on each task

	English			Afrikaans		
	M	SD	n	M	SD	n
Ravens	18.44	4.57	50	22.03	5.73	40
Letter Sounds	45.88	5.78	50	45.23	2.88	40
Letter Names	33.30	15.77	50	39.2	12.16	40
Reading Test	6.10	5.44	50	16.17	3.11	40
Reading Words	3.38	2.91	50	8.20	1.68	40
Reading Nwrds	2.72	2.69	50	7.98	1.64	40
Oral Repetition	34.42	3.02	50	38.05	2.40	40
Bradley & Bryant	15.66	7.04	50	16.90	5.67	40
Initial Sound	5.46	3.01	50	6.00	2.24	40
Middle Sound	4.84	2.68	50	5.75	2.27	40
End Sound	5.32	2.56	50	5.15	2.35	40
Perfetti Test	9.74	2.66	50	11.45	0.82	40
Perfetti Words	6.20	1.91	50	7.83	0.45	40
Perfetti Nwords	3.52	0.97	50	3.63	0.74	40
Yopp-Singer Test	17.30	4.40	50	20.05	2.08	40
Rosner Test	9.42	3.90	50	10.50	3.06	40

Table 3.3 Means and standard deviations for the English and Afrikaans Grade 2 samples on each task

	English			Afrikaans		
	M	SD	n	M	SD	n
Ravens	21.69	4.84	42	23.78	4.74	37
Letter Sounds	48.71	3.42	42	47.3	3.7	37
Letter Names	49.95	2.45	42	47.7	5.95	37
Reading Test	14.48	3.4	42	18.08	2.14	37
Reading Words	8.67	1.60	42	9.08	1.09	37
Reading Nwrds	5.81	2.27	42	9.00	1.43	37
Oral Repetition	36.60	2.03	42	37.00	1.47	37
Bradley & Bryant	24.45	4.06	42	23.92	4.64	37
Initial Sound	8.86	1.54	42	8.05	1.62	37
Middle Sound	8.10	1.82	42	8.12	1.75	37
End Sound	7.52	1.99	42	7.76	1.92	37
Perfetti Test	10.93	1.26	42	11.6	0.83	37
Perfetti Words	7.24	0.98	42	8.00	0.00	37
Perfetti Nwords	3.64	0.69	42	3.60	0.83	37
Yopp-Singer Test	15.36	4.09	42	21.11	1.24	37
Rosner Test	11.62	1.9	42	12.19	1.78	37

3.2. Differences within each Group

Analyses of variance (ANOVAs) were conducted within each language group in order to determine whether the improvement in performance from grade 0 to 2 was significant. The results for the English and Afrikaans samples are shown in tables 3.4 and 3.5 respectively.

Table 3.4 Analyses of Variance between all English grades

Dependent Variable	df	F
Ravens Coloured Progressive Matrices	2	29.96**
Letter Sounds	2	173.49**
Letter Names	2	59.18**
Oral Repetition of Nonwords	2	11.94**
Reading Test Total	2	143.22**
Reading Words	2	191.25**
Reading Nonwords	2	77.67**
Bradley and Bryant Test Total	2	60.11**
Bradley and Bryant Initial Sound	2	54.07**
Bradley and Bryant Middle Sound	2	36.48**
Bradley and Bryant End Sound	2	34.76**
Perfetti Test Total	2	257.84**
Perfetti Words	2	204.57**
Perfetti Nonwords	2	220.39**
Yopp-Singer Test	2	213.31**
Rosner Test	2	40.51**

** $p < 0.0001$ * $p < 0.01$

Bonferroni's test was conducted as a post hoc measure in order to determine where the differences lay. Bonferroni's ordering revealed significant differences between all English grades on all variables, with the exception of the following: between grades 1 and 2 on Yopp-Singer's test, Perfetti nonwords and letter sound awareness, and between grades 0 and 1 on oral repetition of nonwords and Bradley and Bryant's categorisation of middle sounds.

Table 3.5 Analyses of Variance between all Afrikaans grades

Dependent Variable	df	F
Ravens Coloured Progressive Matrices	2	7.04*
Letter Sounds	2	158.38**
Letter Names	2	228.70**
Oral Repetition of Nonwords	2	16.52**
Reading Test Total	2	625.28**
Reading Words	2	576.79**
Reading Nonwords	2	490.29**
Bradley and Bryant Test Total	2	49.52**
Bradley and Bryant Initial Sound	2	24.88**
Bradley and Bryant Middle Sound	2	39.13**
Bradley and Bryant End Sound	2	42.43**
Perfetti Test Total	2	336.71**
Perfetti Words	2	235.94**
Perfetti Nonwords	2	248.28**
Yopp-Singer Test	2	169.82**
Rosner Test	2	113.83**

** $p < 0.0001$ * $p < 0.01$

Bonferroni's ordering revealed significant differences between the Afrikaans grades on all variables, except the following: between grades 1 and 2 on Yopp-Singer's test, Perfetti's test (words and nonwords), letter sounds, Ravens and oral repetition of nonwords, and between grades 0 and 1 on the Ravens.

Multivariate analyses of variance (MANOVAs) were conducted within each language group and grade in order to determine whether there were significant differences in performance on the phonological awareness tests. Further matched pairs t tests were administered to reveal where the differences lay. The results are shown in tables 3.6 and 3.7 below.

Table 3.6 Multivariate Analyses of Variance within each grade and language group, comparing phonological awareness tests

	English		Afrikaans	
Grade	**F**	**df**	**F**	**df**
0	51.51**	3	15.37**	3
1	14.62**	3	56.87**	3
2	14.62**	3	28.65**	3

** $p < 0.0001$

Table 3.7 Matched pairs t tests between the phonological awareness tests within each grade and language group

		Eng	Afr
Grade	**PA Tests**	**t**	**t**
0	Perfetti vs Bradley & Bryant	-7.29**	-6.41**
	Perfetti vs Yopp-Singer	ns	ns
	Perfetti vs Rosner	-7.65**	-4.00*
	Brad & Bryant vs Yopp-Singer	11.29**	4.48**
	Bradley & Bryant vs Rosner	ns	4.97**
	Yopp-Singer vs Rosner	-11.22**	ns
1	Perfetti vs Bradley & Bryant	6.59**	12.30**
	Perfetti vs Yopp-Singer	ns	ns
	Perfetti vs Rosner	4.01*	7.90**
	Brad & Bryant vs Yopp-Singer	-5.49**	-9.06**
	Bradley & Bryant vs Rosner	ns	-4.18**
	Yopp-Singer vs Rosner	ns	5.62**
2	Perfetti vs Bradley & Bryant	3.15*	6.96**
	Perfetti vs Yopp-Singer	5.43**	ns
	Perfetti vs Rosner	4.94**	8.09**
	Brad & Bryant vs Yopp-Singer	ns	-5.96**
	Bradley & Bryant vs Rosner	ns	ns
	Yopp-Singer vs Rosner	ns	7.51**

** $p < 0.0001$ * $p < 0.01$

3.3. Differences between the Groups

Differences between the English and Afrikaans groups on the variables were investigated by means of ANOVAs. Gender and language of instruction were entered as independent variables, and scores on the Ravens, the tests of letter knowledge and oral repetition of nonwords were entered as the dependent variables. No significant differences were found between the performance of males and females on any of the screening tests or phonological awareness tests. The ANOVAs were then rerun with language of instruction as the only independent variable and the results are indicated below in Table 3.8.

Table 3.8 Analyses of Variance between English and Afrikaans samples

Grade	Dependent Variable	df	F
0	Ravens Coloured Progressive Matrices	1	53.76**
	Letter Sounds	1	ns
	Letter Names	1	11.43*
	Oral Repetition of Nonwords	1	7.19*
1	Ravens Coloured Progressive Matrices	1	7.71*
	Letter Sounds	1	ns
	Letter Names	1	ns
	Oral Repetition of Nonwords	1	36.61**
2	Ravens Coloured Progressive Matrices	1	ns
	Letter Sounds	1	ns
	Letter Names	1	ns
	Oral Repetition of Nonwords	1	ns

** $p < 0.0001$ * $p < 0.01$

The next step was to determine whether the English and Afrikaans groups differed significantly on the tests of phonological awareness and reading. Where significant differences had been found between the groups on the independent variables (RCPM, letter knowledge and oral repetition of nonwords) in the previous analysis (see table 3.8 above), analyses of covariance (ANCOVAs) were run, with the variables on which the groups differed entered as covariates in the analysis. This was done in order to make the groups more equivalent before comparing their performance on

the phonological and reading tests. At the grade 2 level, no significant differences were found between the two language groups on the independent variables (Ravens, letter knowledge and oral repetition of nonwords) and so no covariates were entered into the analysis for this group. The results of the ANCOVAs are shown in Table 3.9 below. Results for the reading test are not reported for the grade 0 children, as this test was not administered to them.

Table 3.9 Analyses of covariance between English and Afrikaans samples

Grade	Covariates	Dependent Variable	df	F
0	Ravens Letter Names *Oral Repetition*	Bradley and Bryant	1	ns
		Perfetti Test	1	ns
		Yopp-Singer Test	1	ns
		Rosner Test	1	ns
1	Ravens *Oral Repetition*	Reading Test	1	46.77**
		Reading Words	1	34.91**
		Reading Nonwords	1	51.83**
		Bradley and Bryant	1	ns
		Perfetti Test	1	ns
		Yopp-Singer Test	1	ns
		Rosner Test	1	ns
2	None	Reading Test	1	31.57**
		Reading Words	1	ns
		Reading Nonwords	1	54.40**
		Bradley and Bryant	1	ns
		Perfetti Test	1	7.37*
		Perfetti Words	1	21.56**
		Perfetti Nonwords	1	ns
		Yopp-Singer Test	1	70.97**
		Rosner Test	1	ns

** $p < 0.0001$ * $p < 0.01$

3.4. Correlational Analyses

In order to examine which variables were related, Pearson Product Moment correlations were run. Since correlations for the combined sample of English and Afrikaans children are not likely to be a faithful representation of the situation as they may change the value of the correlation coefficient, these are reported separately for each language group. The correlation coefficients (and their probabilities) among all of the variables are displayed in Tables 3.10, 3.11 and 3.12 for each grade. Correlations for the English children are reported above the diagonal and correlations for the Afrikaans children are reported below the diagonal (in the shaded area). Significant correlations are indicated in the tables.

Table 3.10 Correlations between each task for the English and Afrikaans Grade 0 samples

	Ra	L S	L N	O R	B B	P	Y S	R
Ra		0.44*	ns	ns	0.63**	ns	ns	0.40*
L S	ns		0.76**	0.53*	0.55*	0.43*	0.48*	0.65**
L N	ns	0.53*		ns	0.49*	0.45*	0.39*	0.59**
O R	ns	ns	ns		ns	ns	ns	ns
B B	ns	0.64*	0.67**	0.40*		0.42*	0.42*	0.40*
P	ns	0.54*	0.44*	ns	ns		0.66**	0.42*
Y S	ns	0.50*	0.54*	ns	0.40*	0.81**		0.41*
R	ns	0.54*	0.60**	ns	0.54*	0.40*	0.56*	

Table 3.11 Correlations between each task for the English and Afrikaans Grade 1 samples

	Ra	L S	L N	Re	O R	B B	P	Y S	R
Ra		0.42*	0.36*	0.36*	0.36*	0.46*	ns	ns	ns
L S	ns		0.48*	0.52**	0.35*	0.46*	0.54**	ns	0.42*
L N	ns	ns		0.66**	0.45*	0.57**	0.46*	ns	0.51*
Re	ns	ns	0.48*		0.48*	0.61**	0.50*	ns	0.67**
O R	ns	ns	ns	ns		0.41*	0.45*	ns	0.43*
B B	0.42*	ns	ns	ns	ns		0.50*	ns	0.61**
P	ns	ns	ns	ns	ns	ns		0.52**	0.52**
Y S	ns	ns	ns	ns	ns	ns	ns		0.40*
R	0.44*	ns	ns	ns	ns	0.49*	ns	ns	

** $p < 0.0001$

* $p < 0.01$

Refer to key over page

Table 3.12 Correlations between each task for the English and Afrikaans Grade 2 samples

