Reading isiZulu: reading processes in an agglutinative language with a transparent orthography

Thesis submitted in fulfilment

of the requirements for the degree of

Doctor of Philosophy

at

The University of KwaZulu-Natal

by

SANDRA JANE LAND

Pietermaritzburg   January 2015

TABLE OF CONTENTS

DECLARATION

I, Sandra Land declare that

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(ii) This dissertation has not been submitted for any degree or examination at any other university.

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UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

Research Office (Govan Mbeki Centre)
Private Bag x54001
DURBAN, 4000
Tel No: +27 31 260 3587
Fax No: +27 31 260 4609
Ximbap@ukzn.ac.za

23 November 2011

Ms S Land (721720280)
School of Linguistics

Dear Ms Land

PROTOCOL REFERENCE NUMBER: HSS/1223/011D
PROJECT TITLE: Reading isiZulu: an investigation into reading processes in an agglutinative language with a transparent orthography.

EXPEDITED APPROVAL

I wish to inform you that your application has been granted Full Approval through an expedited review process:

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

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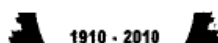
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ACKNOWLEDGEMENTS

ABSTRACT

The focus of this thesis is skilled silent reading in isiZulu. It begins by exploring the current social and educational context of learning to read and practising reading skills in isiZulu. It then considers eye movement patterns that point to proficient reading or incompetent reading, and discusses pitfalls in designing research that aims to compare reading across languages. Thereafter, by exploring measurable aspects of eye movement patterns of a group of skilled adult readers of isiZulu it offers a tentative profile of the reading processes currently exhibited by these readers. This profile indicates that with an average reading speed of 815 letters per minute, isiZulu text takes more time to read than text in other alphabetic languages, and that readers' eye movement patterns differ considerably from the patterns known to characterise proficient reading of English. The comparison is pertinent since English is the most common second language amongst speakers of isiZulu. Psycholinguistic grain size theory provides a useful frame for understanding the differing reading behaviours that appear to characterise each language.

The thesis goes on to analyse indications of automaticity in recordings of eye movement, and suggests textual factors that might be associated with immediate recognition of words or active decoding, which is the opposite of automatic recognition. Findings suggest that the agglutinative structure and conjoined writing system of isiZulu may be less conducive to the development and exercise of automaticity than orthographies of disjunctive languages.

Finally, through a process of using the records of each reader's moving point of focus as a stimulus for recall the intricacies of the cognitive experience of reading of each participant are explored. Their finely detailed accounts are used to identify strategies consciously used by competent readers of isiZulu. Some of these strategies, such as visualisation, are common to efficient readers of all languages, while others might be peculiar to agglutinative and/or tonal languages. These strategies inform suggestions that may be helpful to educationalists in enhancing the development of effective reading skills in isiZulu.

TERMS USED

Agglutinative language	Language in which meaning is modified by short morphemes that cluster round word stems
Disjunctive language	Language in which meaning is modified by separate words
Orthography	The way in which a language is written
Transparent orthography	Orthography in which pronunciation can be accurately predicted from spelling
Opaque orthography	Orthography in which pronunciation cannot be accurately predicted from spelling
Consistent orthography	Orthography in which letters always represent the same speech sounds
Conjoined orthography	Orthography in which morphemes coalesce into single words
Disjunctive orthography	Orthography in which morphemes are represented as separate words
Phoneme	A single speech sound
Morpheme	The smallest unit of language which holds meaning
Grapheme	Written symbol(s) representing a speech sound
Fixation	Point of momentary visual focus
Saccade	Movement of the point of visual focus between successive fixations
Regression	In reading alphabetic script, a movement of the point of visual focus to the left, to relook at text that has been passed
Automaticity	Instant association of combinations of letters with the words or units of language they represent

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION AND METHODOLOGY

INTRODUCTION

INTRODUCTORY STATEMENT

This thesis represents a PhD by publication. In the ensuing chapters, five papers are presented that together explore issues relating to the exploration of skilled silent reading in isiZulu.

Each of the five papers addresses a different issue related to reading in isiZulu. Following this introductory chapter, the first paper (Chapter 2 of this thesis) provides the background and context of the acquisition and exercise of reading skills in isiZulu, and the second (Chapter 3 of this thesis) describes a pilot study and the issues arising from this pilot study. The other three papers (Chapters 4, 5 and 6 of this thesis) present different aspects of a piece of research that followed the pilot, was based on a much larger sample than the pilot, and was the source of data leading to the conclusions presented in this thesis. Papers in chapters 2 and 3 have been published, those presented in Chapters 4 and 6 have been accepted for publication, and that presented in Chapter 5 has been submitted to an academic journal.

Chapter 7 of the thesis summarises the conclusions of the five papers.

Because of the word limits on articles set by academic publications, and since five of the seven chapters constituting this thesis are articles written for publication, this PhD thesis is possibly shorter in length than most traditional doctoral theses. However, as is often the case in writing for publication, it was difficult to present the information in a succinct enough format to conform to word limits required by journals, and I believe that the restricted length does not reflect any restriction relating to the content. Since the papers that constitute Chapters 2, 3, 4, 5 and 6 of this thesis were written as separate stand alone papers and submitted to separate publications, there is repetition in explaining relevant linguistic

1

concepts and information about eye movement research and reading, and, in the papers that refer to the main data collecting exercise, an account of this exercise. This is unavoidable in a dissertation by publication.

Origins of the research idea

The complementary papers that make up this study relate to skilled reading in isiZulu, the most widely spoken of indigenous Southern African languages. Literature searches yield no evidence of other studies that have looked at skills developed by mature, competent readers of isiZulu orthography. Studies by other Southern African researchers of reading in African languages (Pretorius & Mokhwesana, 2009; Van Rooy & Pretorius, 2013; Verbeek, 2010; Trudell & Schroeder, 2007), are directed more towards the acquisition of skills by beginner readers than towards the exercise of well developed skills by adept readers.

My own experience of reading in isiZulu and English led to the research reported on in this thesis. I grew up on a forestry estate in a rural area in KwaZulu-Natal and learnt isiZulu naturally as a second language from childhood playmates and estate staff who could speak only isiZulu. I studied isiZulu as part of my undergraduate degree at the then University of Natal, and gained some insight into its formal structure and grammar, but my reading skills lagged behind my confidence as a speaker of the language, and I seldom attempted to read it. That changed some years ago when, on impulse, I extended an invitation to students who were struggling to write articulately in formal English to submit their assignments in isiZulu. Their unexpectedly enthusiastic response led to my having to read a large amount of isiZulu text in a limited amount of time. This concentrated practice led to a rapid improvement of reading skills in isiZulu, and an awareness that the improvement was due to the refinement of reading processes that contrasted with processes associated with reading English text. In spite of this awareness, I was unable to clarify exactly what the differences between the reading processes were because they seemed to be automatic and inaccessible to conscious examination.

Some months later, I gained some insight into the processes while driving around New Zealand's North Island with monolingual English speaking companions. As newcomers to New Zealand, the Maori place names (e.g. Manawatu-Wanganui, Taumarunui) were equally

unfamiliar to all of us, but it was immediately clear that I was more able to decode the names than the others. It was also clear to me that I was reading the longer place names in the same way that I read text in isiZulu, and if reading aloud, was saying the beginning of the names without knowing how the end would sound. My monolingual companions took much longer than I did to arrive at any way of pronouncing the words, and appeared to default towards English pronunciations of letter combinations wherever there was any parallel. Their efforts struck me as similar to the way Indian and Sri Lankan surnames are written in English, presumably initially by English clerks, where syllable combinations reminiscent of English words are spelt as if they were English words. For instance, the official written form of the surname that is pronounced 'Maslamani' is 'Maslamoney'.

Anecdotal as it is, this observation raised the question of whether the orthography in which one acquires and practices reading skills shapes readers' micro processes and strategies in reading text.

REASONS FOR PURSUING THE RESEARCH IDEA

In his speech to the African Languages Steering Committee in September 2011, Dr Blade Nzimande, the Minister of Higher Education, called for the development of African languages as languages of learning:

> "... we need to move speedily in making the development of African languages a reality at our universities. The development of African languages as languages of scholarship is an imperative that we all need to commit ourselves to. It is not for government alone to see to it that African languages get their rightful place in our society, but indeed this is the responsibility for all of us. Academic institutions, language practitioners and broader society should all come on board to ensure that African languages are strengthened at universities and in society as a whole. (Nzimande, 2011).

Research on reading in African languages is vital to the development of African languages as languages of learning. In addition, it also offers information that may be helpful to educationalists working to address the problems and shortfalls in South Africa's basic education system.

Literature searches show that although the number of studies of reading in European languages is growing, the majority of reading research continues to be carried out in the United States and Britain, and therefore the focus of most research in reading continues to be

on the reading of English text. As an inevitable consequence, available information on reading is likely to be skewed towards the reading behaviour of readers of English text. Therefore, currently debated models of how we acquire reading skills, how we combine multiple sub-skills in order to read, and the ways in which reading is measured and recorded are geared towards the orthography of English. Yet English has particular characteristics that are not shared by many other languages. In fact, its orthographic peculiarities are so different from other languages that it has been described as an "outlier orthography", from which generalisations for reading in other languages cannot be made (Share, 2008, p. 584).

Because of the political history of South Africa, English has high status in this country in relation to indigenous Southern African languages. It is popularly associated with superior education, and, as explained in Chapter 2, often automatically accepted as the optimal language of learning and teaching. Perhaps on account of this, and because of the absence of information relating to reading in indigenous African languages, there appears to be a tendency among South Africans working in education to simply generalise what is known or assumed about reading in English to indigenous languages. Thus they plan and teach according to these generalisations. However, studies of differences in reading patterns developed by readers of the orthographies of different European languages indicate that competent readers of orthographically transparent European languages use processes that are fundamentally different to the processes used by competent readers of English (Ellis et al., 2004; Georgiou et al., 2008; Ziegler & Goswami, 2005; and Manolitsis et al., 2009). This suggests that strategies that are effective in reading in English might not be effective in reading in isiZulu.

LEARNING TO READ IN KWAZULU-NATAL

English and isiZulu both use the Roman alphabet, but have very different orthographies. In KwaZulu-Natal, many children attempt to develop reading skills in both these languages simultaneously, and most of them fail to learn to read effectively. Children who speak indigenous African languages at home face particular adversity, since for them the language used as medium of education changes in their fourth year of schooling from their home language to English (or, for a few, to Afrikaans), which is fundamentally different in structure and orthography from African languages. From then on they must learn through a

second language. This immensely disempowering shift effectively divides children along the old apartheid fault line, except that some privileged black children have joined advantaged white children (Land, 2012). Yet even before the shift happens, most children struggle with reading: every year South Africa's Annual National Assessment tests show that the most privileged 20% of children (in ex-white and ex-Indian schools), perform well but that the performance of children who are learning to read in indigenous African languages is, on the whole, very poor (Taylor, 2011: 10-11; Department of Basic Education, 2012 and 2013) with average literacy scores among Grade 3 learners across the country below 40%. Averages of learners in grades 4, 5 and 6 tend to be even worse: in 2012 ANA tests, average marks for home language literacy were in the 20s and low 30s, rising about 10% in the ANA tests of 2013 (Department of Basic Education, 2013). Results from the end of school Grade 12 examinations look superficially more encouraging, with pass rates of 70% or more. However, the conditions for passing Grade 12 are extremely low, more than 50% of learners registered in Grade 1 never reach Grade 12 (Ramphele, 2012), and 33% of Grade 11s do not continue to Grade 12 (Taylor, 2011).

Reading performance is lowest in South Africa's most poorly resourced schools where practically all the children are speakers of indigenous African languages. According to the 2011 ranking by Southern and Eastern African Consortium for Monitoring Education Quality (SAQMEC lll), the reading performance of students at these schools ranked 14th out of 15 African countries (Taylor, 2011).