	Ra	L S	L N	Re	O R	B B	P	Y S	R
Ra		ns	ns	ns	ns	ns	ns	0.47*	ns
L S	ns		ns	0.37*	ns	0.44*	ns	ns	ns
L N	ns	0.48*		ns	ns	0.56**	ns	ns	ns
Re	ns	ns	ns		ns	ns	ns	ns	0.63**
O R	ns	ns	ns	ns		ns	ns	ns	ns
B B	ns	ns	ns	ns	ns		ns	ns	ns
P	ns	ns	0.63**	ns	ns	ns		ns	ns
Y S	ns	ns	ns	ns	0.44*	ns	ns		ns
R	ns	ns	ns	ns	ns	ns	ns	ns	

** $p < 0.0001$

* $p < 0.01$

Key:

Ra = Ravens

L S = Letter Sounds

L N = Letter Names

Re = Reading

O R = Oral Repetition of Nonwords

B B = Bradley and Bryant

P = Perfetti

Y S = Yopp-Singer

R = Rosner

3.5. Stepwise Multiple Regression

Stepwise multiple regression analyses were conducted on the data in order to, firstly, determine the collective and separate effects of the phonological awareness tests, nonverbal IQ, letter knowledge and phonological memory on reading ability, and secondly, the effects of reading ability, nonverbal IQ, letter knowledge and phonological memory in accounting for the variance observed in the phonological awareness tests. The variables were entered one at a time into the equation in order to determine the relative contribution of each in accounting for the variance in reading ability or a particular phonological awareness test. Stepwise analysis determines the contribution of each predictor already in the equation if it were to enter last. Therefore, it is possible to identify predictors that were considered to be good at an earlier stage, but which have lost their usefulness when an additional predictor is brought into the equation, and may therefore be removed from it. The analyses were run separately for each grade and language group. The predictor variables in the first instance were the scores on the measures of phonological awareness, nonverbal IQ, letter knowledge and phonological memory,with the reading test as the criterion variable. In the second instance, the predictor variables were reading ability, nonverbal IQ, letter knowledge and phonological memory, with scores on each phonological awareness test as the criterion variable.

The first set of stepwise regression analyses, run in order to determine which variables were significant predictors of reading ability (words and nonwords together and separately) for the grade 1 and 2 English and Afrikaans children, are shown in Tables 3.13 and 3.14.

Table 3.13 Stepwise multiple regression analysis to determine the predictors of reading ability for the English and Afrikaans Grade 1 samples

Dep Variable	Indep Variable	Eng Δr^2	Eng r^2	Eng F	Afr Δr^2	Afr r^2	Afr F
Reading	Rosner	0.45	0.45	38.75**	-	-	ns
	Letter Naming	0.13	0.58	15.32*	0.23	0.23	11.26*
Reading W	Rosner	0.45	0.45	40.00**	-	-	ns
	Letter Naming	0.14	0.59	15.92*	0.27	0.27	14.22*
Reading Nw	Rosner	0.39	0.39	30.16**	-	-	ns
	Letter Naming	0.11	0.50	11.16*	0.14	0.14	6.09*

** $p < 0.0001$ * $p < 0.01$

Since letter naming ability and Rosner's test were significantly correlated with most of the other tasks in the English sample, the regression analysis was rerun omitting these two tasks as predictor variables in order to determine whether any of the other tasks could serve as predictors of reading ability. When this was done, none of the other tasks emerged as significant predictors of reading for the English- or Afrikaans-speaking children.

Table 3.14 Stepwise multiple regression analysis to determine the predictors of reading ability for the English and Afrikaans Grade 2 samples

Dep Variable	Indep Variable	Eng Δr^2	Eng r^2	Eng F	Afr Δr^2	Afr r^2	Afr F
Reading	Rosner	0.39	0.39	25.85**	-	-	Ns
	Perfetti et al.	-	-	Ns	0.15	0.15	6.41*
Reading W	Rosner	0.19	0.19	9.49*	-	-	Ns
	Bradley & Bryant	-	-	Ns	0.16	0.16	6.55*
Reading Nw	Rosner	0.40	0.40	26.16**	-	-	Ns
	Letter Naming	-	-	Ns	0.17	0.17	7.23*

** $p < 0.0001$ * $p < 0.01$

When Rosner's test and letter name knowledge were omitted from the regression equation as predictors, no other tasks emerged as significant predictors of reading ability for the English or Afrikaans grade 2 children.

Further stepwise regression analyses were run in order to determine which variables served as significant predictors of success on each of the phonological awareness tests. The results of the regression analyses are shown in tables 3.15, 3.16 and 3.17 for the grade 0, 1 and 2 children respectively.

Table 3.15 Stepwise multiple regression analysis to determine the predictors of phonological awareness for the English and Afrikaans Grade 0 samples

Dep Variable	Indep Variable	Eng Δr^2	Eng r^2	Eng F	Afr Δr^2	Afr r^2	Afr F
B & Bryant	Ravens CPM	0.40	0.40	24.72**	-	-	Ns
	Letter Naming	0.12	0.52	9.29*	0.45	0.45	30.80**
	Letter Sounds	-	-	Ns	0.11	0.56	9.35*
Perfetti	Letter Naming	0.20	0.20	9.54*	-	-	Ns
	Letter Sounds	-	-	Ns	0.29	0.29	15.68**
Y-Singer	Letter Sounds	0.23	0.23	10.95*	-	-	Ns
	Letter Naming	-	-	Ns	0.29	0.29	15.55**
Rosner	Letter Sounds	0.42	0.42	26.85*	-	-	Ns
	Letter Naming	-	-	Ns	0.35	0.35	20.88**

** $\rho < 0.0001$ * $p < 0.01$

Table 3.16 Stepwise multiple regression analysis to determine the predictors of phonological awareness for the English and Afrikaans Grade 1 samples

Dep Variable	Indep Variable	Eng Δr^2	Eng r^2	Eng F	Afr r^2	Afr Δr^2	Afr F
B & Bryant	Reading	0.38	0.38	28.96**	-	-	Ns
	Ravens CPM	0.07	0.44	5.55*	0.18	0.18	1.08*
Perfetti	Letter Sounds	0.29	0.29	19.55**	-	-	Ns
Y-Singer	Oral Repetition	0.10	0.10	5.07*	-	-	Ns
Rosner	Reading	0.45	0.45	38.75**	-	-	Ns
	Ravens CPM	-	-	Ns	0.20	0.20	9.22*

Table 3.17 Stepwise multiple regression analysis to determine the predictors of phonological awareness for the English and Afrikaans Grade 2 samples

Dep Variable	Indep Variable	Eng Δr^2	Eng r^2	Eng F	Afr Δr^2	Afr r^2	Afr F
B & Bryant	Letter Naming	0.32	0.32	18.63**	-	-	Ns
	Letter Sounds	0.11	0.43	7.24*	-	-	Ns
Perfetti	Ravens CPM	0.12	0.12	5.56*	-	-	Ns
	Letter Naming	-	-	Ns	0.40	0.40	23.24
Y-Singer	Ravens	0.23	0.23	11.61*	-	-	Ns
	Oral Repetition	-	-	Ns	0.19	0.19	8.43*
Rosner	Reading	0.39	0.39	25.86**	-	-	Ns

** $p < 0.0001$ * $p < 0.01$

4. DISCUSSION

4.1. Cross-linguistic Hypothesis

The primary aim of this study was to investigate the effect of depth of orthography on the development of phonological awareness and reading. It was hypothesised that there would be a difference between speakers of the transparent Afrikaans language and speakers of the opaque English language in their performance on the phonological awareness and reading tasks. This hypothesis was only partially substantiated by this study.

The initial levels of phonological awareness were approximately the same for the English and Afrikaans children. No significant differences were found between the language groups in grade 0, even when nonverbal intelligence, letter naming ability and oral repetition of nonwords were held constant (see Table 3.9). It appears that depth of orthography does not influence phonological awareness prior to formal reading instruction. It is possible that the phonological awareness tasks may have proved too difficult for the grade 0 children, since performance was below chance on all tasks for both English and Afrikaans groups. Reading was not assessed in the grade 0 children.

The grade 1 English and Afrikaans children had approximately the same levels of phonological awareness as their performance did not differ significantly on any of the phonological awareness tests. Despite this equivalence, the Afrikaans children were significantly better at reading words and nonwords than their English peers even when nonverbal intelligence and oral repetition of nonwords were held constant (refer to Table 3.9). This suggests that, once formal reading instruction has begun, depth of orthography makes no difference to performance on the phonological awareness tests, but does influence reading ability, with children who speak a transparent language reading more successfully than speakers of an opaque language. This supports the findings of Treiman (1992b), Cossu et al. (1988), Kyostio (1980) and Downing (1972) that learning to read in a transparent writing system facilitates the acquisition of literacy. Findings from the current study also indicate that phonological awareness is not a necessary condition in order to begin reading adequately in Afrikaans. This is supported by the correlation analyses, which indicate no relationship between reading and any of the phonological awareness tests for the Afrikaans grade 1 children (see Table 3.11). Consequently, none of the phonological awareness tests emerged as predictors of reading ability in Afrikaans in grade 1.

Since the Afrikaans children in grade 1 showed no significant differences between their reading of words and nonwords, were significantly better at reading words ($F=34.91$; $p < 0.0001$) and nonwords ($F=51.83$; $p < 0.0001$) than the English children of the same age, and made predominantly phonological errors when reading words and nonwords, it may be concluded that they were making more use of a phonics strategy to read both type of items than the English children. This strategy enabled the Afrikaans children to read the regular Afrikaans words adequately, although they did not possess high levels of phonological awareness. The English speaking children, on the other hand, appeared to start reading using a predominantly visual strategy. Evidence in support of this is that many of the English children in grades 1 and 2 experienced difficulty in deriving acceptable pronunciations for the nonwords. Furthermore, their errors in reading words and nonwords tended to be real words or visually similar words, for example "money" read as "monkey" and "doney" read as "donkey". Where nonwords were read correctly by the English children, 92 percent were read by analogy to regular words. Since they were able to read some nonwords, it appears that some of the English children may have been using a phonics strategy. None-the-less, these children were not as skilled at using phonics as the Afrikaans children, who appeared to use it as their only reading strategy and were more successful with the Afrikaans words (which can easily be sounded out) and nonwords.

By grade 2, differences occurred between the language groups on some of the phonological awareness tests. The English and Afrikaans grade 2 children did not differ significantly from one another in terms of their nonverbal intelligence, letter knowledge or phonological memories (refer to Table 3.8). However, significant differences were found between the English and Afrikaans children on Yopp-Singer's phoneme segmentation test ($F = 70.97$; $p < 0.0001$) and on blending words in Perfetti's test ($F = 21.56$; $p < 0.0001$), with the Afrikaans group outperforming the English group on both tasks. These tests both tap skills related to the use of phonics (blending phonemes into words and segmenting words into phonemes). The Afrikaans children, in their second year of using a phonics strategy for reading, had become more skilled at this approach than the English children. Subsequently, the Afrikaans children were also significantly better at reading nonwords ($F = 54.40$; $p < 0.0001$) than their English counterparts. The English children, however, had by this stage developed word recognition units for the words presented in the reading test and were as good at reading words as the Afrikaans children. It appears that the English children in this grade were still relying predominantly on a visual approach for reading, hence their significantly better reading of words than nonwords ($t = 9.40$; $p < 0.0001$). So, as the children become more competent readers, orthography seems to influence performance on the blending of phonemes into words and the segmentation of words into phonemes, as well as the reading of nonwords, with speakers of a transparent language performing

at a higher level than speakers of an opaque language. An error analysis of the items in Perfettis' blending test revealed that both the English and Afrikaans children had difficulty with the concept of nonwords in this test and tended to attempt to form real words on the nonword blending section of this test. This may account for the lack of any significant difference between the language groups on this part of Perfetti's test. The English and Afrikaans children were able to manage all of the syllable manipulation items and several of the phoneme manipulation items in Rosner's test. This test, with its combination of syllable and phoneme manipulation, may be regarded as tapping both visual and phonics strategies.

Fowler (1991) suggests that, prior to the age of seven, the child's phonological lexicon has not reached the level of maturity necessary to perform tasks such as phoneme segmentation. If this is true, the results of this study indicate that the Afrikaans childrens' phonological systems mature earlier than the English childrens', since the former were significantly better at phoneme segmentation than the latter. This is possibly due to the transparency of the language spoken by the Afrikaans children and ties up with Wimmer and Hummer's (1990) findings that speakers of transparent languages such as German appear to start off reading in a an alphabetic stage using a nonlexical strategy of grapheme-phoneme conversion. English beginner readers appear to start reading by using a logographic strategy of visual word recognition. The use of the different strategies by speakers of

the different languages would lead to their phonological systems maturing at different rates. In addition, Tunmer and Nesdale (1985) found that all children who were able to read nonwords could also perform phonemic segmentation, showing that both tasks are related to the use of a nonlexical strategy.

4.2. Predictors of Reading Ability

The second objective of this study was to examine which variables were correlated with and predicted reading ability. It was hypothesised that the phonological awareness tests would be correlated with and predict success on the reading test for both the English and Afrikaans children. While this hypothesis was not found to be true for all age groups, the correlation and regression analyses did provide further support for the use of different reading strategies by the different language groups.

4.2.1. Predictors of Reading in English

Within the grade 1 English sample, reading was correlated with all of the phonological awareness tests, except Yopp-Singer's test of phoneme segmentation. Rosner's test emerged as the strongest predictor of word ($F = 40.00$; $p < 0.0001$) and nonword ($F = 30.16$; $p < 0.0001$) reading for these children. Letter naming also predicted the reading of words ($F = 15.92$, $p <$

0.01) and nonwords ($F = 11,16$, $p < 0.01$) for these children. Adams (1990) found that letter knowledge (letter sounds and letter names) is one of the strongest predictors of English-speaking children's success at reading. The English children seem to be using a strategy related to Rosner's test as well as some phonics (as indicated by letter name awareness) in order to read these items. When these childrens' errors on Rosner's tests were examined, it was found that the majority managed the analysis of the two-syllable, compound words into syllables, but were unsuccessful with the phoneme manipulation aspects of this test. An awareness of larger chunks such as syllables or onsets and rimes, is said to be related to the use of a visual strategy (Wimmer & Hummer, 1990). The English grade 1 children were relying predominantly on a visual strategy in order to read both words and nonwords, although some attempts were also made at sounding out the items. This accounts for the significant difference found between the language groups at reading words in grade 1 ($F = 34.91$; $p < 0.0001$) with the Afrikaans children faring significantly better than their English peers. As most of the words were unfamiliar to the English children, they were unable to use a visual strategy to read them, since they had no word recognition units in their lexicons for these words. Attempts at sounding the words out did not always work, because some of the words were irregular and many of the English children were not proficient with a phonics strategy. This resulted in poor reading performance for these children. Although the words were also unfamiliar to the Afrikaans children, they could none-the-less read

them successfully through grapheme-phoneme conversion, and hence obtained higher scores on this task than the English children. By grade 2 Rosner's test was the only predictor of reading words ($F = 9,49$; $p < 0.01$) and nonwords ($F = 26,16$; $p < 0.0001$). This test includes items that tap both a visual and a phonics strategy.

Bradley and Bryant's sound categorisation task has been consistently shown to predict early reading ability in English (Goswami & Bryant, 1990; Kirtley, Bryant, MacLean & Bradley, 1989; Bradley & Bryant, 1985). It did not, however, emerge as a predictor of reading in this sample. This is because it was used to predict present reading ability, whereas Bradley and Bryant (1983) used it to predict later reading ability over a period of four years after their study was initiated. Thus, a follow-up of the current study should reveal high correlations between the children's scores attained in this study on Bradley and Bryant's task and their reading ability in a few years' time.

4.2.2. Predictors of Reading in Afrikaans

Letter name awareness was correlated with reading ability ($r = 0.48$; $p < 0.01$) for the Afrikaans grade 1 children and emerged as the only predictor of word ($F = 14.22$; $p < 0.01$) and nonword ($F = 6.09$; $p < 0.01$) reading for these children. While the English children in grade 1 were also using an awareness of letter names to read words and nonwords, letter name

awareness was a stronger predictor of reading in Afrikaans than in English. Letter name knowledge accounted for 27% and 14% of the variance in word and nonword reading respectively in Afrikaans and only 14% and 11% for the same items in English. The results of this study reveal that knowledge of letter names is initially useful for reading previously unencountered words in Afrikaans and, albeit to a lesser extent, in English. Letter name knowledge helps beginner readers to discover grapheme-phoneme correspondences, because the names of most letters contain the phoneme to which the letter normally refers. Tunmer (1994), however, found that children need a minimal level of phonological awareness before any benefit could be derived from letter name knowledge. Stahl and Murray (1994) proposed that knowledge of letter names interacts with phonological awareness such that only children who can segment phonemes will benefit from letter name knowledge. Tunmer (1994) suggests that whether children learn to associate the sound "buh" or the name "bee" or both with the letter *b*, they must still segment the sound or name to make the connection between the letter *b* and the phoneme /b/. A significant correlation between phoneme segmentation and letter naming was found for the English ($r = 0.39$, $p < 0.01$) and Afrikaans ($r = 0.54$, $p < 0.01$) grade 0 children in the current study.

An interesting change occurred from grade 1 to grade 2 in the predictive relationship of letter naming for reading achievement for the Afrikaans children. While letter naming was the only predictor of reading words and

nonwords for the grade 1 children, it was only related to reading nonwords in grade 2 ($F= 7.23$; $p < 0.01$). Bradley and Bryant's test emerged as the only predictor of word reading for these children ($F=6.55$; $p < 0.01$). This task is commonly viewed as an onset/rime task (Kirtley, Bryant, MacLean & Bradley, 1989). Thus, the Afrikaans children appeared to be using onset and rime analogies for word reading in grade 2, but not in grade 1, where they used their knowledge of letter names to read words. This finding is supported by Wimmer, Landerl and Schneider (1994), who found that onset and rime awareness is not important for the initial stages of learning to read in German, since pronunciations for new words can be assembled via grapheme-phoneme translation and blending (hence letter naming as a predictor of initial word reading for Afrikaans children). As the German children became more skilled readers, onset and rime analogies became progressively more important for the later phases of reading, when reading success depends on mental representations for written words. Such mental representations may be more easily established when graphemes are grouped and connected to larger phonological segments such as onsets and rimes. Thus, by grade 2, the Afrikaans children, like their German counterparts, were beginning to use a visual strategy for reading words and were no longer solely reliant on sounding out words.

4.2.3. Correlations between the Phonological Awareness Tests in the English Sample

The correlations found *between the phonological awareness tests* support most of the findings mentioned in the sections above. Within the English sample, in grade 0, all of the phonological awareness tests were correlated with one another (see Table 3.10). These children had not yet started reading, and thus one reading strategy had not yet begun to dominate. At this stage, the phonological awareness tests had some overlap in what they were measuring, possibly a general awareness of sounds in words and nonwords. At the grade 1 level, the phonological awareness tests remained intercorrelated, with the exception of Bradley and Bryant's task and Yopp-Singer's segmentation test, which were no longer correlated with one another (refer to Table 3.11). Bradley and Bryant's task, Rosner's test and Perfetti's test, which were intercorrelated, were all also correlated with the oral repetition of nonwords test, whereas Yopp-Singer's test was not. Thus, the former three tests appear to involve the use of phonological memory, while the latter task does not.

The correlation between Rosner's test, Perfetti's test and Yopp-Singer's test can be accounted for by their all possessing items which involved the manipulation, deletion or segmentation of phonemes, whereas Bradley and

have items which tap the use of a phonics strategy, while Bradley and Bryant's test is related to the use of a visual strategy. By grade 2, there were no correlations between any of the phonological awareness tests within the English sample (see Table 3.12). The tests now each measured a different, unrelated skill.

4.2.4. Correlations between the Phonological Awareness Tests in the Afrikaans Sample

Findings within the Afrikaans sample show a similar pattern to the English group. In grade 0, all of the phonological awareness tests were intercorrelated with the exception of Bradley and Bryant's and Perfetti's tests (refer to Table 3.10). The similarity between the correlated tests was not connected to the use of phonological memory, as in the English sample, because not all of the tasks were correlated with the oral repetition of nonwords test. Rather, the similarity between the tests seems to be that Bradley and Bryant's test, Rosner's test and Yopp-Singer's test all possess only real word items, whereas Perfetti's test alone included nonword items. The relationship between Rosner's test, Perfetti's test and Yopp-Singer's test may be accounted for, as with the English sample, by the inclusion in all three tests of items which involve phoneme manipulation of some sort. By grade 1, only Bradley and Bryant's and Rosner's tests were correlated (see Table 3.11), and the overlap may be that they both use items which tap a

visual strategy (syllable manipulation and onset/rime detection), whereas Perfetti and Yopp-Singer's tests related to different aspects of a phonics strategy (blending and segmentation). As with the English sample, there were no correlations between any of the phonological awareness tests in grade 2 (refer to Table 3.12). Each test appeared to be measuring a different skill at this stage. These findings support suggestions by Seymour and Evans (1994), Duncan, Seymour and Hill (In press), Goswami (1993) and Ehri (1992) that phonological awareness is not just a single skill, but has many facets to it, each relating to different stages (or strategies) of reading development.

4.3. Predictors of Phonological Awareness

The third objective of this study was to examine the variables that predicted success on the phonological awareness tests. It was hypothesised that letter sound and name awareness, as well as phonological memory, would be correlated with and predict performance on the phonological awareness tests for both the English and Afrikaans samples. Short-term phonological memory has been positively correlated with phonological awareness (McBride-Chang, 1995). Since short-term memory depends on the ability to gain access to phonological structure and to use it to hold linguistic information (Conrad, 1964; Liberman, Mattingly & Turvey, 1972), it would be expected that children who have poor short-term memories will experience

difficulty with phonological awareness. Research confirms that young children who are poor readers have trouble holding verbal information in short-term memory (Liberman & Shankweiler, 1985; Wagner & Torgesen, 1987). Studies that have examined the recall of nonlinguistic information such as unfamiliar faces, nonsense drawings or abstract designs, reveal no differences between good and poor readers (Liberman, Mann, Shankweiler & Werfelman, 1982). Thus, it is primarily those cases where the material to be remembered is a spoken stimulus that distinguishes good and poor beginner readers. Children with poor reading ability have been shown to be weaker at repeating nonwords than younger normal readers of the same reading ability (Snowling, 1981). The unexpected finding that poor readers have difficulty with a language task that does not even involve processing print has since been demonstrated several times (Brady, Mann & Schmidt, 1987; Brady, Poggie & Rapala, 1989; Brady, Shankweiler & Mann, 1983). Tasks involving the oral repetition of nonwords require the temporary storage of an unfamiliar phonological sequence. Since children are constantly exposed to unfamiliar words which they attempt to imitate, the task of repeating single nonwords is appropriate as an assessment of the learning of the phonological form of new words (Gathercole et al., 1994).

The results of the current study revealed that letter knowledge and phonological memory did not consistently arise as predictors of performance on each of the phonological awareness tests. Different predictors emerged for the various phonological awareness tests used in this study because, as with any task of cognitive performance, the phonological awareness tasks each make different task-specific cognitive demands, and appear to be tapping different skills. So, different predictors emerged for the same phonological awareness tests in the English and Afrikaans samples.

4.3.1. Predictors of Phonological Awareness in English

In the English grades 0 and 1 samples, letter naming ability or letter sound awareness frequently emerged as a predictor of success on the four phonological awareness tasks (see Tables 3.15 and 3.16). Letter sound awareness was correlated with both letter naming ability and with the oral repetition of nonwords test in grade 0 and grade 1. Where other variables such as the RCPM and the reading test arose as predictors of performance on the phonological awareness tests (as was the case for Bradley and Bryant's and Rosner's tests in grade 1), these variables were found to be correlated with both tests of letter knowledge as well as with the oral repetition of nonwords test. The predictor variables, letter knowledge and phonological memory, had thus already accounted for the variance provided by the RCPM and the reading test and for this reason the latter two did not

emerge as predictors of phonological awareness in the regression analysis. So, letter knowledge and phonological memory were both found to be related to successful performance on each of the phonological awareness tests for the English children in grades 0 and 1.

By grade 2, letter naming ability and letter sound awareness, which were uncorrelated, only predicted success on Bradley and Bryant's test (see Table 3.17). The reading test, which was correlated with letter sound awareness, predicted performance on Rosner's test, and RCPM test predicted performance on Perfetti's test. There were no predictors of performance on Yopp-Singer's test. This indicates that letter knowledge becomes less important for the phonological awareness tests in grade 2, possibly due to the increased competence with and reliance on a visual strategy. Phonological memory does not appear to be related to any of the phonological awareness tests at this stage.