One of the factors often called into question in debate of children's poor performance is the quality of teaching carried out by South African teachers. Most of them are themselves products of apartheid's notorious Bantu Education system and efforts to upgrade their levels of understanding and teaching expertise since the end of apartheid have been neither well planned nor effective (Mather and Land, 2014). Those few teachers who have been well trained to teach reading have invariably been trained to teach reading in English or Afrikaans, and are seldom given any guidance in teaching reading in African languages. This is hardly surprising since as yet not much is known of the differences in readers' optimal responses to different orthographies.

Usually, notwithstanding the fundamental differences between the orthographies of European and African languages, it is assumed that student teachers should, can and will simply apply

what they have learnt about how to teach reading in English to the teaching of reading in African languages.

If more information was available about the implications that the differences between the orthographies of English and isiZulu have for readers, it is possible that strategies could be developed to better equip South African teachers of reading.

Differences between English and isiZulu orthography

Use of the Roman alphabet as a script for isiZulu

It has been suggested (de Vos & Katz, 2013) that symbols representing whole syllables might have been a better writing system for African languages than the Roman alphabet. If settlers from Europe had not colonised Southern Africa and invented writing systems for the languages they found there, the Ethiopic script might have made its way to the southern end of the continent and been adopted by speakers of Bantu languages. Ethiopic script, which is an adaptation of the South Arabian script, represents a syllabary consisting of 182 symbols, each of which represent a consonant + vowel combination (Comrie, Matthews, & Polinsky, 2003).

Indigenous South African languages have a general Consonant – Vowel pattern of syllables, so would be well accommodated by syllabic symbols such as those of Ethiopic script, especially since only five vowel sounds need to be represented, and the restricted number of permitted syllables would have served to limit the number of symbols needed to represent them. Such a system would have the advantage of reducing the length of words because single symbols would represent speech sounds that require two or more letters in the Roman alphabet, for example, ngu- and ba-, and even possibly syllables with multiple consonants such as –ntsha and -nywa. This might have the effect of easing and speeding the process of learning to read, and increasing the reading speed of competent readers. Thus the Roman alphabet might not be the most elegant or appropriate vehicle for representation of Southern African languages in print, and its use might present readers with particular challenges. However, with writing systems using the Roman alphabet now established and in use for indigenous languages of South Africa, and a growing body of literature printed in this

alphabet, it is simply too late to change scripts. At least use of the Roman alphabet carries the advantages of using the same writing system as many others of the world's currently dominant languages, and as a consequence, the benefit of transfer of learning when learning to read in different languages.

ORTHOGRAPHIC DEPTH AND CONSISTENCY

Because of the irregular relationship between the phonemes of spoken English and the letters used to represent them in its orthography, English orthography is described as "opaque" (Ziegler et al. 2010; Share 2008), "deep" (Frost, 2007) and "inconsistent" (Ziegler & Goswami 2005) relative to other writing systems. Opacity and depth refer to the abundant instances in English where letters do not represent the sounds they are first associated with, and inconsistency to variations in the speech sounds they stand for. To cope with these features of English, readers must learn to discern and remember where letters they see are voiced in line with the rules they first learn on beginning to read, such as "dog", where they are voiced in ways contrary to the originally encountered rules, such as in "word", and "cough", and where they are not voiced at all, as in words such as "through", "knife" and "league".

In contrast, Zulu orthography is seen as transparent and consistent; its graphemes are pronounced with perfect consistency, so that rules first learnt for pronouncing them can be reliably depended upon. Apart from a small number of easily learnt digraphs, such as "hl", "dl", "gq" and "ng", letters represent the sounds first associated with them.

AGGLUTINATION AND WORD LENGTH

English is a non-agglutinating, disjunctive language, which means that, apart from tenses and plurals, modifiers in meaning tend to be in the form of separate words, such as "not". This has the effect of making English words short even relative to other European languages, as is demonstrated in subsequent chapters. In contrast, a feature of the orthography of isiZulu is a high number of long, complex words. This is because isiZulu has the highly agglutinative

structure of Nguni languages, in which meaning is modified by short conjoined morphemes that cluster round word stems. This is explained and exemplified in ensuing chapters.

MEASURABLE COMPONENTS OF SILENT READING

Silent reading of continuous text has been difficult to research because the processes involved are largely internal, and, once a certain level of skill is attained, below the level of awareness. Usually, the only externally observable activity is eye movement, which, until recently, has been impossible to measure.

However new eye tracking technology has facilitated substantial growth of information on silent reading (Liversedge & Findlay, 2000), and raised questions about different orthographies and their implications for readers (Hutzler et al. 2004; Ziegler & Goswami 2005; Georgiou et al. 2008). Eye movement recordings yield information on:

- fixations, which are the points in text that are focussed on as a reader progresses through lines of text,
- the duration of each fixation,
- the span of recognition, which is the number of letters recognised in a fixation,
- saccades, or the distance between consecutive fixations,
- and regressions, which are movements to the left made when a reader fixates on points in the text already passed.

Researchers now tend to agree that eye movements are determined by cognitive processes, and therefore that analysis of eye movement yields information relating to these processes (Paulson, 2005; Reichle et al. 2008; White 2008). By extension, their analysis could possibly show how reading processes might be shaped by different language structures and different orthographies.

When I observed a demonstration of the reading development programme Reading Plus[1] and the Visagraph eye tracking equipment, it occurred to me that recordings made on this system

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[1] The Reading Plus software and the Visagraph equipment are described under "Instruments" below

would possibly yield information relating to differences in reading strategies. This was because the equipment registers and records a reader's point of focus as they read, and can present the recording in various forms, including a mapping of successive fixations on an electronic version of the text read, so that the point of focus appears as a type of cursor moving from fixation to fixation on the letters of the text. The recorded movement can be replayed at different speeds, thus affording opportunities for detailed examination as it is played in slow motion.

The strong association between fixations and attention (Paulson, 2005; Miellet et al. 2009) implies that analysis of the patterns of these fixations can yield information about cognitive reading processes, and hence about how reading processes might differ across different orthographies or different languages. Consideration of this raised the question of whether records of eye movements would reveal differences between reading processes that characterised competent reading in English and isiZulu.

This led to my beginning negotiations with Reading Plus to create a package with texts taken from isiZulu novels and supplied by me. This took almost a year, but eventually resulted in their developing what they termed an "IsiZulu package", which was a programme based on the set of texts described in chapters 4, 5 and 6 of this thesis. The programme enabled me to map the eye movements of competent readers of isiZulu directly onto isiZulu text in a way that lent itself to close examination of the eye movements played in slow motion after the recording was made.

While awaiting the development of this package, I used the Visagraph eye tracker in a pilot study described in Chapter 3 of this thesis. In this pilot study I substituted texts in isiZulu for English texts in the Reading Plus programme and used these to record the eye movements of thirteen adults who saw themselves as competent readers of isiZulu. Although this strategy did not allow eye movements to be mapped onto the isiZulu text, it did allow me to conduct this pilot study that was useful in that it revealed several pitfalls that jeopardise studies of reading in different languages. These pitfalls are described in chapter 3 of this thesis, and include:

- the impracticality of using words per minute as a measure of reading rate across languages with different word structures,
- impediments to comparing levels of difficulty of texts in contrasting languages,

- obstacles in comparing reading across languages, such as differing levels of language competence that cloud the issue if someone serves as their own control, and the sheer number and range of factors that impact on reading skills, making it impossible to control for them in order to perform a matched pairs study.

The main data gathering exercise that followed this pilot and is reported on in chapters 4, 5 and 6 was designed to avoid these problems, and focussed entirely on reading in isiZulu.

PURPOSE OF THIS STUDY

The aim of this study was to explore skilled reading of isiZulu, taking into account the background context and the exercise of reading skills. Proficient reading of isiZulu was explored through recorded eye movement patterns exhibited by competent readers of isiZulu text, and through the personal accounts of these readers as they linked features in their own recorded eye movements with their experience of construction of the meaning of the text. Participants' matching of their own recorded eye movement patterns with their recollections of their reading experience from a cognitive point of view proved to be valuable in exploring the reasons for particular patterns.

It was useful to compare these patterns to those already benchmarked for reading in English since, as noted above, in most KwaZulu-Natal schools learners learn to read in these two languages. Thereafter, because of the dominance of these two languages in KwaZulu-Natal (Van der Merwe & van der Merwe, 2006) the reading that they do as adults is likely to be in these two languages. Apart from the value of discovering the strategies of competent readers of isiZulu orthography as part of researching an indigenous language, what is discovered about these strategies automatically leads to some suggestions for effective training of South African educators who will teach reading in isiZulu and English.

RESEARCH DESIGN

RESEARCH PARADIGM

This research project is primarily within the post positivist paradigm, since it draws on previous studies, and analyses measured and quantified elements of eye movement patterns; it differs from pure positivism in acknowledging the potential for fallibility in design, data collection and interpretation. Both descriptive and inferential statistical analysis is used in order to develop a profile of proficient readers of isiZulu, and to discover patterns of correlation and contrast within the records of the samples tested both in the pilot study and the main data gathering exercise, and in comparison with data from studies of readers of other languages.

The study also draws on the interpretivist paradigm in that, as noted above, in the main data collection exercise, each participant joined with the researcher in a close examination of their own eye movement records while the reading experience was still fresh in their short term memory. In this exercise, recorded eye movement served as the stimulus in a process of stimulated recall, during which the reader attempted to recall the cognitive elements of their own reading experience, and where possible, to match them with observed features in the eye movement record. This component of the research falls within the interpretivist paradigm since it involved exploring each reader's subjective reading experience, and noting their own interpretations of features in their eye movement records, as they matched these features to elements in their recall of the reading experience. Thus data gathered in this way reflected their own individual moment by moment experience, located in a very particular context, and their own construction of the meanings of the reading experience and of the content of the text are at the core of data collected at this point of the study.

RESEARCH FOCUS AND KEY QUESTIONS ADDRESSED

This study set out to explore skilled reading in isiZulu, and to discover whether skilled readers develop and use reading strategies and processes that differ from those developed by proficient readers of English. In this endeavour it aimed to measure and analyse eye movement patterns, and to link these with cognitive elements of the recalled reading experience. It further aimed to discover whether any effective strategies naturally developed

by skilled readers in response to the orthography of isiZulu could be profitably incorporated into the teaching of reading of reading in isiZulu.

Particular research questions addressed in ensuing chapters are:

In what context do readers of isiZulu develop and practice their reading skills?

What can eye movement records tell us about reading in an agglutinative, orthographically consistent African language?

How do reading patterns shown by competent readers of isiZulu compare with reading patterns shown by readers of other languages?

How does automaticity function in competent reading of isiZulu as an orthographically transparent agglutinative language?

Are there particular textual features of the orthography of isiZulu that facilitate the development and application of reading skills, or that make particular demands on readers?

How do readers of isiZulu text cope with the absence of signals of tonality in its orthography, and how do they resolve uncertainty?

Are there specific strategies that teachers could use to develop effective reading skills among adults or children learning to read in isiZulu?

THEORIES INFORMING THE RESEARCH

Frost's orthographic depth hypothesis (2007) suggests that in transparent orthographies, where readers can count on a regular relationship between orthographic cues and phonology to predict the pronunciation of words from their spelling, they tend to read by mentally reconstructing speech sounds as they progress through texts. Ziegler and Goswami's psycholinguistic grain size theory (2005), is related to the above hypothesis and suggests that readers of transparent orthographies are likely to rely on small grain size units of text, thus processing text in chunks of only a few letters at a time, such as single syllables. This strategy contrasts with whole word recognition which seems to be the most effective strategy for reading languages with an inconsistent orthography or irregular sound-letter correlation. Psycholinguistic grain size theory (Ziegler & Goswami, 2005) suggests that isiZulu text, with

its orthographically transparent representation of an agglutinative language, presents readers with a profoundly different reading experience than English text, as an orthographically opaque representation of a non-agglutinative language. Information from this study, presented in the following chapters, resonates with this suggestion, since it indicates that eye movement patterns and reading strategies associated with well-developed reading skills in isiZulu differ from those of English even more than the patterns and strategies observed by European researchers among readers of other European languages (Ellis et al., 2004, Georgiou et al., 2008, Ziegler & Goswami, 2005, and Manolitsis et al., 2009).