4.3.2. Predictors of Phonological Awareness in Afrikaans

In terms of the Afrikaans sample, in grade 0, letter naming ability or letter sound awareness also emerged as predictors of performance on the phonological awareness tests (refer to table 3.15). Where only one of the tests of letter knowledge arose as a predictor, it was possibly because it already accounted for the variance provided by the other test of letter

knowledge, since the two were correlated in the grade 0 sample (see Table 3.10). Oral repetition of nonwords did not arise as a predictor of phonological awareness, nor was it correlated with the tests of letter knowledge. In fact, oral repetition did not predict success on any of the phonological awareness tests at any age, except for Yopp-Singer's test in grade 2 (see Table 3.17). The Afrikaans children in grades 0 ($F=7.19$; $p < 0.01$) and 1 ($F=36.61$; $p < 0.0001$) had significantly better phonological memories than their English peers, yet there appeared to be no relationship between phonological memory and phonological awareness for the former children. In grade 1, nonverbal intelligence (RCPM) predicted performance on Bradley and Bryant's and Rosner's tests (refer to Table 3.16). This is possibly because both of these tests are related to the use of a visual strategy, and these Afrikaans children had not yet developed this strategy. Therefore, only the more intelligent children were capable of performing the operations necessary for Bradley and Bryant's and Rosner's tests. There were no predictors of performance on Perfetti's or Yopp-Singer's tests in grade 1, nor were there any for Bradley and Bryant's and Rosner's tests in grade 2 (see Tables 3.16 and 3.17). Some other skill(s), not tapped by the tests used in this study, may be responsible for determining performance on these tasks. Letter naming ability, which was correlated with letter sound awareness, predicted performance on Perfetti's blending test in grade 2.

As hypothesised, letter knowledge arose as a predictor of performance on the phonological awareness tests, but only for the early grades and less so by grade 2. Oral repetition of nonwords predicted performance on Yopp-Singer's segmentation test in grade 1 for the English children and in grade 2 for the Afrikaans children. This supports research showing that performance on nonword repetition is related to the ability to perform phonological segmentation in both poor readers (Snowling, 1981; Snowling et al., 1986) and in normal readers (Snowling, Chait & Hulme, 1991).

4.4. Developmental Hypothesis

The final aim of this study was to investigate the developmental pattern of phonological awareness in children who spoke and were learning to read a transparent versus an opaque orthography. It was hypothesised that there would be a difference with age in performance on the phonological awareness tasks within the English and Afrikaans samples.

4.4.1. Comparisons across the Age Groups

Within the English sample, significant differences were found between the grades on most of the phonological awareness tests (refer to Table 3.6), with performance on these tasks increasing with age. No significant differences were found between the children in grades 0 and 1 on Bradley

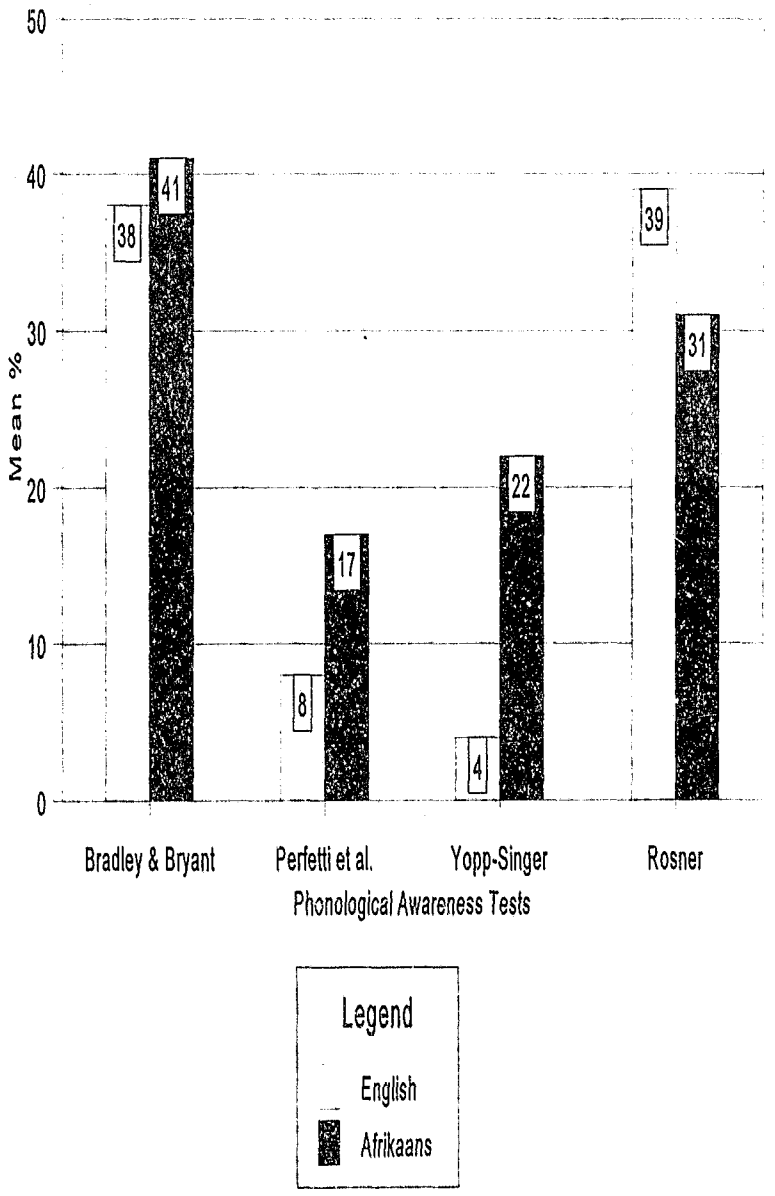
and Bryant's categorisation of middle sounds and between grades 1 and 2 on Yopp-Singer's segmentation test and on the blending of nonwords in Perfetti's test. This indicates that the English children in grades 1 and 2 were equally able to segment words into phonemes and blend phonemes into nonwords (both linked to the use of a phonics strategy). These children appeared to have relatively undeveloped phonics skills and were relying predominantly on a visual strategy for reading. Significant differences were also found between the grades in the Afrikaans sample on most of the phonological awareness tests, with performance on these tasks improving with age (refer to table 3.6). No significant differences were found between the children in grades 1 and 2 on Yopp-Singer's and Perfetti's test, indicating that these children, like their English peers, were equally able to segment words into phonemes and blend phonemes into both words and nonwords.

With a few exceptions, the three age groups performed at different levels of competence on the phonological awareness tasks in both the Afrikaans- and English-speaking samples. There appears to be a difference between the phonological awareness of children who have not yet learned to read and those who have been exposed to reading instruction, which corroborates findings by Adams (1990), Goswami and Bryant (1990) and Wagner and Torgesen (1987).

4.4.2. Comparisons within each Age Group

The relative difficulty of each phonological awareness task was examined in order to determine the developmental progression for each language group. Figure 4.1 shows the average percentage of correct responses obtained by the English and Afrikaans grade 0 children separately on each phonological awareness task. Both the English- and Afrikaans-speaking grade 0 children achieved significantly higher scores on Rosner's syllable and phoneme manipulation task and Bradley and Bryant's onset/rime task than on Perfetti's phoneme blending and Yopp-Singer's phoneme segmentation tasks (see Table 3.7). The English grade 0 children found Bradley and Bryant's and Rosner's tests equally difficult, while the Afrikaans children in grade 0 performed significantly better on Bradley and Bryant's task than on Rosner's task ($t = 4.97$, $p < 0.0001$). An error analysis revealed that, on Rosner's test, both the English and Afrikaans children were able to perform the syllable manipulation aspect of this test, but not the phoneme manipulation part. This confirms the findings of Morais et al. (1986) that prereaders tend to be better at judging rhyme (e.g. Bradley and Bryant's task) and manipulating syllables (e.g. Rosner's test) than at manipulating phonemic segments (e.g. Perfetti et al. and Yopp-Singer's tasks). Seymour and Evans (1994) also found that English-speaking preschoolers (4 year olds) attempted rhyme production and alliteration production tasks, but blending and segmentation tasks were beyond their capabilities.

Figure 4.1 Mean % Correct on Phonological Awareness Tests: Grade 0

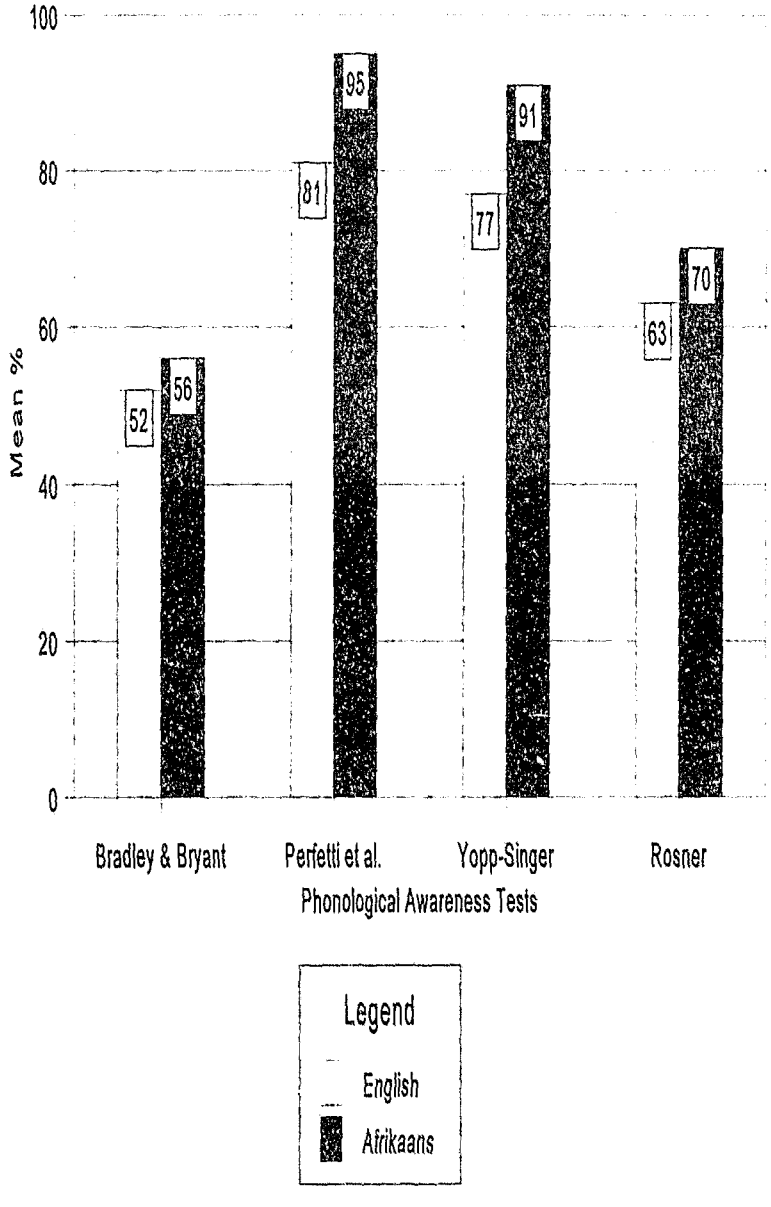


The English Grade 0 (mean age = 5.86 years) children fared better on Perfetti's blending task than on Yopp-Singer's segmentation task. However, this difference was not statistically significant. Similarly, Seymour and Evans (1994) found that Primary 1 (5 year old) children performed better on a blending task than on a segmentation task. The reverse was found for the Afrikaans grade 0 children, who were better at Yopp-Singer's task than Perfetti's task, but also not significantly so. By Primary 2 (6 years old), the children in Seymour and Evans' study improved considerably on both the blending and segmentation tasks. In the present study, the results of an ANOVA and post hoc tests (refer to Tables 3.4 and 3.5) also reveal statistically significant improvements from grade 0 to grade 1 for both the English and Afrikaans children in the present study on Perfetti's blending task and Yopp-Singer's segmentation task. The pattern shown by the grade 0 English and Afrikaans children mirrors that found by Treiman and Zukowski (1991). They discovered that, out of three phonological awareness tasks, Canadian preschoolers found phoneme segmentation the most difficult to perform, followed by onset and rime detection. Syllable deletion (as assessed by Rosner's test) was found to be the easiest of the three tasks for these children. So, it appears that some forms of speech manipulation, such as onset and rime detection and syllable manipulation are, up to some point, acquired spontaneously (although they can probably still be improved by specific training), but that manipulation of particular phonemic units, as assessed by phoneme blending and segmentation tasks,

is dependent on the acquisition of literacy.

Once literacy training begins, the pattern changes. Figure 4.2. shows the mean percentage of correct responses obtained by the grade 1 English and Afrikaans children on each of the phonological awareness tasks. Perfetti et al. (1981) and Yopp (1988) found that phoneme blending ability is one of the easier phonological tasks for young children and precedes phoneme deletion ability in first grade children. This is reflected in the performance of the grade 1 children in the current study, where both the English and Afrikaans children were significantly better at Perfetti's phoneme blending task than at Rosner's test, which involves some phoneme deletion. Unlike the grade 0s, the grade 1 children from both language groups were significantly better at the phoneme blending (Perfetti) and segmentation (Yopp-Singer) tasks than at onset and rime detection (Bradley and Bryant) and phoneme and syllable manipulation (Rosner). These children all found the phoneme segmentation and blending tasks equally easy (refer to Table 3.7). The syllable and phoneme manipulation task was found to be significantly easier than the onset and rime task by both language groups in grade 1. The introduction of literacy training through a combination of phonics and whole words, and/or the maturation of the childrens' phonological systems, seems to lead to an awareness of phonemic units .

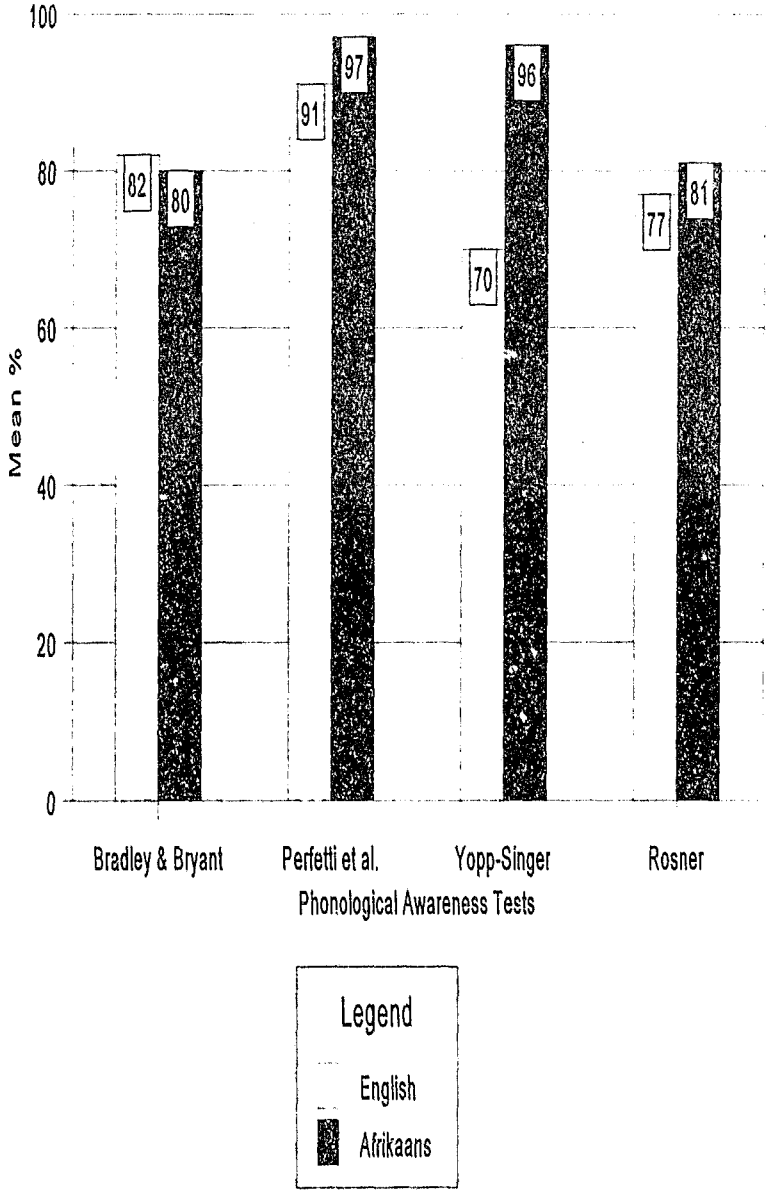
Figure 4.2 Mean % Correct on Phonological Awareness Tests: Grade 1



such that the grade 1 children were much better at phoneme segmentation and blending than at onset/rime detection and syllable and phoneme deletion.

By grade 2, Perfetti's blending task remained significantly easier than the other tasks for both language groups (Refer to figure 4.3 for the mean percentage correct on each phonological awareness test within each language group). For the Afrikaans children, phoneme blending was as easy as segmentation, while for the English children, phoneme blending was significantly easier than phoneme segmentation, onset and rime detection and syllable and phoneme manipulation. There was no significant difference between the English children's performance on the segmentation, onset and rime detection and syllable and phoneme manipulation tasks. Onset and rime detection and phoneme and syllable manipulation were found to be equally easy for the Afrikaans children (see Table 3.7). These latter two tasks (Bradley and Bryant's test and Rosner's test), as measures of compound phonemic awareness (Yopp, 1988), make greater cognitive demands on the child as they require an item or several items to be held in memory and then to be manipulated in some way. This may explain why the grade 1 and 2 children found these tasks harder than the simple phoneme segmentation and blending tasks. Also, since reading requires that the child blend together phonemes to form words, it follows that, once the children have become more literate, they should find phoneme blending the easiest

Figure 4.3 Mean % Correct on Phonological Awareness Tests: Grade 2



of the phonological awareness tasks.

There was a general improvement in performance on all tasks from grade 0 to grade 2 for both the English and Afrikaans groups. Cossu et al. (1988) found that Italian children improved in performance from preschool to second grade on phonological awareness tasks. The same pattern has been found with English-speaking children (Wimmer et al., 1991; Morais et al., 1986 and Morais et al., 1979). The marked improvement in performance between children in grade 0 and those in grade 1 may be the result of exposure to the alphabetic code through learning to read, since there are aspects of phonological awareness, such as those tapped by Yopp-Singer's phoneme segmentation test, which only seem to develop with the acquisition of literacy. (Read, Zhang, Nie and Ding (1986) found that only readers of an alphabetic script could perform segmentation tasks). However, the improvement may also be the result of a psychological maturation process taking place around 6 or 7 years (Fowler, 1991), making this an appropriate age to start reading instruction.

4.5. Summary of Main Findings

Depth of orthography does not seem to influence initial levels of phonological awareness. However, after two years of reading instruction, readers of a transparent orthography are better at phoneme segmentation and blending and reading nonwords than readers of an opaque orthography. Further, Afrikaans children appear to begin reading in an alphabetic stage using a nonlexical strategy of grapheme-phoneme conversion. English beginner readers seem to start reading using predominantly a logographic strategy of visual word recognition. By their second year of reading, the Afrikaans children were using grapheme-to-phoneme conversion only to read nonwords and onset and rime analogies to read words. The English grade 2 children were using a combination of phonics and visual strategies in their reading.

In terms of phonological awareness, it appears that some levels of awareness such as onset and rime detection and syllable manipulation are acquired spontaneously by prereaders of both languages, but that the manipulation of phonemic units is dependent on the acquisition of literacy. The introduction of literacy training by means of a combination of phonics and whole words as well as the maturation of the childrens' phonological systems seems to result in a change to a greater awareness of small phonemic units than of larger units such as onsets and rimes. Tests

assessing onset and rime awareness (Bradley and Bryant) and phoneme and syllable manipulation (Rosner) require that items be held in memory and then manipulated in some way, and thus place greater cognitive demands on the child than the tests measuring the more simple skills of phoneme blending and segmentation.

4.6. Relevance of this Study

This study has both theoretical and practical relevance to the field of reading research. Theoretically, findings assist in ascertaining that phonological awareness issues tend to be specific to a particular writing system. On a practical level, results from this study can be used to develop screening techniques to identify children who may have difficulty in learning to read, as well as to develop training programmes to help these children to overcome their potential reading difficulties. Results reinforce the prevailing view from recent research that teachers should be alert to children's phonological awareness and alphabetic knowledge and seek to develop these in children lacking them on school entry. Although phonological awareness is known to play an important part in early literacy, activities to increase phonological awareness have not yet been incorporated into most preschool classrooms in South Africa. Poor phonological awareness leads to poor reading, which affects the child's general knowledge and vocabulary growth, and has other far reaching implications such as the emotional consequences of failure.

4.7. Suggestions for Further Research

In South Africa, children are exposed to reading in both English and Afrikaans, and it is important therefore to gain an understanding of the impact of phonological skills developed in one language upon the reading performance in the other language. Further studies could thus include English-Afrikaans bilingual children.

A difficulty in comparing the results of studies on phonological awareness is that spelling knowledge appears to affect the perception of sounds. Ehri & Wilce (1980) found that fourth grade children who were asked to decide on the number of phonemes in spoken items incorrectly indicated that there are four sounds in the word "pitch", yet correctly indicated that there are three in the word "rich". In this example, the silent /t/ in "pitch" was represented as though it contributed a sound (Ehri & Wilce, 1980). The findings that children use the number of graphemes rather than phonemes when asked how many sounds there are in a word, indicates that spelling influences performance on phonological awareness tasks. These findings support the view that the relationship between phonological awareness, reading and spelling is reciprocal such that early phonological skill, reading and spelling interact and facilitate each other (Gathercole & Baddeley, 1993; Cataldo & Ellis, 1988; Bertelson, 1987). This reciprocity may be a confounding factor when interpreting the results of phonological awareness

tests. Future studies should also investigate the relationship between phonological awareness, reading and spelling.

In order to assess the exact nature of the benefits of early phonological awareness skills on later, orthographic reading in both a transparent and an opaque orthography, a long-term follow-up of these samples should be undertaken.

5. REFERENCES

Adams, M. (1990). Beginning to read: Thinking and learning about print. Cambridge: MIT press.

Alegria, J., Pignot, E. & Morais, J. (1982). Phonetic analysis of speech and memory codes in beginning readers. Memory and Cognition, vol. 10, pp. 451-456.

Backman, J. (1983). The role of psycholinguistic skills in reading acquisition: A look at early readers. Reading Research Quarterly, vol. 18, pp. 466-479.

Baddeley,A.D. (1978). Working memory and reading. In P.A. Kolers, M.E. Wrolstad & H. Bouma (Eds), Processing of Visible Language, vol.1. New York: Plenum Press.

Baddeley, A.D. (1986). Working Memory. Oxford: Oxford University Press.

Baddeley, A.D. & Hitch, G.J. (1974). Working Memory. In G.Bower (Ed.), The Psychology of Learning and Motivation, vol.8 (pp.47-90). New York: Academic Press.

Baddeley, A.D. & Wilson, B.A. (1993). A developmental deficit in short-term phonological memory: Implications for language and reading. Memory, vol. 1, pp. 65-78.

Ball, E.W. (1993). Phonological Awareness. What's important and to whom? Reading and Writing: An Interdisciplinary Journal, vol. 5, pp. 141-159.

Berninger, V., Thalberg, S., DeBruyn, I. & Smith, R. (1987). Preventing reading disabilities by assessing and remediating phonemic skills. School Psychology Review, vol. 16 (4), pp. 554-565.

Bertelson, P. (1987). The Onset of Literacy. Cambridge, MA: MIT Press.

Besner, D. & Smith, M. (1992). Basic processes in reading: Is the orthographic depth hypothesis sinking? In R.Frost & L.Katz (Eds), Orthography, Phonology, Morphology and Meaning. New Holland Press.

Blachman, B.A., Ball, E.W., Black, R.S. & Tangel, D.M. (1994). Kindergarten teachers develop phoneme awareness in low-income, inner-city classrooms: does it make a difference? Reading and Writing: An Interdisciplinary Journal,vol. 7, pp. 1-18.

Bowey, J.A. & Francis, J. (1991). Phonological analysis as a function of age and exposure to reading instruction. Applied Psycholinguistics, vol. 12 (1), pp. 93-121.

Bowey, J.A. & Patel, P.K. (1988). Metalinguistic ability and early reading achievement. Applied Psycholinguistics, vol. 9, pp. 367-383.

Brady, S., Mann, V. & Schmidt, R. (1987). Errors in short-term memory for good and poor readers. Memory and Cognition, vol. 15, pp. 444-453.