METHODOLOGY

Reading is essentially an inner cognitive process that cannot be directly observed; also, as readers' competence develops, they become less and less aware of the sub-skills they combine in this extremely complex activity. Because of this, reading researchers must devise methods of deducing the processes involved in reading from observable behaviour (Yoshida, 2008). Rapidly developing technology in eye tracking methodology has enabled researchers to learn a great deal more than was previously possible about the cognitive processes involved in reading, and there is a fast growing body of research that draws on the analysis of eye movements recorded during silent reading, and relates these movements to cognitive processes (Reichle et al., 2009; Rayner et al., 2007; Rayner, 2009; Paterson et al., 2011).

The rationale for using eye movement to deduce elements of cognition in reading rests on the association between the direction of attention and fixations (Paulson, 2005; Miellet et al., 2009). While the parallel is not always exact[2], it is clear from numerous studies that both the direction and duration of fixations are strongly linked to the predictability, familiarity and orthographic features of words, and of features of sentences and the discourse of a text (Rayner et al., 2007), and therefore records of fixation patterns can be used to trace patterns of cognition in reading.

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[2] For example cognitive integration of meaning contained in text to the left of the point of focus might continue while the reader pauses momentarily, as expressed by some participants in this study; as one said "I landed in a safe place to think".

S<small>AMPLING</small>

In the pilot study described in Chapter 3, a sample of 13 readers was used. All 13 volunteered to participate in the study. They saw themselves as proficient readers of isiZulu but no screening test was used to check on their reading rate or level of comprehension.

For the main data gathering exercise a purposive sampling process was used to select competent readers. Since there are as yet no standardised measures of reading proficiency for isiZulu (Van Rooy & Pretorius, 2013), a call was made for volunteers who regarded themselves as proficient readers and who were interested in participating in research relating to the reading of isiZulu to self-select for a screening test. The call was made to the whole community of the University of KwaZulu-Natal (UKZN), copies of it were inserted into isiZulu newspapers for sale in a shopping centre, and sent to journalists on an isiZulu language newspaper and publishers of isiZulu texts, since they were likely to read isiZulu texts in the course of their everyday work, and to have become competent through extensive practice. Approximately 150 people responded and volunteered to undergo a timed silent reading test (Appendix 1). The text used in this screening test was an excerpt from a speech by the South African Minister of Education arguing for the academic development of indigenous languages. The most efficient 25% of respondents (38 of them) were selected on the basis of their reading speed and accurate recall when asked to recount the content of the text. In giving their account of the content, participants could choose to use isiZulu or English, or a mix of the two languages. As the researcher is a fluent speaker of isiZulu there was no need for an interpreter. All of the 38 selected participants read the text in under a minute and gave a coherent and accurate account of its content.

The eye movements of these 38 people were recorded using the Visagraph eye tracking equipment (see description below) as they read selected texts (see description below).

Five participants were subsequently excluded because of imperfect recordings. All of the remaining group of 33 were first language speakers of isiZulu. The group ranged in age from 16 to 61, with 4 under 20, and another 4 over 50 (so 75% between 20 and 50), and included:

- 15 women and 18 men;
- 5 full time university students and 4 high school students who were at the top of their grade in isiZulu;

- 24 professionals, (11 of whom were also part time post graduate students), including lecturers of isiZulu, journalists on an isiZulu language newspaper, publishers of isiZulu texts, and educators.

INSTRUMENTS

Instruments used in this study were selected texts and specialised eye movement recording equipment and software.

In the pilot study, texts from a website on the history of the Zulu people offering parallel accounts in English and isiZulu was used.

In the main data gathering exercise that followed the pilot, texts selected were excerpts from five isiZulu novels published between 1953 and 1992, and written in isiZulu (and therefore are authentic and natural texts as opposed to texts translated from other languages) (see Appendix 2). I did consider using newspaper texts and spent some time scanning newspapers in search of suitable blocks of text. However, it was extremely difficult to find text that was not littered with place names, personal names, dates and references to English names of events and objects (e.g. "the Africa Cup of Nations"). As a result I turned my attention to Zulu novels in the library. To my concern I found these occupied not more than a metre of shelving space in the library, but this was more than sufficient to yield a number of passages without terms from other languages. I am happy to say that when I raised my concern about the small collection of novels with the librarians they devoted R80 000 of their budget to extending their collection of books in isiZulu.

A grading system for judging the difficulty of isiZulu texts does not yet exist[3] . Therefore three lecturers in the Centre for Adult Education at UKZN who were first language speakers of isiZulu were asked to form a focus group, in which they read a selection of one page texts, discussed them as examples of isiZulu literature, and ranked them in terms of their own perception of the degree of reading ease or difficulty. In their opinion, the five texts selected

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[3] According to a personal email communication 2013/04/12 from Sabelo Zulu, of Shuter & Shooter Educational Publishers, the largest publishers of isiZulu educational texts in the country.

represented isiZulu literature well, and they judged two of the texts to be easy to read, and three to be more demanding on readers. The selected texts were then slightly adapted to suit the Visagraph equipment and Reading Plus software used in this study. Requirements were that the texts had to be in Times Roman 14 point font, with 1.5 line spacing, and that there were exactly100 words in the lines between the first and last lines of the text. This last requirement is because eye movements on the first and last lines are not included in the record, so as to exclude the processes of getting started and coming to the end of a text. Thus the measured part of each text consisted of 100 words, but the number of lines ranged from 14 to 17. Although the lecturers who had judged the texts had done so on the basis of their intuition, their assessment matched measures of textual complexity: The two texts judged to be the easiest to read comprised 19 and 14 short, simple sentences respectively, and the three judged to be more difficult comprised 9, 10, and 6 longer, more complex sentences.

Vocabulary and expressions in the easier texts tended towards high frequency words and expressions common in isiZulu currently spoken in urban areas, and those in the more difficult texts included words and expressions associated with what is now referred to as "deep" isiZulu, which tends to be spoken in remote rural areas, and is the basis of formal studies in isiZulu.

Table 1: Characteristics of texts (excluding first and last lines).

Texts	Word count	Letter count	Line count	Sentence count
1. Sengikhulile	100	765	16	19
2. Ubudoda abukhulelwa	100	747	14	14
3. Amahlaya alala insila	100	831	17	9
4. Ukufika Kosuku	100	762	14	10
5. Ingwe idla ngamabala	100	749	15	6

After the first four recordings in the main data gathering exercise it became clear that reading five texts and going through the stimulated recall process required for linking eye movements to thought processes in reading each one was too demanding on participants; they were tired after four texts. Therefore text D (see Appendix 2) was omitted. Reasons for choosing to omit this text were that it was similar in terms of vocabulary and perceived difficulty to Text C, and all four readers said it was the least interesting of the five originally selected.

Another change in the process related to the method used to check on readers' comprehension of the text. The Reading Plus programme was designed primarily as a reading improvement programme, and part of its format is the inclusion of a set of ten True / False questions for each text used. Therefore a set of ten True / False questions was devised for each of the selected texts (see Appendix 2), and read out to the first four participants, who were asked to respond orally. However, the implementation of this testing technique had a significant effect on participants and on the power dynamics in the recording situation. If they got one or two of the questions wrong, their sense of themselves as cooperative, empowered partners in the study seemed to evaporate, and, in spite of encouragement given to them, they showed signs of seeing themselves as failed candidates, and the researcher as a critical examiner. This clearly presented an intolerable limitation on the study because part of the data collection depended on the relaxed and confident participation of each reader as he or she joined the researcher in a detailed examination and discussion of recorded eye movement patterns and the thoughts each participant could recall that arose as they read and possibly shaped their reading behaviour. Because of this, instead of the True / False questions, readers were asked to recount what they were able to recall of the content of each text immediately after reading it. All but one of the participants, who grew tired towards the end of the process, gave coherent, sensible accounts of the content of the texts, just as they had done of the text used in the screening test.

Readers' eye movements were recorded using the Visagraph testing apparatus and Reading Plus software. The system uses infrared differential reflectivity to detect eye movement through receptors lodged in a glassless mask worn by readers. The mask is connected to a computer via a flexible 2.4m computer cable, allowing completely free head movement. It registers eye movement, at a sampling speed of 60 Hz (Compevo, 2012). Records reveal each reader's patterns of fixations, regressions, reading rate, and inter-eye coordination (Compevo, 2012). The system works in natural light, and was particularly useful for this research

because it is designed to be used with a laptop computer, so the researcher could meet participants wherever was convenient for them.

The Reading Plus software was created by the Reading Plus organisation in the United States and adapted particularly for this piece of research. It incorporated the texts described above and enabled the mapping of each reader's eye movements directly onto electronic versions of the texts as he or she read. It enables the recording to be viewed as a moving cursor on the electronic text, which can be viewed at half or quarter speed, or as graphs (see Figures 1, 2 and 3 in Chapter 5 below).

DATA COLLECTION

Quantitative and qualitative data were collected in both the pilot study and the main data gathering exercise. Quantitative data, in the form of recorded eye movement patterns, were collected, recorded and analysed by means of the Visagraph and Reading Plus software. Qualitative data were collected in the main data gathering exercise through discussion and a stimulated recall process, recorded on a voice recorder, and analysed with a view to gaining insights into each reader's experience of reading. This data collection process took approximately one hour for each participant. It started with a voice recorded discussion of the participant's reading habits and attitudes towards reading (see Appendix 3), and continued with their silent reading of each of the selected texts. As they read each one, their eye movements were recorded and automatically analysed by the Reading Plus software, and the reading of each text was followed by a check of their understanding of the content through their recounting of what they had understood of the text. Since the researcher is a fluent speaker of isiZulu participants were free to use either isiZulu or English to do this. Most used isiZulu to do this, although some, particularly the younger participants, switched between languages. Next, with the reading experience still fresh in short term memory, the reader participated with the researcher in a detailed examination and discussion of the recorded eye movement, mapped directly onto the electronic version of the text. In this part of the process, a moving cursor representing the movement of the reader's point of focus as he or she progressed through the text was used as the basis for stimulated recall of cognitive elements of the reading experience. The reader followed the recorded progress of his or her own point of focus (sampled 60 times per second, but played at quarter speed) over the lines of text, and

recalled her experience of constructing meaning as she read. Indications of hesitation, quick recognition, and the slower processes of word decoding, all of which occur at the level of fractions of a second were considered, and linked wherever possible with what the reader recalled of how he or she had constructed the meaning of the piece of text in view.

Information from this dual process was used to explore the relevance of psycholinguistic grain size theory for reading in Zulu, and to discover the features in text associated with ease of accessing information, as well as those associated with difficulties in deciphering text.

DATA ANALYSIS

QUANTITATIVE DATA

As noted above, quantitative data collected in this study relates to participants' eye movement during their silent reading of selected texts. The Reading Plus software used in conjunction with the Visagraph equipment automatically measured quantified, recorded and analysed these eye movements, producing a set of scores for each reader as they read each of the selected texts in the main data gathering exercise. With 33 readers reading four texts each, 132 reading sessions were recorded. For each of these recordings, each reader's scores represented:

- Words per minute
- Fixations per 100 words
- Regressions per 100 words
- Saccade length
- Duration of fixations

Taking into account the number of words, letters, lines, and sentences in each text, and the time taken to read it, further calculations were done to arrive at letters per minute, and to compare readers' scores in each of the above categories for each text. Inferential statistical analysis (Pearson product moment correlation, and the Tukey test) was carried out to discover the extent to which textual factors were related to measurable aspects of reading including word recognition, saccade length, refixation and regression, and to analyse the variance of

measured aspects of reading across the texts. Data analysis specific to each aspect of the study is described in each of the papers presented in the following chapters.

QUALITATIVE DATA

The discussion and a stimulated recall process used to collect qualitative data yielded data relating to each reader's experience of reading, both in the long term, and the immediate moment by moment experience of reading each of the selected texts. Elements of the experience that were recalled by readers as they followed the recorded point of their visual focus replayed in slow motion on an electronic copy of each text provided insight into the cognitive processes linked to their eye movements, and as a result of this information, the researcher was able to link features such as pauses, regressions, and refixations with the process the reader was engaged in of making sense of the information contained in the text. This was extremely useful, since eye movement records are simply measurement of movement and cannot offer definite information on cognitive processes.

OVERVIEW OF CHAPTERS

Apart from the introductory and closing chapters, this thesis is presented as a collection of papers. The paper presented as Chapter 2 provides the background context for the others, with particular reference to the unequal status of English and isiZulu in the province of KwaZulu-Natal. The surrender of speakers of indigenous languages to the hegemony of English has had the effect of retarding the development of isiZulu as a language of learning and reading. Yet the use of mother tongue as a language of learning and teaching, and of the advantages of the development of reading skills in mother tongue are increasingly valued (Alexander, 2006; Alidou & Brock-Utne, 2006; Postma & Postma, 2011) and greater insight into skills naturally developed by highly competent readers of isiZulu could be used profitably in the promotion and development of isiZulu as an academic language.

The paper in Chapter 3 presents a pilot study with a small sample that addresses conceptual and practical difficulties encountered in a pioneering study of reading in an African language, and in attempting to make comparisons with research findings from studies of reading in

another language. It reflects particularly on the relevance of the Psycholinguistic Grain Size Theory to this issue, as well as possible differences between measurable processes in the reading of English text and of isiZulu text, and on problems that can limit the validity of this kind of study. These included

- complexities involved in comparing the relative degree of reading difficulty of texts in profoundly different languages, difficulties in translating cultural content of each text, and of finding a culture free text; in comparing the degree of reading difficulty of texts in profoundly different languages, and the implications of translation and cultural context of texts;

- the effect of observation on the reading behaviour, and the impossibility of knowing how closely the recorded scores reflect unobserved reading under natural conditions;

- limitations of using a comparison of the same person reading passages in different languages to draw conclusions about the demands of each language and orthography, since differing levels of competence between first and additional languages, and the carry-over effects of reading habits learned early in life inevitably affect scores;

- inapplicability of readability indexes developed for English to other languages, and the need for measurements that accommodate cross lingual comparisons.

Papers presented in subsequent chapters (described below) relate to the particular processes and patterns shown by competent readers of isiZulu, in the main data gathering exercise that followed the pilot, and designed to avoid the problems discussed in Chapter 3. They are based on data gathered from the sample described above, which was large enough to be of statistical significance. This data were gathered with the aim of answering the following research questions:

- What can eye movement records tell us about reading in an agglutinative, orthographically consistent African language?

- How do reading patterns shown by competent readers of Zulu orthography compare with reading patterns shown by readers of other languages?

- How does automaticity function in competent reading of Zulu as an orthographically transparent agglutinative language?

- Are there particular textual features of Zulu orthography that facilitate the development and application of reading skills, or that make particular demands on readers?

- How do readers of Zulu text cope with the absence of signals of tonality in its orthography, and how do they resolve uncertainty?

These questions all relate to the central question referred to above, which is whether readers develop and use different reading processes in response to different orthographies, in this case those of English and isiZulu, and whether these can shape aspects of reading behaviours, including eye movement patterns and reading rate.

The paper that constitutes Chapter 4 presents an overall profile of competent readers of isiZulu. It does so through an analysis of the recorded eye movements of the proficient adult readers who participated in this research, and a comparison of the patterns of their eye movement with the eye movement patterns accepted as representative of competent reading of English. This comparison is particularly relevant because English is the second language of almost all readers of isiZulu, is used as the medium of instruction from the fourth year onwards in almost all schools in KwaZulu-Natal, and is the most predominant language of print and electronic text encountered by native speakers of isiZulu.

A paper that explores automaticity in the reading of isiZulu text as revealed in eye movement records of research participants is presented as Chapter 5. In this exploration, the recordings of eye movement are used to discover which types of words were immediately recognised by readers, and which readers needed to actively decode. It uses this information to explore features of isiZulu text that impact on the visual distinguishability of words, which is central to the development and exercise of automaticity in reading.

Chapter 6 constitutes a paper that draws attention to strategies used by participants in this piece of research to cope with the particular demands of the orthography of isiZulu as an agglutinative language with a conjoined writing system. It links processes used by these competent readers with considerations for the development of effective reading skills of children and adults who are learning to read in isiZulu, and points to the implications of these strategies for reading development programmes reading teachers.

Chapter 7 presents an overall summary of the findings and conclusions of this piece of research. These findings suggest that skilled readers of isiZulu use processes and strategies

that relate to its particular linguistic structure and orthography. Since these differ markedly from the structure and orthography of English, it follows that features that characterise skilled reading in English cannot be assumed to apply to reading in isiZulu.

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APPENDICES

APPENDIX 1A: INVITATION TO PARTICIPATE IN THE STUDY, INCLUDING A SELF TEST OF READING RATE

UYAMENYWA UKUBA UZIMBANDAKANYE NOMSEBENZI WOCWANINGO LOKUFUNDA ISIZULU

Ungakwazi ukufunda lokhu ebhokisini ngaphansi komzuzu owodwa?

Sidinga ukusebenza ngokushesha ukuthuthukisa izilimi zase Africa enyuvesi yethu. Ukuthuthukiswa kwezilimi zase Africa njengezilimi esiphathelene nemfundo ephakeme kubalulekile. Sonke sidinga ukuzinikela kuzona. Akusiyena uhulumeni kuphela okungafanele abone ukuthi lezilimi zase Africa zisetshenziswa endaweni efanele emphakathini wethu. Ngokweqiniso lokhu kungumsebenzi wethu sonke. Ezikhungweni eziphezulu zemfundo, abathuthukisi bezilimi, kanye nomphakathi wonkana kufanele baqiniseke ukuthi izilimi zase Africa ziqinisekiswe.

Izilimi zase Africa zibalulekile kulelizwe. Zisivezele ukuthi singobani, futhi sifuna ukuba ngobani, kanye nendlela esifisa ukwakha ngayo i South Africa.

Ukuthuthukiswa kwezilimi zase Africa kwimfundo, nakwezemfundo ephakeme, kusemthethweni sisekelo. Uthi umthethosisekelo, bhekisisani ukushabalala kwesisindo sezilimi zabantu bakithi kuleli, uhulumeni kumele athathe izinyathelo ezinqala zokuphakamisa isisindo nenqubo yokusetshenziswa kwezilimi zethu. Masingavumeli ukuthi izilimi zakulelizwe zishabalale. Kodwa masiziqinisekise.

Uma kuwuthi thina esiluncele ebeleni lolulimi asiluthuthukisi, ubani ozoluthuthukisa?

Zikalele ngewashi. Uma ungafunda kulelibhokisi isikhathi esingaphansi komzuzu owodwa , kungenzeka uthande ukuba ingxenye yocwaningo lomsebenzi wokufunda imibhalo yesiZulu. Indlela okubhalwa ngayo isiZulu kuhluke kakhulu endleleni okubhalwa ngayo isiNgisi. Kanye namakhono okufundwa kwesiZulu awakaqondisiseki namanje.

Ngidinga abantu abakwazi ukufunda isiZulu ngokushesha futhi okulula kubona ukufunda, abangaba nothando lokuvolontiya. Ngidinga ukuqopha indlela amehlo abo anyakaza ngayo uma befunda. Inhloso yami eyokuhlola amakhono okufunda incwadi yesiZulu.

Uma uzinikezela kulomsebenzi ungsiza entuthukisweni yolimi lwesiZulu njengolimi olufundwayo. Bonke abazozinikela kululucwaningo bayothola ulwazi mayelana namakhono okufunda kwabo.

Ayikho imali ezotholakala ngokwenza lomsebenzi.

Sandra Land   Centre for Adult Education   University of KwaZulu-Natal

(not used in the study, but included here for clarification).

INVITATION TO PARTICIPATE IN A RESEARCH PROJECT ON READING IN ISIZULU.

Can you read the text in this box in under a minute? Time yourself:

If you can read the text in the box in less than 1 minute, you might be interested in taking part in a research

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We need to move speedily in making the development of African languages a reality at our universities. The development of African languages as languages of scholarship is an imperative that we all need to commit ourselves to. It is not for government alone to see to it that African languages get their rightful place in our society, but indeed this is the responsibility for all of us. Academic institutions, language practitioners and broader society should all come on board to ensure that African languages are strengthened at universities and in society as a whole.

African languages constitutes one of our most important [forms of] heritage, about who we are and about who we want to be and the kind of South Africa we wish to build, including the manner which we use our languages.

The development of African languages in education in general and higher education in particular is mandated by the Constitution ... [which] states that, "recognising the historically diminished use and status of the indigenous languages of our people, the state must take practical and positive measures to elevate the status and advance the use of these languages" We should not allow our languages to die, but strengthen them If we are not seeking to develop our languages as practitioners in

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project by having your own reading of Zulu text analysed. The way Zulu is written is very different from the way English is written, and the skills needed to read Zulu text well are not yet well understood.

I am looking for people who read Zulu fast and easily and who would be interested in volunteering to have their eye movements recorded as they read short excerpts from Zulu novels. The purpose of this recording is to discover whether particular patterns of eye movement are common among competent readers of Zulu text.

Participants in this project will be making a significant contribution to research in the development of Zulu as a language of reading and learning, and each participant will receive a summary analysis of their reading skills. **However please note that there will be no payment for participation in the project.**

Sandra Land   Centre for Adult Education   University of KwaZulu-Natal

APPENDIX 2: TEXTS SELECTED FOR THE MAIN DATA GATHERING EXERCISE

(not used in this format)

Memela, N. (1992). *Sengikhulile.* **Durban: New Readers Publishers. p. 1**

UNomadashimane igama lami. Sengikhulile! Awu! Akukho okudlula lokhu. Ikhulu leminyaka akusiyo into encane. Phela ngazalwa ngempi yamaNgisi namaBhunu. Abanye babewabiza ngokuthi amaDashimane amaBhunu. Igama elithi Nomadashi lasukela lapho. Ubaba wayesebenza epulazini endaweni yase-Bulwer. Kwathi ngokusuka kwempi wathi umlungu kubaba, "Ngiya empini. Hleze ngingabuyi, ngifele khona. Uma ngingabuyanga, ungakhathazeki. Ngiwenzile onke amalungiselelo okuthi umesisi anibheke nezingane zakho." Umama ngalesosikhathi wayekhulelwe. Wazibula ngamawele, umfana nentombazana. Bathi kuzelwe amakhosi. Bangiqamba igama elithi nginguNomkhosi. Kepha ngenxa yokuthi ngazalwa ngempi kwaduma elokuthi nginguNomadashi. Ngakhula-ke sihlezi epulazini. Sasilima, sisenga izinkomo, kudliwa amasi. Kwakujwayelekile ukuthi ingane ekhulele epulazini iwuqale isencane umsebenzi. Ngaqala ukusebenza ngingakalihlanganisi ishumi leminyaka. Umsebenzi wami kwakungowokuphatha izingane zomlungu. Ngaze ngakhula impela ngisebenza kuye lomlungu.