Brady, S., Poggie, E. & Rapala, M.M. (1989). Speech repetition abilities in children who differ in reading school. Language & Speech, vol. 32, pp. 109-122.

Brady, S., Shankweiler, D. & Mann, V. (1983). Speech perception and memory coding in relation to reading ability. Journal of Experimental Child Psychology,vol. 35, pp. 345-367.

Bryant, P.E., Bradley, L., Maclean, M. & Crossland, J. (1989). Nursery rhymes, phonological skills and reading. Journal of Child Language, vol. 16, pp. 407-428.

Bradley, L. & Bryant, P.E. (1985).Rhyme and Reason in Reading and Spelling. Michigan: University of Michigan Press.

Bradley, L. & Bryant, P.E. (1983). Categorising sounds and learning to read -A causal connection. Nature, vol. 301, pp. 419-421.

Bradley, L. & Bryant, P.E. (1978). Difficulties in auditory organisation as a possible cause of reading backwardness. Nature, vol. 271, pp. 746-747.

Bryant, P.E. & Goswami, U. (1987). Phonological awareness and learning to read. In J.R. Beech & A.M. Colly (Eds), Cognitive Approaches to Reading (pp. 213-243). New York: Wiley.

Bryant, P.E., MacLean, M. & Bradley, L. (1990). Rhyme, language and children's reading. Applied Psycholinguistics, vol. 11, pp. 237-252.

Caravolas, M. & Bruck, M. (1993). The effect of oral and written language input on children's phonological awareness: A cross-linguistic study. Journal of Experimental Child Psychology, vol. 55, pp. 1-30.

Cataldo, S. & Ellis, A.W. (1988). Learning to spell, learning to read. In P.D. Pumfrey and C.D. Elliot (Eds), Primary School Pupils' Reading and Spelling Difficulties: Current Research and Practice. Basingstoke: Falmer Press.

Catts, H.W. (1989). Defining dyslexia as a developmental language disorder. Annals of Dyslexia, vol. 39, pp. 50-63.

Catts, H.W. (1986). Speech production/phonological deficits in reading disordered children. Journal of Learning Disabilities, vol. 19, pp. 504-508.

Coetzee, A.E. (1985). Fonetiek. Pretoria: Academia.

Coltheart, M. (1980). Reading, phonological recoding and deep dyslexia. In K.E. Patterson, J.C. Marshall & M. Coltheart (Eds), Surface Dyslexia. London: Erlbaum.

Coltheart, M. (1984). Acquired dyslexias and normal reading. In R.N. Malatesha and H.A. Whitaker (Eds), Dyslexia: A Global Issue (pp. 357-374). The Hague: Martinus Nijhoff.

Conrad, R. (1964). Acoustic confusions in immediate memory. British Journal of Psychology, vol. 55, pp. 75-84.

Cossu, G., Rossini, F. & Marshall, J.C. (1993). When reading is acquired but phonemic awareness is not: A study of literacy in Down's Syndrome. Cognition, vol. 46, pp. 129-138

Cossu, G., Shankweiler, D., Liberman, I.Y., Katz, L. & Tola, G. (1988). Awareness of phonological segments and reading ability in Italian children. Applied Psycholinguistics, vol. 9, pp. 1-16.

Crain, S., Shankweiler, D. Macaruso, P. & Bar-Shalom, E. (1990). Working memory and comprehension of spoken sentences: Investigations of children with reading disorders. In G.Vallar & T. Shallice (Eds), Neuropsychological Impairments of Short-term Memory. Cambridge: Cambrideg University Press.

Cunningham, A.E. (1990). Explicit versus implicit instruction in phoneme awareness. Journal of Experimental Child Psychology,vol. 509, pp. 429-444.

De Manrique, A.M.B. & Gramingna, S. (1984). Phonological and syllabic segmentation in preschool and first grade children. Lectura y Vida, vol. 5, pp. 4-13.

Downing, J.A. (1972). Comparative Reading. New York: Macmillan.

Duncan, L.G., Seymour, P.K. & Hill, S. (In press). How important are rhyme and analogy in beginning reading?

Ehri, L.C. (1992). Reconceptualising the development of sight word reading and its relationship to recoding. In P.B. Gough, L.C. Ehri & R. Treiman (Eds), Reading Acquisition. Hillsdale, NJ: Erlbaum.

Ehri, L.C. (1979). Linguistic insight: Threshold of reading acquisition. In T.G. Waller and G.E. MacKinnon (Eds), Reading Research: Advances in Theory and Practice, vol. 1 (pp 63-113). New York: Academic Press.

Ehri, L.C. & Wilce, L.C. (1980). The influence of orthography on readers' conceptualization of the phonemic structure of words. Applied Psycholinguistics, vol. 1, pp. 371-385.

Ellis, A.W. & Young, A.W. (1988). Human Cognitive Neuropsychology. London: Lawrence Erlbaum Associates Ltd.

Fowler, A. (1991). How early phonological development might set the stage for phoneme awareness. In S.A. Brady & D.P. Shankweiler (Eds), Phonological Processes in Literacy: A Tribute to Isabelle. Y. Liberman (pp. 97-117). Hove: Lawrence Erlbaum Associates.

Frith, U. (1995). Dyslexia: Can we have a shared theoretical framework? Educational and Child Psychology, vol. 12 (1), pp. 6-17.

Frith, U. (1985). Beneath the surface of developmental dyslexia. In K.E. Patterson, J.C. Marshall & M. Coltheart (Eds). Surface Dyslexia. London: Erlbaum.

Gathercole, S.E. (1990). Working memory and language development: How close is the link? The Psychologist, vol. 2, pp. 57-60.

Gathercole, S.E. (1995). Is nonword repitition a test of phonological memory or long-term knowledge? It all depends on the nonwords. Memory and Cognition, vol. 23 (1), pp. 83-94.

Gathercole, S.E. & Baddeley, A.D. (1990). Phonological memory deficits in language disordered children: Is there a causal connection? Journal of Memory & Language, vol. 29, pp. 336-360.

Gathercole, S,E. & Baddeley, A.D. (1993). Working Memory and Language. Hove: Lawrence Erlbaum Associates.

Gathercole, S.E., Willlis, C.S. & Baddeley, A.D. (1991). Differentiating phonological memory and awareness of rhyme: Reading and vocabulary development in children. British Journal of Psychology, vol. 82, pp. 387- 406.

Gathercole, S.E., Willlis, C.S., Baddeley, A.D. & Emslie, H. (1994). The children's test of nonword repitition: A test of phonological working memory. Memory,vol. 2, no. 2, pp. 103-127.

Gathercole, S.E., Willlis, C.S., Emslie, H. & Baddeley, A.D. (1992). Phonological memory and vocabulary development during the early school years: A longitudinal study. Development Psychology, vol. 28, pp. 887-898.

Gleitman, L.R. & Rozin, P. (1977). The structure and acquisition of reading I: Relations between orthographies and the structure of language. In A.S. Reber & D.L. Scarborough (Eds), Towards a Psychology of Reading (pp.1-53). Hillsdale, NJ: Erlbaum.

Goswami, U. (1986). Children's use of analogy in learning to read: A developmental study. Journal of Experimental Child Psychology, vol. 42, pp. 73-83.

Goswami, U. (1988). Children's use of analogy in learning to spell. British Journal of Developmental Psychology, vol. 6, pp. 21-33.

Goswami, U. (1990). A special link between rhyming skills and the use of orthographic analogies by beginner readers. Journal of Child Psychology and Psychiatry, vol. 31, pp. 301-311.

Goswami, U. (1991). Learning about spelling sequences: the onsets and rimes in analogies in reading. Child Development, vol. 62, pp. 1110-1123.

Goswami, U. (1993). Toward an interactive analogy model of reading development: Decoding vowel graphemes in beginning reading. Journal of Experimental Child Psychology, vol. 56, pp. 443-475.

Goswami, U. & Bryant, P. (1990). Phonological skills and learning to read. Hillsdale, NJ: Lawrence Erlbaum Associates.

Goswami, U. & Mead, F. (1992). Onset and rime awareness in analogies in reading. Reading Research Quarterly, vol. 27, (2), pp. 153-162.

Gough, P. & Juel, C. (1991). The first stages of word recognition. In L. Rieben & C. Perfetti (Eds), Learning to Read. Hillsdale, NJ. : Erlbaum Associates.

Harris, M. & Coltheart, M. (1986). Language processing in children and adults: An introduction. London: Routledge and Kegan Paul.

Helfgott, J. (1976). Phonemic segmentation and blending skills of kindergarten children: Implications for beginning reading acquisition. Contemporary Educational Psychology, vol. 1, pp. 157-169.

Hurford, D. (1990). Training phonemic segmentation ability with a phonemic discrimination intervention in second- and third-grade children with reading disabilities. Journal of Learning Disabilities, vol.23, pp. 564-569.

Hurford, D. (1991). The possible use of IBM-compatible computers and digital-to-analog conversion to assess children for reading disbilities and to increase their phonemic awareness. Behaviour Research Methods, Instruments and Computers, vol. 23, pp. 319-323.

Jorm, A. (1983). Specific reading retardation and working memory: A review. British Journal of Psychology, vol. 74, pp. 311-342.

Kirtley, C. Bryant, P.E., MacLean, M.J. & Bradley, L.L. (1989). Rhyme, rime and the onset of reading. Journal of Experimental Child Psychology, vol. 48, pp. 224-245.

Klein, D. (1993). Bilingualism and Dyslexia: An Investigation. Unpublished Doctoral Thesis, University of the Witwatersrand, Johannesburg.

Kroes, H.(1984) Frekwensie Bepaling van die Kernwoordeskat en sekere basiese strukture van die Afrikaanse Spreektaal. Johannesburg: RAU Taaldiens.

Kucera, H. & Francis, W.N. (1967) Computational Analysis of Present-day American English. Providence, R.I.: Brown University Press.

Kyostio, O.K. (1980). Is learning to read easy in a language in which the grapheme-phoneme correspondences are regular? In J.F. Kavanagh & R.L. Venezky (Eds), Orthography, Reading and Dyslexia. Baltimore, MD: University Park Press.

Ladefoged, P. (1982). A Course in Phonetics (2nd ed.). New York: Harcourt Brace Jovanovich.

Lewkowicz, N.K. (1980). Phonemic awareness training: What to teach and how to teach it. Journal of Educational Psychology, vol. 72, pp. 686-700.

Liberman, A., Cooper, F.S., Shankweiler, D. & Studdert-Kennedy, M. (1967). Perception of the speech code. Psychological Review, vol. 74, pp. 731-761.

Liberman, I.Y. (1973). Segmentation of the spoken word and reading acquisition. Bulletin of the Orton Society, vol. 23, pp. 65-77.

Liberman, I.Y. & Liberman, A.M. (1990). Whole language v. code emphasis: Underlying assumptions and their implications for reading instruction. Annals of Dyslexia, vol. 40, pp. 51-76.

Liberman, I.Y., Mann, V.A., Shankweiler, D. & Werfelman, M. (1982). Children's memory for recurring linguistic and non-linguistic material in relation to reading ability. Cortex, vol. 18, pp. 367-375.

Liberman, I.Y., Mattingly, I.G. & Turvey, M. (1972). Language codes and memory codes. In A.W. Melton & E. Martin (Eds), Coding Processes and Human Memory. Washington, D.C: V.H. Winston and Sons.

Liberman, I.Y. & Shankweiler, D. (1985). Phonology and the problems of learning to read and wrote. Remedial and Special Education, vol. 6., pp. 8-17.

Liberman, I.Y. & Shankweiler, D. (1991). Phonology and beginning reading: A tutorial. In L. Rieben and C.A Perfetti (Eds), Learning to Read: Basic Research and its Implications (pp. 3-17). Hillsdale, NJ. Lawrence Erlbaum Associates.

Liberman, I.Y., Shankweiler, D., Fischer, F.W. & Carter, B. (1974). Explicit syllable and phoneme segmentation in the young child. Journal of Experimental Child Psychology, vol. 18, pp. 201-212.

Liberman, I.Y., Shankweiler, D., Liberman, A.M., Fowler, C. & Fischer, F.W. (1977). Phonetic segmentation and recoding in the beginning reader. In A.S.

Reber & D.L. Scarborough (Eds), Towards a Psychology of Reading (pp.207-225). Hillsdale, NJ: Erlbaum.