1. UNomadashimane ungumuntu omdala.	Yebo/Cha	Y
2. Wakhulela eShowe	Yebo/Cha	C
3. Uyise wayesebenzela umlungu wesitolo	Yebo/Cha	C
4. Lomlungu washiya indawo yakhe, waya empini.	Yebo/Cha	Y
5. UNomadashimane wayenomfowabo.	Yebo/Cha	Y
6. Umbhali waqanjwa igama "UNomadashimane" ezalwa	Yebo/Cha	C
7. Basenga izinkomo kodwa bangawathola amasi okudla	Yebo/Cha	C
8. UNomadashimane wasebenza epulazini esemncane	Yebo/Cha	Y
9. Umsebenzi wakhe kwakungukubheka izinkukhu	Yebo/Cha	C
10. Wayeka ukusebenzela umlungu esemncane	Yebo/Cha	C

Nyembezi, S. (1953). *Ubudoda abukhulelwa.* **Pietermaritzburg: Shuter & Shooter. p.15**

Lapha kwaMsezane kwakwakhiwe ngempela. Kwakungumuzi ovuthiwe. Indlu yayakhiwe ngesitini esibomvu, esishisiwe. Yayinovulande ezinhlangothini ezimbili. Indlu yayinamakamelo ayisishiyagalolunye. Kwakukhona indlu yokuphola, neyokudlela, nalapho ayesebenzela khona uMsezane nalapho ayegcina khona izincwadi zakhe. Phela kwakungumfo owayekuthanda ukufunda. Kunamakamelo amathathu okulala. Bese-ke kuba yikhishi nendlu lapho kubekwa khona ukudla. Uma ungena endlini yokuhlala, wawukhangwa upiyane olukhulu, luzisho nje ukuthi olwemali. Kwakukhona futhi endlini izihlalo ezithofozelayo, ayethi umuntu uma ehlala kuzo ashone phansi avele ngezindlebe. Phakathi nendawo kukhona itafulana elincane kubekwe phezu kwalo isitsha esinezimbali. Phansi lapha amapulangwe ayembozwe ngocansi lwabeLungu. Kwakuyiloluhlobo othi uma uhamba phezu kwalo nezigi zife, umuntu athashazise okukamangobe. Ezindongeni kwakulenga izithombe ezimbalwa. Zonke izinto ezazikulomuzi zazikhuluma ngokusobala zithi kukwamnumzane lapha.

1. Indlu yakaMsezane yakhiwe ngodaka   Yebo/Cha   C

2. Yayinovulande omkhulu   Yebo/Cha   Y

3. Yayinamakamelo amaningi   Yebo/Cha   Y

4. Yayinekamelo lokugcina izincwadi   Yebo/Cha   Y

5. Yayinamakamelo amahlanu okulala   Yebo/Cha   C

6. Kwakukhona upiyano olufile   Yebo/Cha   C

7. Izihlalo zakhona zaziqinile   Yebo/Cha   C

8. Ematafuleni amancane kwakunezimbali   Yebo/Cha   Y

9. Ukhaphethi wawenza ukuthi izigi zabantu zingazwakali   Yebo/Cha   Y

10. Zazingekho izithombe ezidongweni ngenxa yamafasitela amakhulu   Yebo/Cha

Mkhize, M. T. (1983). *Amahlaya alala insila*. **Pretoria: De Jager-HAUM Publishers. p. 1**

Umuzi wakubo kaChithimpi Zondi umfo kaNkalimba wawunezindlu ezimangaqhugwana amathathu wakhiwe ngaphansi kwegquma. Iminyango yezindlu yayibheke ngaseNyakatho ukugwema iziphepho ezazivamise ukuqhamuka ngaseNingizimu. NgaseMpumalanga yomuzi kwakunomhoshana okwakwehla kuwo umchachazwana wamanzi owawuze uyongenela emfuleni uMzimayi. Ntambama kwakuye kuheleze umoya obandayo owawuye ungene ngezi-khadlana zezicabha kwaZondi. Lamahelehelana ayeqala ngokuphola kamnandi kodwa agcine esebanda ngoku-mangalisayo lapho sekuphakathi kwamabili ebusuku ikakhulukazi uma kusebusika. Ngalelilanga kunguMgqibelo ntambama iwona lamahelehelana ayesiza ekupholiseni kwaZondi. Phela lapha emzini kaNkalimba ngalelilanga kwakusindwe ngobethole kutatazela omakoti kunjeyaya. Okungamakhehla nezalukazi kwakulokhu kubonakala kuphuma kuthi tshobe ngemva kwezindlu kuchitha lawomanzi ayengasadingeki emizimbeni yawo. Kulobuhholohholo bomsindo wabonakala uDuda umfowabo omncane kaNkalimba engena endlini nezimbuzi ezimbili ayezibambe ngezimpondo eyokuma ngasemsamo. Esemsamo uDuda wabatshela abasendlini ukuthi lezimbuzi kwabe kungezani.

1. Umuzi wakubo kaZondi wawunamaqhugwana amathathu   Yebo/Cha   Y

2. Wakhiwe ngaphansi kwewa   Yebo/Cha   C

3. Iminyango yezindlu yayibheke ngaseMpumalanga   Yebo/Cha   C

4. Endabeni kuthiwa isiphepho siqhamuka ngaseNingizimu   Yebo/Cha   Y

5. Kwakunomfudlana eduze nomuzi   Yebo/Cha   Y

6. Kulomuzi babenomcimbi   Yebo/Cha   Y

7. Abantu abadala babengekho emcimbini   Yebo/Cha   C

8. Kwakunomcimbi womemulo   Yebo/Cha   C

9. UDuda wangenisa izimbuzi ezimbili   Yebo/Cha   Y

10.   Emsamo uDuda wama wathula   Yebo/Cha   C

Ngcobo, M. (1960). *Ukufika Kosuku.* **Cape Town: Via Afrika Publishers.**

Indawo owawakhiwe kuyona umuzi kaMhlakaza yayehlela kancane ibheke ngaseningizimu. Laphaya ezansi kwakukhona umfula owawunekhwane, nomhlanga, kanye notshani obude obuye bumile ezindaweni ezinamanzi amaningi. Kwezinye izindawo kwakumile izihlahla ezinkulu nezincane, zingapha nangapha komfula. Abantu baseNhlambe babethi igama lawo yiMpongo. Ngezansana nje kwalapho babewela khona abeza emzini kaMhlakaza kwakukhona isiziba esikhulu. Sasisihle ngoba sasihlala sicwebile uma iMpongo ingadungekile ngoba igcwele. Ngenxa yokuba sisithwe izihlahla kanye nomhlanga sasingabonakali lapho umuntu emi ezibukweni. Wayethi uMhlakaza lapho emi emagcekeni omuzi wakhe ebheka ngaphesheya kweMpongo abone umuzi omkhulu kakhulu kunowakhe. Lowo kwakuwumuzi wenkosi uKhwintshi eyayibusa esifundeni sabo saseNhlambe. Ngelinye ilanga kwafika induna kaKhwintshi emzini kaMhlakaza. Yathi ithunywe nguyena ukuba izomtshela ukuthi kusasa afike emzini wakhe.

1. Indawo yakaMhlakaza yayibheke ngasenyakatho   Yebo/Cha   C

2. Ngezansi kwakunezinhlobo ezihlukene zotshani   Yebo/Cha   Y

3. Kwakunezihlahla ezinkulu   Yebo/Cha   Y

4. Igama lomfula wakhona kwakuyiNqama   Yebo/Cha   C

5. Eduze komuzi kaMhlakaza kwakunesiziba esikhulu   Yebo/Cha   Y

6. Lesiziba sasibonakala uma umuntu ema ezibukweni   Yebo/Cha   C

7. Umuzi kaKhwintshi wawubonakala uma umuntu ema kaMhlakaza   Yebo/Cha   Y

8. UKhwintshi wayeyinkosi yaseNhlambe   Yebo/Cha   Y

9. Ngelinye ilanga kwafika inkosikazi kaKhwintshi   Yebo/Cha   C

10. Induna yathi uMhlakaza kumele aphume endaweni kaKhwintshi   Yebo/Cha   C

Zama, J. M. (1967). *Ingwe idla ngamabala.* **Pietermaritzburg: Shuter & Shooter.   p. 1**

Kwakungenye intambama lapho selibantubahle; kusentwasahlobo iminduze seyiqalile ukuqhakasa, mhla ngiqalayo ukuyizwa inguquko empilweni yami ngoba ngakhanyelwa kusukela ngaleyo ntambama ukuthi akukho lutho oluzenzekelayo nje ngokwalo. Yonke into emhlabeni inembangela nenhloso ethile kulowo nalowo muntu. Leyontambama engiyisusela kuyo lendaba yami ngayiphawula ngoba ubaba, uNqakamatshe, wafikisana kanye nathi esangweni lomuzi wakwethu, kwazise ukuthi sasingaveli ndawonye nobaba. Ubaba wayebuya embizweni eyayibizwe nguGazi iNkosi yethu thina baThembu. Thina sobathathu madodana akhe sasiqhamuka kokumba iziphunzi esikhaleni esasisivule ezinsukwini ezingaphambiyana ngokugawula izihlahla ekupheleni kwehlathi elaligudla insimu kamame omkhulu, uMaButhelezi. Umame omkhulu wayebike kubaba ukuthi isife ayesilima minyaka yonke sase sinciphile ububanzi baso ngenxa yokucinaniswa yimixhantela yezihlahlana ezazimila ezimpandeni zemithi eyayisephethelweni laleohlathi. Thina sasivela kulowo msebenzi.

1. Umbhali uthi kusebusika	Yebo/Cha	C
2. Umbhali uthi izinto ezenziwe zinezinhloso	Yebo/Cha	Y
3. Uyise kambhali ubephuma emhlanganweni ebukhosini	Yebo/Cha	Y
4. Umbhali nomndeni ngabakwaZulu	Yebo/Cha	C
5. Endabeni, umbhali ubehamba nodadewabo	Yebo/Cha	C
6. Umsebenzi wabo kwakuwukumba iziphunzi	Yebo/Cha	Y
7. Babesebenzela umame omkhulu	Yebo/Cha	Y
8. Inkinga ngesife ibibikwe kuyise kambhali	Yebo/Cha	Y
9. Umame omkhulu ubesanda kuqala ukulima lesife	Yebo/Cha	C
10. Isife sinciphile ngenxa yokusondezwa kwezindlu zabantu	Yebo/Cha	C

APPENDIX 3: SCHEDULE FOR DISCUSSION IN SEMI-STRUCTURED INTERVIEWS WITH PARTICIPANTS

1. Readers' experience of reading Zulu text, and their perceptions of how they recognise words or components of words and other parts of text.

2. Readers' perceptions of any aspect of their own reading performance on English or Zulu text that might be relevant to the study.

3. Readers' beliefs about isiZulu as a language of academic reading and learning.

4. Readers' beliefs about the way the use of isiZulu will change in this century (in view of the prediction that Africa will lose all but 200 of the 2193 languages currently spoken on the continent (Batibo, 2005)

(Numbers 3 and 4 are not directly relevant to the information sought in relation to the analysis of reading skills that is the subject of this study, but will provide useful contextual information, particularly in view of the possible effect of readers' understanding of and attitudes towards their own reading behaviour.)

CHAPTER 2

CONTEXT OF THE DEVELOPMENT OF READING SKILLS OF ISIZULU IN KWAZULU-NATAL

Published as:

BACKGROUND

In 1990, Rolihlahla Mandela was released from prison. The apartheid government of the time realised that they had to choose between a doomed struggle as an internationally outcast regime repressing its country's people and capitulation. They admitted defeat, and Mandela walked out of prison, setting South Africa on a new steeplechase ride that is probably still just beginning. In the two decades since then, South Africa (or uMzansi, as people call it[1]), went from two official languages to eleven, from four provinces to nine, and from an obsession with race for segregation to an obsession with race for redress. Our rulers changed from a right-wing, white government to a black, post-liberation government that rests on an increasingly factionalised and fractious tripartite alliance of the South African Communist Party, a trade union coalition (COSATU), and the African National Congress, a political party that reels between the socialist demands of its loyal millions of voters and the capitalist interests of its political elite. "Interesting times" is an understatement for the political

landscape we career through, and our language dynamics reflect all the hopes and hazards, and the contradictions, discords and harmonies that characterise our "rainbow nation".

In 1996 the Constitution of South Africa accorded official status to eleven languages: nine indigenous Southern African languages spoken within the bounds of the country; isiNdebele, Sesotho, Sepedi (or Sesotho sa Leboa), siSwati, Xitsonga, Setswana, Tshivenda, isiXhosa and isiZulu, as well as two languages of settlers from Europe; Afrikaans, derived from Dutch, and English. The Constitution states that everyone has the right to use the language and participate in the cultural life of his or her choice, and with reference to the indigenous languages, it states that "Recognising the historically diminished use and status of the indigenous languages of our people, the state must take practical and positive measures to elevate the status and advance the use of these languages" (*Constitution of the Republic of South Africa*, No. 108 of 1996, Chapter 1, Point 6).

Arising from the Constitution, our Bill of Rights ensures that speakers of all South Africa's official languages have equal language rights. These rights could be exercised by, for example, an employee insisting that she receives communication from her employer in her own language, or by students rightfully expecting to learn in their home language, or someone in need of services rendered by state offices requiring to be spoken to in a familiar vernacular language.

In practice, although indigenous African languages are spoken in the homes of 78% of the population (Statistics SA, 2001), their speakers almost never claim the right to have their home languages used in public spheres. In this phenomenon we follow in the wake of previously decolonised African countries, where "indigenous African languages remain confined to the cultural domains, much as they were in the colonial era" (Kamwangamalu, 2010, p. 4). Therefore, even though only 2 million of the total population of 50 million are of British descent[2], English continues as the dominant language in the business world, politics and education, and prevails in the hubs of big business activity, particularly in and around Johannesburg, Durban, and Cape Town. Here, the dominance of English is massive, and indigenous languages are being displaced. First-language Zulu students at UKZN (the University of KwaZulu Natal), who garnish the Zulu they speak liberally with English terms and expressions, claim that they cannot understand what they call "deep Zulu," the form used by people who live in rural areas remote from towns. By "deep Zulu" they mean a form relatively free from the influence of English, and rich in idiom and terms that most of the

students consider archaic and inaccessible. The consensus in a class of approximately 30 post-graduate students (the B.Ed. Honours class of 2010) was that that this form of Zulu has come to be associated with poor, rural, unsophisticated people, and has therefore become stigmatised. Similarly, Heugh found (2009) that Xhosa students regard "deep Xhosa" as unattractive, and regard its use as restricted to rural people and academics (Heugh, 2009).

Afrikaans is the next most dominant language after English in influential discourse, particularly in parts of Johannesburg and Cape Town, and in the towns and cities established by Dutch settlers when they fled English domination in the Cape and moved into the interior two centuries ago. Today, almost all Afrikaans speakers can speak English, and there is a shift in Afrikaans communities toward speaking English (Gough, 1996), but white English speakers, as self-assured as ever in our sense of distance and superiority, refer to Afrikaans areas as "behind the boerewors[3] curtain". Ironically, the Afrikaans community are the only language group who tend to claim their constitutionally guaranteed rights; it is from them that the bulk of complaints has been received by the Pan South African Language Board (Pienaar, 2008).

Given that, in the years when the apartheid government restricted the vote to white people, it could not have retained power without the voting support and tacit approval of a substantial portion of English speakers, it is unfair that Afrikaans was labelled so unequivocally as the language of the oppressor. English should share that label. However, perhaps because the worst aspects of apartheid were associated with Afrikaans-speaking politicians and state officials, and because in the famous 1976 school riots children demonstrated primarily against being forced to learn some subjects through the medium of Afrikaans, it alone carries this tag, and English is accepted the post-liberation *lingua franca*. The use of English by the ANC in exile, partly because exiled members came from different language groups, may have set a trend for this, but the social status of the language relative to other languages in South Africa makes it eminently acceptable as a language of power. This ready acceptance is frequently demonstrated, for example, by President Jacob Zuma, who, in spite of having styled himself as a "100% Zulu boy" in his political campaigns, continues parliamentary tradition by giving his state of the nation address at the opening of Parliament in English, with asides in Zulu, Sesotho and Afrikaans.

Part of the reason for using English is practical. Although many Black South Africans understand only one indigenous language, across the country more people understand English

than any other official language. Also, as de Klerk (1999, p. 316) suggests, the use of English as a *lingua franca* "disadvantages all indigenous language groups equally". This might sound bizarre, but our lamentable track record in intergroup violence in the last few decades gives her statement perspective. Hence, as in many ex-British colonies that spanned territories of more than one indigenous language group, public communication is in the language of the ex-coloniser. The resource- and time-saving advantages of avoiding multiple translations is clear. However the irony of a previously repressed and exploited people not only readily accepting the colonial language, but according it high status in their liberated country, and thus, in Phillipson's words (2008, p. 6) "perpetuating the subordination of colonial times into the present", remains.

English has high status across all communities. We English speakers take its status for granted with our customary casual arrogance, Afrikaans speakers sometimes seethe against it with grinding resentment, and in black communities the status is accorded with ready recognition of confidently spoken English as a marker of high levels of education and sophistication. This elevated status of English in the perception of ordinary people, and the linguistic capital it carries, is evident in language practices such as the use of English by Zulu politicians to address Zulu communities. At a political rally near Durban during the build up to a general election, some first-language Zulu politicians spoke exclusively in English, although they were well aware that Zulu would be understood by all attending the meeting, and English understood by only a few (Chili, 2007 p. 76). This incident is a mirror image of another referred to by Bourdieu, (1991, p 68), where a French-speaking official won the respect of a gathering by addressing them in their own local dialect, thus demonstrating token solidarity with them. Bourdieu describes this as "a strategy of condescension", used to gain profit. In the Zulu example, the politicians used English to profit by underscoring the social distance between themselves and the gathering, which would be considered a triumph in a context where escape from poor, marginalised rural communities is prized. According to Chili, who is himself a member of this community, the politicians' strategy was effective, and, in spite of being patently unable to follow what was said to them, community members expressed a high regard for the speakers who addressed them in English. Thus they surrender, apparently willingly, to what Bourdieu would term the symbolic violence of this demonstration of unequal power between them and the politicians they vote for, and believe in the paradox that because the politicians decline to truly speak *with* them, they are the best to speak *for* them.

In this surrender we see economically and linguistically marginalised people engaged in what Bourdieu termed "active complicity". In Bourdieu's terms, they are dominated by the symbolic power of the legacy of their colonisers, and they support the legitimacy of this power as well as the authority of the people who can exercise it (Thompson, 1991). In South Africa this belief and support has not been engineered in a calculated way, but rather it conforms to the pattern delineated by Bourdieu, and "impalpably inculcated, through a long and slow process of acquisition, by the sanctions of the linguistic market, and which are therefore adjusted, without any cynical calculation or consciously experienced constraint, to the chances of material and symbolic profit which the laws of price formation characteristic of a given market objectively offer to the holders of a given linguistic capital" (Bourdieu, 1991, p. 51). As noted by Rapatahana in the introduction to this book, "Power is pervasive and omnipresent and insinuative; insidious and insidiously self-maintaining." Indeed.

The interplay described above between politicians and rural communities exemplifies a fast developing new South African divide between the recently empowered and enriched South Africans, and those whose lives have not improved since apartheid. This echoes a situation only too common in previously colonised countries, and pointed to by Ngũgĩ wa Thiong'o in Kenya, where members of a post-independence elite, to whom he refers as "comprador neo-colonial ruling elements" (Ngũgĩ, 1986, p. 22), use English to maintain their domination. In South Africa the development of these power relations are a direct contradiction of an optimistic prediction by Master (1998, p. 723-724) that "... when non-English-speaking countries that currently rely on English for modernization ... become strong enough to continue that progress in their own vernacular languages, for example, by inventing new terminology, English will be displaced, as will all those in the population who identify with it, and power will naturally shift to those who know (and identify with) the vernacular", and that "the dominance of English will gradually give way to reciprocity and fairness". In making this appealing prediction, Master failed to consider that among the powerful few of those speakers of the vernacular, there would possibly be some who were more interested in establishing and ensuring their own power than in sharing it, and they find English a useful tool for doing so. As Master also notes, "at the level of linguistic dominance, the power to advance is contrasted with the power to hold back" (Master, 1998, p. 717), here used in a way that few of us foresaw – a distressing situation where ordinary people are discovering that promises of liberation can be bewilderingly turned inside out. Many people who are now in

the government seem to have changed direction, and they have started to use the tools of the colonialists for their own elite advantage.

As long-time political activist and respected language specialist, Neville Alexander stated, with reference to an English-only or English-mainly policy in South Africa, that such a situation:

- *prevents the majority of the people from access to vital information and therefore from full participation in the democratic political process*
- *undermines the confidence of L2 speakers and, even more so, that of the vast majority for whom English is effectively a foreign language*
- *smothers the creativity and spontaneity of people who are compelled to use a language of which they are not in full command, and*
- *at the economic and workplace levels, it causes major and avoidable blockages that can have significant negative impacts on productivity and efficiency.*

(Alexander, 2006a, p. 251)

PROMISE AND FORFEIT: THE CHOSEN FEW

It is unsurprising then, that learning English holds great promise for socio-economically deprived South Africans. The chasm between rich and poor in South Africa appears to have grown wider since the end of apartheid, with the difference now that a growing proportion of the wealthiest are black. This elite, often referred to as "black diamonds" includes political appointees at various levels of government, entrepreneurs who have made money through business ventures that were previously hampered by apartheid restrictions, or promising employees of business corporations who fast-track them up the corporate ladder in order to meet Black Economic Empowerment targets set as a condition for getting state tenders (hence a new South African English word, "tenderpreneurs").

The appointment of these high fliers is a result of both political liberation, and the international trend towards corporatisation. Like similar institutions elsewhere in the world, South African public institutions are increasingly run along business lines, and they focus on making a profit rather than on delivering an affordable service for the public good. People in executive positions in these organisations can earn very high salaries. Many prominent members of the ANC gained positions in government on the basis of the role they or their family members played in "the Struggle" - the resistance and armed activity that was waged

against the apartheid regime. So, black people who remain poor in South Africa have witnessed meteoric rises in wealth and power of some who were previously amongst them. Initially nicknamed "WaBenzi" because of the Mercedes Benz cars they favoured, many have moved out of black townships and into suburbs that were previously reserved for whites. Concurrently, unjust racially based differences in the rates of pay between people working in positions such as teachers or nurses ceased, and a large number of black South Africans experienced a sudden rise in income. Ever-ready to reap interest from whoever can pay it, the banks rushed to offer credit, and this group rapidly improved their houses, bought cars and became enthusiastic and discerning consumers of fashion and expensive household paraphernalia. Those who are anxious to show off the emblems of prosperity to emphatically separate themselves from those who remain mired in poverty would possibly fit Bourdieu's notion of a *bourgeoisie*. Where they shift their speech, or "linguistic productions" (Bourdieu, 1991, p. 82), towards the language of those in power, they mirror Bourdieu's description of the French *petits bourgeois*, who "attempt to appropriate the properties of those who are dominant" (Bourdieu, 1991, p. 83).

THE DISPOSSESSED AND BETRAYED

Naturally this dramatic social transformation has raised the awareness of their own poverty among the great numbers of black South Africans who have not benefitted from political transformation. It is to our shame as a country that there are a great many whose lives have not improved at all, especially as their earning opportunities have actually decreased. Our new labour laws, including minimum wages and procedures to protect people from dismissal, make employers wary of employing new staff. Also, with increased trends of corporatisation, many institutions which previously employed their own general workers now outsource functions like cleaning, and make use of labour agencies, who tend to pay a flat rate at the lowest level permissible without increases for experience, and certainly no benefits. In addition, many businesses that were owned by emigrating white South Africans closed down, so jobs were lost in these businesses and in the homes of the émigrés.

A shift from agriculture to property development, land restitution claims and increased crime such as stock theft and home robberies resulted in a drop of 12.7% in the number of productive farms between the years 2002 – 2007 alone (Mnyaka, 2009). In our land

restitution programme, black South Africans can claim land that their families lived on before it was appropriated by white settler farmers. This restitution is rights-based; claimants do not need to be farmers, and the majority do not intend to farm. The land restitution programme is currently stalled, with an enormous number of land claims pending, and commercial farmers of all races are unwilling to invest in expansion or even maintenance for fear that they will have to give up their farms and that compensation will not cover their investments. Thus again, ironically, developments intended to empower poor people have worsened their plight, in terms of decreased opportunities for unskilled workers, and the loss of benefits that went with employment on farms such as grazing rights or housing, which was not always of the miserable hostel-type often associated with the previous political dispensation.