Lundberg, I. (1994). Reading difficulties can be predicted and prevented: A Scandinavian perspective on phonological awareness and reading. In C. Hulme and M.J. Snowling (Eds), Reading Development and Dyslexia. London: Lawrence Erlbaum Associates.

Lundberg, I., Frost, J. & Peterson, O. (1988). Effects of an extensive programme for stimulating phonological awareness in preschool children. Reading Research Quarterly, vol. 23, pp. 263-284.

MacLean, M., Bryant, P.E. & Bradley, L. (1987). Rhymes, nursery rhymes and reading in early childhood, Merrill-Palmer Quarterly, vol. 33, pp. 255-282.

Mann, V.A. (1986). Phonological awarenes: The role of reading experience.Cognition, vol. 24, pp. 65-92.

Mann, V. A. & Liberman, I.Y. (1984). Phonological awareness and verbal short-term memory. Journal of Learning Disabilities, vol. 17, pp. 592-599.

McBride-Chang, C. (1995). What is phonological awareness? Journal of Educational Psychology, vol. 87, no. 2, pp. 179-192.

Miles, M. (1983). Dyslexia. Springfield, Illinois: Charles C. Thomas Publishers.

Morais, J., Alegria, J. & Content, A. (1987). The relationship between segmental analysis and alphabetic literacy. An interactive view. Cahiers de Psychologie Cognitive, vol. 7, pp. 1-24.

Morais, J., Bertelson, P., Cary, L. & Alegria, J. (1986). Literacy training and speech segmentation. Cognition, vol. 24, pp. 45-64.

Morais, J., Cary, L., Alegria, J. & Bertelson, P. (1979). Does awareness of speech as a sequence of phones arise spontaneously? Cognition, vol. 7, pp. 323-331.

Morton, J. & Frith, U. (1993). What lesson for dyslexia from Down's Syndrome? Comments on Cossu, Rossini and Marshall (1993). Cognition, vol. 48, pp. 289-296.

Morton, J. & Patterson, K. (1980). A new attempt at interpretation, or, an attempt at a new interpretation. In K.E. Patterson, M. Coltheart & J.C. Marshall (Eds). Deep Dyslexia. London: Erlbaum.

Nesdale, A.R., Herriman, M.L. & Tunmer, W.E. (1984). Phonological awareness in children. In W.E. Tunmer, C. Pratt & M.L. Herriman (Eds), Metalinguistic Awareness in Children. New York: Spinger-Verlag.

Nittrouer, S. & Studdert-Kennedy, M. (1987). The role of coarticulatory effects in the perception of fricatives by children and adults. Journal of Speech and Hearing Research, vol. 30, pp. 319-329.

Ognjenovic, V., Lukatela, G., Feldman, L.B. & Turvey, M.T. (1983). Misreadings by beginning readers of Serbo-Croatian. Quarterly Journal of Experimental Psychology, **35A**, 97-109.

Olofsson, A. (1985). Phonemic awareness and learning to read. A longitudinal and quasi-experimental study. Unpublished doctoral dissertation, Umea University, Sweden.

Patterson, J.C. & Shewell, C. (1987). Speak and spell: Dissociations and word-class effects. In M. Coltheart, G. Sartori & R. Job (Eds). The Cognitive Neuropsychology of Language. London: Erlbaum.

Perfetti, C.A., Beck, I., Bell, L.C. & Hughes, C. (1987). Phonemic knowledge and learning to read are reciprocal: A longitudinal study of first-grade children. Merrill-Palmer Quarterly, vol. 33, pp. 283-319.

Perfetti, C. (1992). The representation problem in reading acquisition. In P.B. Gough, L.C. Ehri & R. Treiman (Eds) Reading Acquisition. Hillsdale, NJ: Erlbaum.

Ponelis, F. (1993). The Development of Afrikaans. Frankfurt: Peter Lang.

Rack, J.P., Snowling, M.J. & Olson, R.D. (1992). The nonword reading deficit in developmental dyslexia: A review. Reading Research Quarterly, vol. 27, pp. 228-253.

Raven, J.C., Curt, J.H. & Raven, J. (1977). Raven's Coloured Progressive Matrices and Vocabulary Scales. London: H.K. Lewis & Co., Ltd.

Read, C., Zhang, Y-F., Nie, H-Y. & Ding, B-Q. (1986). The ability to manipulate speech sounds depends on knowing alphabetic writing. Cognition, vol. 24, pp. 31-44.

Rosner, J. (1971). Phonetic Analysis Training and Beginning Reading Skills. University of Pittsburgh: Learning Research and Development Centre.

Rosner, J. (1975). Helping Children Overcome Learning Difficulties. New York: Walker and Company.

Rozin, P. & Gleitman, L.R. (1977). The structure and acquisition of reading II: The reading process and the acquisition of the alphabetic principle. In A.S. Reber & D.L. Scarborough (Eds), Towards a Psychology of Reading (pp.55-141). Hillsdale, NJ: Erlbaum.

Schneider, W. (1987). Connectionism: Is it a paradigm shift for psychology? Behavioural Research Methods, Instruments and Computers, vol. 19, pp. 73-83.

Seidenberg, M.S. & McClelland, J.L. (1989). A distributed, developmental model of word recognition and naming. Psychological Review, vol. 96, pp. 523-568.

Seymour, P.H.K. (1987). Developmental dyslexia. In M.W. Eysenck (Ed.) Cognitive Psychology: An International Review. London: John Wiley & Sons.

Seymour, P.K. & Evans, H.M. (1994). Levels of phonological awareness and learning to read. Reading and Writing: An Interdisciplinary Journal, vol. 6, pp. 221-250.

Share, D.L., Jorm, A.F., MacLean, R. & Mathews, R. (1984). Sources of individual differences in reading acquisition. Journal of Experimental Psychology, vo. 76, pp. 1309-1324.

Snowling, M.J. (1981). Phonemic deficits in developmental dyslexia. Psychological Research, vol. 43, pp. 219-234.

Snowling, M.J. (1991). Developmental reading disorders. Journal of Child Psychology and Psychiatry, vol. 32, pp. 49-77.

Snowling, M.J., Chait, S. & Hulme, C. (1991). Words, nonwords and phonological processes: Some comments on Gathercole, Willis Emslie & Baddeley. Applied Psycholinguistics, vol. 12, pp. 369-373.

Snowling, M.J., Goulandris, N., Bowlby, M. & Howell, P. (1986). Segmentation and speech perception in relation to reading skill: A developmental analysis. Journal of Experimental Child Psychology, vol. 41, pp. 489-507.

Stahl, S.A. & Murray, B.A. (1994). Defining phonological awareness and its relationship to early reading. Journal of Educational Psychology, vol. 86 (2), pp. 221-234.

Stanovich, K.E. (1988). Explaining the difference between the dyslexic and the graden-variety poor reader: The phonological core variable-difference model. Journal of Learning Disabilities, vol. 21, pp. 590-612.

Stanovich, K.E., Cunningham, A. & Feeman, D.J. (1984). Intelligence, cognitive skills and early reading progress. Reading Research Quarterly, vol. 19, pp. 178-303.

Stanovich, K.E., Cunningham, A. & Cramer, B. (1984). Assessing phonological awareness in kindergarten children: Issues of task comparability. Journal of Experimental Child Psychology, vol. 38, pp. 175-190.

Stuart, M. & Coltheart, M. (1988). Does reading develop in a sequence of stages? Cognition, vol. 30, pp. 139-181.

Tanenhaus, M.K., Dell, G.S. & Carlson, G. (1988). Context effects in lexical processing: A connectionist approach to modeularity. In J.Garfield (Ed.) Modularity in Knowledge Representation and Natural Language Understanding. Cambridge, MA: MIT Press.

Taylor, H.G., & Lean, D., & Schwartz, S. (1989). Pseudoword repitition ability in learning-disabled children. Applied Psycholinguistics, vol. 10, pp. 203-219.

Thorndike, E.L. & Lorge, I. (1963). The Teacher's Word Book of 30,000 Words. New York: Teacher's College Press, Columbia University.

Treiman, R. (1993). Beginning to Spell. Oxford: Oxford University Press.

Treiman, R. (1992a). Beginning to spell: A study of first grade children. New York: Oxford University Press.

Treiman, R. (1992b). The role of intrasyllabic units in learning to read and spell. In P.B. Gough, L.C. Ehri & R. Treiman (Eds), Reading Acquisition. Hillsdale, NJ: Erlbaum.

Treiman, R. & Baron, J. (1983). Phonemic analysis training helps children benefit from spelling-sound rules. Memory and Cognition, vol. II, pp. 382-389.

Treiman, R. & Zukowski, A. (1991). Levels of phonological awareness. In S.A. Brady and D.P. Shankweiler (Eds), Phonological Processes in Literacy (pp. 67-84). Hove: Lawrence Erlbaum Associates.

Tunmer, W.E. (1994). Phonological processing skills and reading remediation. In C. Hulme and M.J. Snowling (Eds), Reading Development and Dyslexia. London: Whurr.

Tunmer, W.E. & Nesdale, A.R. (1985). Phonemic segmentation skill and beginning reading. Journal of Educational Psychology, vol. 77, pp. 417-427.

Van Kleeck, A. (1990). Emergent literacy: Learning about print before learning to read. Topics in Language Disorders, vol. 10 (2), pp. 25-45.

Vellutino, F.R. (1991). Introduction to three studies on reading acquisition: Convergent findings on theoretical foundations of code-orientated versus whole-language approaches to reading instruction. Journal of Educational Psychology, vol. 83, pp. 437-443.

Vellutino, F.R. & Scanlon, D.M. (1987). Phonological coding, phonological awareness, and reading ability: Evidence from a longitudinal and experimental study. Merrill-Palmer Quarterly, vol. 33, pp. 321-363.

Wagner, R.K. & Torgesen, J.K. (1987). The nature of phonological processing and its causal role in the acquisition of reading. Psychological Bulletin, vol. 101, pp. 192-212.

Wagner, R.K., Torgesen, J.K., Laughon, P, Simmons, K. & Rashotte, C.A. (1993). The development of young readers' phonological processing abilities. Journal of Educational Psychology, vol. 85, pp. 1-20.

Wijk, A. (1966). Rules of Pronunciation for the English Language. Oxford: Oxford University Press.

Wimmer, H. & Goswami, U. (1994). The influence of orthographic consistency on reading development: Word recognition in English and German children. Cognition, vol. 51(1), pp. 91-103.

Wimmer, H. & Hummer, P. (1990). How German-speaking first-graders read and spell: Doubts on the importance of the logographic stage. Applied Psycholinguistics, vol. 11, pp. 349-368.

Wimmer, H., Landerl, K., Linortner, R. & Hummer, P. (1991). The relationship of phonemic awareness to reading acquisition: More consequence than precondition but still important. Cognition, vol. 40, pp. 219-249.

Wimmer, H., Landerl, K. & Schneider, W. (1994). The role of rhyme awareness in learning to read a regular orthography. British Journal of Developmental Psychology, vol. 12, pp. 469-484.

Yopp, H.K. (1988). The validity and reliability of phonemic awareness tests. Reading Research Quarterly, vol. 23, pp. 159-177.