Adding to the gloom is that only half of young South Africans are in training or employed. In 2007, it was estimated that almost 3 million of the 6.7 million South Africans between 18 to 24 were neither in training nor employment, and in spite of affirmative action policies, 86% of these unplaced youth are black or Coloured (Gower, 2009).

THE SIREN SONG

In many African countries, "the masses have become increasingly aware that ex-colonial languages are the catalyst for socio-economic inequalities, and that only access to these languages can bring about a remedy" (Kamwangamalu, 2010, p. 5). Correspondingly, in our context, it is unsurprising that many poor black families hear in the siren sounds of well-spoken English, the allure of a possibly better life for their children, and make enormous sacrifices to send them to schools that will give them the best chance of gaining access to tertiary education or reasonably paid employment. For many speakers of indigenous South African languages, this means striving for the opposite of the right to be taught in their mother tongue, and doing whatever they can to send their children to schools where English is the medium of teaching and the language of the playground - in other words, to the schools that were preserved under apartheid for white, Coloured[4] or Indian children. In some of these schools, as the enrolment of black children has increased, that of whites has decreased until some are now completely black, but still have English first-language teaching staff.

During apartheid, when schools were segregated according to racial population groups, schooling was compulsory for white children but not for others, and a sliding scale of school

subsidy was applied to state-run schools. White schools got a subsidy that enabled them to compare well with schools in first world countries, Indian and Coloured schools got a subsidy considerably lower than that, and schools for indigenous black South Africans received the lowest subsidy of all. In 1994 expenditure on each white child was four times that of the expenditure on each African child (Lemon, 2004, p. 270). Institutions for black South Africans were organised under the infamous "Bantu Education system", which was designed to produce an acquiescent working class with a limited education. The system restricted not only spending but also curriculum. It entrenched learning by rote rather than enquiry, and allowed lower levels of education as a minimum for black teachers than was allowed for teachers of other race groups. Black schools were characterised by enormous classes (with sometimes as many as 80 children in a class, particularly in the lower grades), a lack of resources, poorly trained, badly paid and often demotivated teachers, and very high drop-out rates. Many children stayed in school for one or two years only, sometimes because of traditional family duties such as cattle herding, but often because schools failed to accommodate them or were too far away from their homes. The dishonest rhetoric of the apartheid government was "separate but equal development", but it is clear that for generations to come, South Africa will suffer the serious consequences of the indefensible inequities of the apartheid system.

Language policy in education under apartheid was that the medium of the first four years of education should be mother tongue and that, where this was an indigenous African language, the medium should thereafter switch to English or Afrikaans – the two official languages at the time. Textbooks in indigenous languages were available only for the first four years. Teachers used indigenous languages in the first phase, but both indigenous and official languages in the phases that followed, mediating the content of the English or Afrikaans textbooks where they could to make the information more accessible to their students. However, because teachers were themselves products of the Bantu Education system, their own command of English tended to be weak, and their understanding of curricula, textbook content and teaching strategies limited. The following account by a South African academic of his own experience as a black learner taught by black teachers in the Bantu Education system illustrates:

> *My Grade 9 and 10 English teacher, who would always carry a stick when teaching, never smiled during his lessons. His teaching approach was the epitome of what Balfour (2000, p. 48) refers to as 'the transmission mode of teaching with*

its emphasis on the authority of the teacher and passivity of learners'. Both in my Grade 9 and Grade 10, he was the only person in the class who had copies of the novels prescribed ... Because of this, during reading lessons he would walk around our desks, reading the novel out loud and checking if any of us were talking. We thus had no choice but to remain absolutely silent. The silence was so obstructive to learning that, even if there were areas we did not understand as he read to us, it was almost impossible to raise a hand and ask him to repeat or clarify something. On one occasion during our so-called 'Orals period', he gave me five lashes because of my 'wrong pronunciation' of the word 'apple'...

Grade 11 was worse. Our teacher, then a student at one of the teacher training colleges, 'taught' us essay writing and only one novel over the whole year. She missed most of her lessons as she spent most of her time either in the staff room or on 'sick leave'... (Mgqwashu, 2009 p. 296 – 297)

It took a hardy, innate intellect to develop in this context, and predictably a great many learners under the Bantu Education system left school with poor content knowledge, poor mathematical skills and poorly developed literacy skills. Since the system produced its own teachers, a vicious cycle was established and, sadly, this continues in many schools.

There are some traditionally black schools where, in spite of being poorly resourced and serving disadvantaged communities, teachers have a high work ethic and achieve good results[5], but they are unusual. For the most part, the new South African education department has failed to change the situation in poorly performing schools and many fail to give pupils a sound education. To illustrate, in this province of KwaZulu-Natal, the results of the school leaving examination continued to reflect apartheid differences at the end of 2008, when 73.9% of white children gained sufficient points for acceptance into a degree course at university, compared with 44.6% of Indian children, 39.1% of Coloured children, and only 13.2 % of black African children (Cronje and Roodt, 2009). Obviously, the fact that the majority of black African children write their school leaving examination in English, and not their first language is an influential factor in these results, yet there are other damaging dynamics at play. According to the report on the newly introduced Annual National Assessments released by the national Department of Basic Education in June 2011, even learners in the lower grades where teaching is in the mother tongue appear to be learning very little. The report shows that the average percentage gained in a mother tongue literacy test by Grade 3 learners (in their third year of schooling) was 35%, and in a numeracy test, only 28%. Performances by Grade 6 learners, who by their 6th year in school are supposed to have

switched to English as a medium of learning and teaching were only slightly more alarming, at an average of 28% for literacy, and 30% for mathematics (Department of Basic Education, 2010).

As noted in an address to school principals by President Zuma, a major problem in South African schools is the damaging tradition among teachers at dysfunctional schools of arriving late, leaving early, not attending at all on pay day, and spending the time at school doing things other than teaching (Zuma, 2009). Current policies are attempting to deal with the problem, and in "The Education Roadmap", the government's 2009 plan for improving education, the first point is: "1. Teachers to be in class, on time, teaching. Teachers must also be required to use textbooks in class." (Netshitangani, 2009, p. 2). The South African Democratic Teachers Union (SADTU), a powerful union whose membership continues to be overwhelmingly black has been successful in negotiating some much needed improved remuneration for teachers, but it has also protected poorly performing teachers against censure and dismissal, and prevented the testing of teachers' competence (Taylor, 2011). In addition, learning is hampered by difficulties associated with the poverty that characterises the lives of so many of the learners.

SURRENDER TO THE SIREN

Parents' eagerness to give their children a better educational springboard than they would be likely to get in traditionally black schools has resulted in a stampede of black children to ex-Coloured, Indian and white schools. The demand for places at suburban English-medium schools is so great that the schools can only accommodate fewer than 10% of the applicants (Heugh, 2009). Some of these state schools are still beyond the reach of poor families because they charge fees to augment state funding. A legacy of apartheid is that ex-white state schools have good sports fields, libraries, and other resources, and the drop in subsidy at the end of overt white privilege has forced them to choose between abandoning these facilities or charging fees. It is a source of bitterness for black families who cannot afford these fees that government officials and teachers who run historically black schools send their children to ex-white schools (Xulu, 2009), in the same way as the elite elsewhere in Africa send their children to schools where colonial languages are spoken, while officially supporting the promotion of indigenous languages (Kamwangamalu, 2010, p. 3). The painful

outcome of this convoluted history is that, as far as parents are concerned, there is an unwritten but obvious hierarchy of desirability of state schools, with ex-white schools (run on English education traditions along with the use of the English language) at the top, then ex-Indian or ex-Coloured schools, then black schools where teachers do not belong to SADTU, and at the least desirable level, historically black, SADTU-dominated schools (Mgqwashu, 2009a).

Overall, black African parents who choose to send their children to English-medium schools hope that the children will gain the rewards associated with English proficiency, and feel at home in both traditional African culture, and Western English culture. However, they also face the hazard that they may never feel like a true insider in either one, seen as "not quite one of us" by white South Africans, and labelled by relatives and members of black African communities, as a "coconut", a term used reprovingly to mean that they might be black on the outside but have become white on the inside.

Policies for redressing inequity at universities include a complicated equity system that advantages members of "previously disadvantaged" groups in terms of university access for students as well as staff employment. However, gaining access to university does not necessarily equate to adequate academic performance, and many black students from schools which equipped them poorly in academic skills struggle with the demands of university..

For black academics at South African universities, the struggle continues. There are no indigenous-language South African universities, and in spite of being held in high esteem by ex-schoolmates for having apparently sailed beyond the rocky perils of degrees and gained employment as lecturers, many black academics continue to struggle with the predominant English discourse. The pressure for all academics to have a PhD and publish in academic journals (which are in English) has shifted the goal posts from where they were some years ago, when an Honours degree was acceptable for undergraduate teaching and publishing was optional. In academic publishing, the power of English has fed on itself and since the majority of editors, editorial boards and readers are English, the discourse, research paradigms and perspectives conform to the expectations of the English-speaking world (Altbach, 2008, p. 57). Again, speakers of African languages are disadvantaged in comparison with their first-language English colleagues. Many of them, once more summoned by the siren song, this time towards the prospects of promotion or simply acceptance as equals, strive with academic texts and websites, with a good number

foundering on the rocks and cliffs of perennial proposal writing or repeated rejection by journals. With Rapatahana in the Introduction to this book, one is reminded of Bourdieu's concept (1984. p. 255) of "the power of the dominant to impose, by their very existence, a definition of excellence which being nothing other than their own way of existing, is bound to appear simultaneously as distinctive and different, and therefore both arbitrary (since it is one among others) and necessary, absolute and natural."

At the other end of the education spectrum, most adult literacy classes teach literacy skills in indigenous languages before introducing learners to English, but some workplace programmes offer the "Straight to English" option where learners try to learn literacy in English, thus attempting to use one unknown to learn another. This route appeals to literacy learners because they believe they will achieve their central goals (mostly based on learning English) sooner than they would if they first learned literacy skills in their mother tongue. The strategy can be successful for learners who are reviving skills they learnt in brief periods of schooling as children, but not for first-time literacy learners. The promises made to them of speedy progress and vast gains are possibly the cruellest siren songs of all, since they offer hope to the most marginalised of South Africans, yet this learning route is characterised by painfully slow progress, small insignificant gains and high dropout rates (Land, 2003).

PLOTTING A COURSE TO THE FUTURE

Since the post-apartheid government committed itself to upholding the nine official indigenous languages and nurturing their development at the beginning of its rule, work has been done in setting up bodies such as the Pan South African Language Board and its associated provincial committees, and on developing policy. Yet this effort seems to have produced only bureaucratic results. People outside of these formal structures have not seen transformation relating to language beyond the broadcasts of news and some locally made programmes in indigenous languages on national television. Thus, in line with an unfortunate South African trend in many spheres of public life, we have extensive language policy development, but do not enjoy the expected outcomes. Webb (2009) offers several possible explanations for this failure to deliver on language policy, including a lack of capacity and preparedness among those in positions where they could use the policies to effect their desired ends, the association of the use of our different languages in education with apartheid,

and the possibility that the speakers of indigenous languages do not support their use in place of English.

This last suggestion resonates with what Alexander (2006a, p 242) terms "static maintenance syndrome" in which people use their own languages in their families, homes, and communities, but do not see in their languages the capacity for use as languages of learning and power. Many first-language speakers of indigenous South African languages reveal this attitude towards their mother tongue, and in it they typify Bourdieu's notion of symbolic domination (Bourdieu, 1991). We see people acquiescing, apparently voluntarily, to the disadvantage brought upon them by accepting as legitimate the assumed superior value of a dominant language. The "consent of the victims" has been a major factor in maintaining the status of English and Afrikaans in South Africa (Alexander, 2006b). Their perception of the relative values of dominant and indigenous languages in "the linguistic market" reflects and contributes substantially to the reality of this market. The attribution of higher status to all things associated with the colonisers of this country is linked with the habitual positioning, possibly in the minds of South Africans of all races, of black people in South Africa as *quiescent recipients* of perceived benevolence, who accept and believe in the difference in status, as *potential agitators* against dominance, who reject the difference in status, or as *opportunistic agents*, ready to use any available strategy to improve their circumstances.