Appendix 1

Sounding and Naming Letters Test - English/Afrikaans				
Letter	Resp Sound	Score	Resp Name	Score
G				
h				
W				
P				
K				
l				
m				
H				
o				
L				
a				
Y				
i				
R				
U				
C				
B				
e				
J				
s				
d				
z				
A				
w				
O				
D				
n				

Letter	Resp Sound	Score	Resp Name	Score
V				
p				
x				
F				
j				
S				
X				
f				
r				
t				
M				
k				
u				
b				
T				
g				
y				
E				
q				
c				
v				
l				
Q				
Z				
N				
Total Sound:			**Total Name:**	

Appendix 2

Word and Nonword Reading Test - English			
Item	Item Type	Child's Response	Score
house	word		
body	word		
kire	nonword		
zome	nonword		
event	word		
doctor	word		
church	word		
kree	nonword		
fire	word		
stild	nonword		
gody	nonword		
ovent	nonword		
child	word		
goctor	nonword		
home	word		
tree	word		
shurch	nonword		
fouse	nonword		
doney	nonword		
money	word		
Total words:	Total Nonwords:	Total score:	

Appendix 3

Word and Nonword Reading Test - Afrikaans			
Item	**Item Type**	**Child's Response**	**Score**
huis	word		
hele	word		
gaam	nonword		
gens	nonword		
seker	word		
dogter	word		
klaar	word		
duis	nonword		
mens	word		
meker	nonword		
sele	nonword		
booit	nonword		
nooit	word		
mogter	nonword		
naam	word		
besig	word		
ɡlaar	nonword		
resig	nonword		
bierso	nonword		
hierso	word		
		Total words:	
		Total nonwords:	
		Total score:	

Appendix 4

Oral Repetition of Nonwords Test -English		
Test Item	**Response**	**Score**
dopelate		
glistering		
pennel		
sep		
contramponist		
hampent		
fot		
perplisteronk		
blonterstaping		
grall		
nate		
glistow		
frescovent		
bannifer		
stopograttic		
woogalamic		
ballop		
hond		
fenneriser		
thip		
bift		
smip		
trumpetine		

Test Items	Response	Score
sladding		
commeecitate		
tafflest		
loddenapish		
barrazon		
commerine		
empliforvent		
thickery		
tull		
clird		
rubid		
brasterer		
diller		
penneriful		
bannow		
prindle		
skiticult		
Total score:		

Appendix 5

Oral Repetition of Nonwords Test - Afrikaans		
Test Item	**Response**	**Score**
dopelate		
glistering		
pennel		
sep		
contramponis		
hampent		
fot		
perplisteronk		
blonterstaping		
grall		
nate		
glistoë		
freskovent		
bannifer		
stopograttik		
woogalamik		
ballop		
lond		
fenneriser		
sip		
bift		
smip		
trompetine		
sladding		

Test Item	Response	Score
kommeesitate		
taffles		
loddenapis		
barrazon		
kommerine		
empliforvent		
tikery		
tull		
klird		
rubid		
brasterer		
diller		
penerriful		
bannoë		
prindel		
skitikult		
	Total score:	

Appendix 6a

Bradley and Bryant's Sound Categorisation Test (First Sound) -English			
Practice Items			
Items	**Correct Response**	**Child Resp**	**Score**
rot rod rock box	**box**		
lick lid miss lip	**miss**		
Test Items			
bud bun bus rug	**rug**		
pip pin hill pig	**hill**		
ham tap had hat	**tap**		
peg pen well pet	**well**		
kid kick kiss fill	**fill**		
lot mop lock log	**mop**		
leap mean meal meat	**leap**		
crack crab crag trap	**trap**		
slim flip slick slip	**flip**		
roof room food root	**food**		
		Total score:	

Appendix 6b

Bradley and Bryant's Sound Categorisation Test (Middle Sound) - English			
Practice Items			
Item	**Correct Response**	**Child Resp**	**Score**
mop hop tap lop	**tap**		
pat bat fit cat	**fit**		
Test Items			
lot cot pot hat	**hat**		
fun pin bun gun	**pin**		
hug dig pig wig	**hug**		
red fed lid bed	**lid**		
wag rag bag leg	**leg**		
fell doll well bell	**doll**		
man bin pin tin	**man**		
fog dog mug log	**mug**		
feed need wood seed	**wood**		
fish dish wish mash	**mash**		
Total score:			

Appendix 6c

Bradley and Bryant's Sound Categorisation Test (End Sound) - English			
Practice Items			
Item	**Correct Response**	**Child Resp**	**Score**
fan cat hat mat	**fan**		
leg peg hen beg	**hen**		
Test Items			
pin win sit fin	**sit**		
doll hop top pop	**doll**		
bun hut gun sun	**hut**		
map cap gap pal	**pal**		
men red bed fed	**men**		
wig fig pin dig	**pin**		
weed peel need deed	**peel**		
pack lack sad back	**sad**		
sand hand land bank	**bank**		
sink mint pink wink	**mint**		
Total score:			

Appendix 7a

Bradley and Bryant's Sound Categorisation Test (First Sound) - Afrikaans			
Practice Items			
Item	**Correct Resp**	**Child Resp**	**Score**
pot pos pop kol	**kol**		
wit wil sin wig	**sin**		
Test Items			
ruk rus rug bul	**bul**		
dik dit min dig	**min**		
kat bad kas kam	**bad**		
bek bel pen bed	**pen**		
sin sit sig lip	**lip**		
hof pot hok hom	**pot**		
leen meet meer meel	**leen**		
krag krap kram trap	**trap**		
staal braaf staat staan	**braaf**		
roof room koop rook	**koop**		
Total score:			

Appendix 7b

Bradley and Bryant's Sound Categorisation Test (Middle Sound) - Afrikaans			
Practice Items			
Item	**Correct Response**	**Child Resp**	**Score**
nat kat pot wat	**pot**		
pen wen sin ken	**sin**		
Test Items			
gek bek rek bok	**bok**		
rug veg sug lug	**veg**		
pas vis mis kis	**pas**		
wen ken son pen	**son**		
wag sag lag tog	**tog**		
vol bul kol rol	**bul**		
man sin min win	**man**		
pop kop lap dop	**lap**		
meer hoor keer seer	**hoor**		
sien tien dien soen	**soen**		
			Total score:

Appendix 7c

Bradley and Bryant's Sound Categorisation Test (End Sound) - Afrikaans			
Practice Items			
Item	**Correct Response**	**Child Resp**	**Score**
kis sit rit wit	**kis**		
dag sag pas mag	**pas**		
Test Items			
sit dit min lit	**min**		
pot kol rol wol	**pot**		
rug bul sug dug	**bul**		
man kan van pak	**pak**		
bel pen wen ken	**bel**		
min sin dig vin	**dig**		
lees peer mees bees	**peer**		
pak sak bad tak	**bad**		
hand land bank sand	**bank**		
vink kind sink dink	**kind**		
		Total score:	

Appendix 8

Perfetti et al. Phoneme Blending Task - English		
Practice Items		
Item	**Child's Response**	**Score**
m-a-n		
f-o-r		
r-e-d		
b-a-ll		
Test Items		
s-ee		
c-a-n		
d-o-g		
i-s		
m-i-tt		
c-a-p		
s-t-o-p		
S-t-a-n		
a-p		
f-e-k		
t-i-b		
e-b		
Total Words:	**Total Nonwords:**	
	Total Score:	

Appendix 9

Perfetti et al. Phoneme Blending Task - Afrikaans		
Practice Items		
Item	**Child's Response**	**Score**
m-a-n		
v-i-r		
r-e-d		
b-a-l		
Test Items		
s-ee		
k-a-n		
d-a-g		
i-s		
m-i-n		
k-o-p		
s-t-o-p		
s-t-o-k		
a-p		
f-e-k		
t-i-b		
e-b		
Total Words:	**Total Nonwords:**	
	Total Score:	

Appendix 10

Yopp-Singer Phoneme Segmentation Test - English			
Practice Items			
Item	**Corr Resp**	**Child Resp**	**Score**
old	o-l-d		
ride	r-i-de		
go	g-o		
man	m-a-n		
Test Items			
dog	d-o-g		
fine	f-i-ne		
she	sh-e		
grew	g-r-ew		
red	r-e-d		
sat	s-a-t		
lay	l-ay		
zoo	z-oo		
job	j-o-b		
ice	i-ce		
top	t-o-p		
do	d-o		
keep	k-ee-p		
no	n-o		

Item	Corr Resp	Child Resp	Score
that	th-a-t		
wave	w-a-ve		
me	m-e		
race	r-a-ce		
three	th-r-ee		
in	i-n		
at	a-t		
buy	b-uy		
		Total score:	

Appendix 11

Yopp-Singer Phoneme Segmentation Test - Afrikaans			
Practice Items			
Item	**Corr Resp**	**Child Resp**	**Score**
min	m-i-n		
hoek	h-oe-k		
is	i-s		
man	m-a-n		
Test Items			
dag	d-a-g		
fyn	f-y-n		
sy	s-y		
gaan	g-aa-n		
rok	r-o-k		
sit	s-i-t		
lê	l-ê		
pa	p-a		
kop	k-o-p		
ys	y-s		
vir	v-i-r		
sê	s-ê		
kies	k-ie-s		
op	o-p		

Item	Corr Resp	Child Resp	Score
dat	d-a-t		
waai	w-aai		
ek	e-k		
reis	r-ei-s		
drie	d-r-ie		
in	i-n		
by	b-y		
bou	b-ou		
		Total score:	

Appendix 12

Rosner's Test of Auditory Analysis Skills - English				
Practice Items				
Instruct 1	**Instruct 2**	**Corr Resp**	**Child Resp**	**Score**
say **keyhole**	Now say it again, but don't say **key**	**hole**		
say **snowflake**	Now say it again, but don't say **flake**	**snow**		
say **address**	Now say it again, but don't say */a/*	**dress**		
Test items				
say **cowboy**	Now say it again, but don't say **boy**	**cow**		
say **steamboat**	Now say it again, but don't say **steam**	**boat**		
say **sunshine**	Now say it again, but don't say **shine**	**sun**		
say **picnic**	Now say it again, but don't say **pic**	**nic**		
say **cucumber**	Now say it again, but don't say **cu(q)**	**cumber**		

Instruct 1	Instruct 2	Corr resp	Child resp	score
say **coat**	Now say it again, but don't say /k/	**oat**		
say **meat**	Now say it again, but don't say /m/	**eat**		
say **take**	Now say it again, but don't say /t/	**ache**		
say **game**	Now say it again, but don't say /m/	**gay**		
say **wrote**	Now say it again, but don't say /t/	**row**		
say **please**	Now say it again, but don't say /z/	**plea**		
say **clap**	Now say it again, but don't say /k/	**lap**		
say **play**	Now say it again, but don't say /p/	**lay**		
say **stale**	Now say it again, but don't say /t/	**sale**		
say **smack**	Now say it again, but don't say /m/	**sack**		
			Total score:	

Appendix 13

Rosner's Test of Auditory Analysis Skills - Afrikaans				
Practice Items				
Instruct 1	**Instruct 2**	**Corr Resp**	**Child Resp**	**Score**
sê **toonbank**	Nou sê dit weer, maar moenie **toon** sê nie	**bank**		
sê **spoorweg**	Nou sê dit weer, maar *moenie* **weg** sê nie	**spoor**		
sê **skaap**	Nou sê dit weer, maar moenie */sk/* sê nie	**aap**		
Test items				
sê **laerskool**	Nou sê dit weer, maar moenie **skool** sê nie	**laer**		
sê **stoomboot**	Nou sê dit weer, maar moenie **stoom** sê nie	**boot**		
sê **sonskyn**	Nou sê dit weer, maar moenie **skyn** sê nie	**son**		
sê **digter**	Nou sê dit weer,maar moenie **dig** sê nie	**ter**		
sê **komkommer**	Nou sê dit weer, maar moenie **kom** sê nie	**kommer**		
sê **koud**	Nou sê dit weer, maar *moenie* */k/* sê nie	**oud**		

Instruct 1	Instruct 2	Corr Resp	Child Resp	Score
sê **maand**	Nou sê dit weer, maar moenie **/m/** sê nie	**aand**		
sê **trou**	Nou sê dit weer, maar moenie **/t/** sê nie	**rou**		
sê **geen**	Nou sê dit weer, maar moenie **/g/** sê nie	**een**		
sê **trein**	Nou sê dit weer, maar moenie **/n/** sê nie	**trei**		
sê **skoen**	Nou sê dit weer, maar moenie **/k/** sê nie	**soen**		
sê **klap**	Nou sê dit weer, maar moenie **/k/** sê nie	**lap**		
sê **plat**	Nou sê dit weer, maar moenie **/p/** sê nie	**lat**		
sê **skool**	Nou sê dit weer, maar moenie **/k/** sê nie	**sool**		
sê **smaak**	Nou sê dit weer, maar moenie **/m/** sê nie	**saak**		
			Total score:	

Author Cockroft K A S
Name of thesis The Developemtn Of Phonological And Reading Skills In English And Afrikaans Children Cockroft K A S 1998

PUBLISHER:
University of the Witwatersrand, Johannesburg
©2013

LEGAL NOTICES:

Copyright Notice: All materials on the University of the Witwatersrand, Johannesburg Library website are protected by South African copyright law and may not be distributed, transmitted, displayed, or otherwise published in any format, without the prior written permission of the copyright owner.

Disclaimer and Terms of Use: Provided that you maintain all copyright and other notices contained therein, you may download material (one machine readable copy and one print copy per page) for your personal and/or educational non-commercial use only.

The University of the Witwatersrand, Johannesburg, is not responsible for any errors or omissions and excludes any and all liability for any errors in or omissions from the information on the Library website.