This rather crass division possibly has some use in considering the practicalities of what people stand to gain and lose in accepting the dominance of English (and the marginalisation of indigenous languages), or in choosing to use their indigenous languages as languages of learning, commerce and power.

Alexander (2006b, p. 8) maintains that "In Africa ... the languages of the majority of the people have to become the dominant languages ... in the respective economy ... of the individual countries. Only if this happens will the danger of a two-tier citizen-subject social model be countered in favour of a democratic system where all are citizens and all have similar life chances."

The sentiment is intuitively attractive, yet how could indigenous languages achieve dominance in South Africa? Alexander writes of languages being "given market value", and their enhancement of their instrumentality in "processes of production, exchange and distribution" (Alexander, 2006b, p. 12), but it is difficult to imagine how this could be effected, even with government intervention. Even apartheid-era businesses, which went

along willingly with policies of separate development found that, while the use of the distinct languages would have been useful for keeping a workforce divided and therefore more controllable, a *lingua franca* was necessary in workplaces such as mines. "Fanakalo", a simplified language based mainly on Zulu root words and English grammar, evolved as a workplace medium of communication. In spite of attempts to phase it out (Matomela, 2011), it is still used extensively, albeit now much less stridently, from suburban kitchens to De Beers, because workers need to communicate with each other both on-duty and off, and many speak neither English nor Afrikaans, nor each other's languages (Madiba, 2011).

In public commercial activity, some banks offer users the choice of indigenous languages on their autobank screens, but this is a very small shift in the language market, and the only cost is one of investing in translation and some website maintenance. More substantial and potentially more influential shifts carry high costs and significant risks, for example, in the publishing industry. A common lament is that there is little published in indigenous languages, and therefore not much available to read; less than 2% of the turnover for trade fiction and non-fiction books published in 2008 was from books in indigenous languages (Galloway and Struik, 2009). On the other hand, publishers are reluctant to publish books in indigenous languages because, historically, the demand for them has been low (Desai, 2010). To remedy this situation, the government would need to subsidise the costs of publishing books in indigenous languages. Unfortunately, this is extremely unlikely, as even a petition to exempt books from value added tax was rejected in 2009. Just the same, one possible sign of increased reading in indigenous languages is a recent rapid increase in the sales of a daily Zulu language newspaper, *Isolezwe*. While sales of English newspapers fell by as much as 16% in 2010, *Isolezwe* has had a surge of popularity, increasing its sales in the same period by 3.5%. In 2011 it recorded sales of more than 100,000 papers daily (Timse, 2011).

Ultimately, people will live according to the language options that accord best with what they experience as most comfortable, and what brings them the most advantage. In Bourdieu's terms, they will, without deliberately shifting or preserving their language, choose whatever language use they are capable of that will best aid them in their pursuit of symbolic profit in interactions with other people, and in the society in which they live (Bourdieu, 1991).

In families who have moved into the suburbs and into English schools, parents commonly express concern in relation to their children's shift towards English, but they tend to accept it

as inevitable, as illustrated in the following recorded interview with a fellow academic[4] at the University of KwaZulu- Natal:

NM: I speak Zulu to them [my children] and I wish they spoke more Zulu than English ... My husband and I always speak Zulu to them – they respond in English most of the time. They do speak Zulu to each other. But they are more comfortable in English.

SL: What language will their children speak?

NM: Mmm! You know how worried I am about that! I think it will depend on who they marry. But if they get married to kids like them - I mean - they speak more English than Zulu. And it's not like we haven't made a conscious effort - we've begged them, we've bribed them, we've paid them - when they were little we did everything we could in our power to make sure they spoke Zulu more often, but in the end ... we would just throw up our hands ...

SL: What about reading in Zulu?

NM: *There was a time when I was really worried about them reading Zulu ... I'm glad they can [now] read Zulu. My husband and I get so surprised when we hear them reading - because there was a time when we just threw our hands up and thought Oh God! We've really tried, it's not like we didn't **try** - we've done everything we could in our power to make sure they speak isiZulu more often – when going to ... my husband comes from a deep rural area near Richards Bay – we would say [to them] "When we get there, please, please, **please** just for a **little**!" and they would try – for like 30 minutes or so ... then they would just go back to English ... I used to be so embarrassed ...because I used to hate it when I saw kids like those [when I was younger] – and during my time there weren't many. But I used to think how can they be speaking English when all of us are speaking Zulu? And I could not believe it when my kids did the same. I tried to organise my friend Maki to open up Zulu classes for my kids. Other parents were not as concerned as I was but they were concerned.*

SL*: Do you think the [Zulu] language will be lost?*

NM: *I can believe it when I look at my kids. But I hope I'll be around to be a Zulu gogo* [grandmother]. (Mthiyane, 2009)

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[4] This interview was of a colleague who took part of the pilot study reported on in Chapter 3. The interview covered her attitude to the changing use of isiZulu.

CONCLUSION

Borne on the rising tide of technological development and the sweeping power of globalisation, the English Hydra flourishes across the world, with the South African head as vigorous as any. In mythology the breath of the many-headed Hydra was poisonous, a strikingly apt image for the effect of the English tongue on the other languages it touches. Here in South Africa, there is no overt, deliberate, and defined imposition of English. It must also be acknowledged that a significant number of the South Africans who share the perception that they are appropriating English for their own purposes will eventually gain the rewards they pursue - and do so fully conscious of the implications of their choice. They are not hapless victims, yet they are more "swimming with the tide" than choosing their course. Like language communities anywhere that do not have the bulwarks of a publishing industry and readers with the tastes and resources to support it, a naturally growing terminology in twenty-first-century discourses, and speakers' confidence that the language can take its place alongside English, our indigenous languages are indeed shrivelling in the warmth of the Hydra's breath and the lure of the sirens' song.

ENDNOTES

1. 'uMzansi', a Zulu and Xhosa word denoting 'the one at the bottom', refers to South Africa's position on a map of Africa. The nickname has a strongly positive connotation, and is used in advertising slogans such as 'UMzansi fo sho!'

2. Less than half of white South Africans speak English as a first language (Census 2001, p. 18); almost half a million whites emigrated between 1996 and 2010, leaving four and a half million whites in the country (Statistics SA 2010, pg. 6)

3. Boerewors is a spicy undivided sausage cooked on an open fire, enjoyed by all South Africans, but originally a food of the Afrikaans community particularly.

4. The word 'Coloured' was used by the South African apartheid government in the era of politically charged and traumatising racial discrimination as a basket term for people who did not fit into apartheid's rigid racial categories of "African", "Asian" and "White. In spite of this the term is not generally regarded as pejorative in South Africa.

5. Some of these functional schools have their origins in missionary education, which, although now much maligned, was at least characterised by a strong work ethic and high standards of education.

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CHAPTER 3

PITFALLS THAT JEOPARDISE STUDIES OF READING IN DIFFERENT LANGUAGES

ABSTRACT

We know that competent readers of text in all languages move through text with speed and ease, and are confident that they can tell what the writer has written. We also know that incompetent readers in all languages show the same pattern of moving hesitantly through text, rereading words and lines, stalling over particular pieces of text, and, often with good reason, are not confident that they can discover what the writer means to say. What is not clear from this apparent similarity of reading patterns across languages is whether the minute processes that cohere to produce the activity of reading are similar across languages, and across different orthographies, or whether this similarity is superficial, and elements of established patterns of reading performance differ with different orthographies. These minute processes and their implications for learning to read, for teaching reading skills, and for competence in reading, and ways to measure it are the subject of unresolved debate, especially in relation to reading in different languages. While studies have been done of differences in observable physical reading patterns between European languages, as well as some Asian languages, and between different orthographies, there is conspicuously very little information about reading in African languages. This article focuses on a quest to find out whether there are differences between measurable processes of reading of English text and reading of Zulu text, and particularly on problems thrown up in the course of the study.

 Keywords: reading   orthography   Zulu   psycholinguistic grain size theory

WHAT THE RESEARCH SAYS ABOUT EYE MOVEMENT IN READING

The relationship between eye movements and aspects of reading have long been studied, and researchers' observations were first published in 1879 (Starr and Rayner 2001). Early attempts involving the use of mirrors and minute observation of the apparent movements of readers' eyes were followed by complicated mechanical inventions such as a connection to readers' eyelid that converted eye movements into sounds for ease of recording, and then by computerised equipment that produces minute digital recording of eye movements, including tracking and mapping of successive points of focus onto the text read. This has facilitated close analysis of eye movements in direct relation to text, and different positions of researchers are based on this analysis. In the early years of the past decade, some researchers maintained that the idea that eye movements in reading were dictated by motor processes to do with the eye while others argued that the movement was governed by cognitive processes and the direction of attention (Starr and Rayner 2001). More recently, there is more general recognition that models of eye movement in reading based on cognitive processing and attention direction explain phenomena that the model based purely oculomotor principles cannot account for (Reichle, Liversedge, Pollatsek, & Rayner, 2008 p. 116). There is also general agreement that, with reference to English text, particular patterns of eye movement are associated with competent reading, where readers speedily and easily access the meaning of texts, and that equally, particular patterns of eye movement are associated with laboured, unskilled reading (Liversedge and Findlay 2000).

WHAT THE RESEARCH SAYS ABOUT THE COGNITIVE ASPECT OF READING

There are two concepts that have been central in investigating the process of a reader's starting off with looking at unfamiliar text, and arriving at the ideas the writer conveyed. One is that readers have a store of memorised word or text cluster constructs that are immediately accessible to them as they speak, listen, read or write. The idea is that using this bank, readers recognise whole words (or large parts of words, or groups of short words that frequently occur in a particular sequence) in print and access each word construct (complete with its meaning) from their store as they read text. The other concept is the idea that readers develop

the capacity to use cues from the orthography (the visual patterns of written language) to prompt memorised phonemes which they can synthesise, and use internalised rules for transforming letter combinations into speech sounds and then words and longer units of languages, and hence meaning. Henderson, (1984, p. 1) refers to the first process described above as the use of a mental lexicon, and the second as the use of orthographic cues. Not many researchers have given attention to whether these concepts are heuristically useful in researching reading across languages and orthographies other than English, but in 2005, Ziegler and Goswami proposed their psycholinguistic grain size theory, which provides a useful base for analysis of reading skills.

Psycholinguistic grain size theory proposes that "phonological awareness of syllabic and intrasyllabic structure" (Ziegler and Goswami, 2005 p. 16) has a strong influence on the development and practice of reading skills. Their argument is that while there is agreement between major reading theories that the ability to identify phonemes in spoken language is vital in the process of learning to read text in languages using the alphabetic system, differing language structures can result in differing units of text becoming salient for readers of different languages:

> **psycholinguistic grain size theory** suggests that the dramatic differences in reading accuracy and reading speed found across orthographies reflect fundamental differences in the nature of the phonological recoding and reading strategies that are developing in response to the orthography. For example, in alphabetic languages, children who are learning to read more orthographically consistent languages, such as Greek, German, Spanish, or Italian, rely heavily on grapheme–phoneme recoding strategies because grapheme–phoneme correspondences are relatively consistent. Children who are learning to read less orthographically consistent languages, such as English, cannot use smaller grain sizes as easily because inconsistency is much higher for smaller grapheme units than for larger units like rimes (Treiman et al., 1995). As a consequence, English-speaking children need to use a variety of recoding strategies, supplementing grapheme–phoneme conversion strategies with the recognition of letter patterns for rimes and attempts at whole-word recognition. Inconsistent orthographies like English appear to push readers into developing both small unit and large unit recoding strategies in parallel. (Ziegler and Goswami, 2005 p. 17)

Georgiou, Parrila, and Papadopoulos (2008, p. 566) cite some cross lingual reading comparisons in support of their suggestion that researchers working on models of reading development tend to assume generalisation across languages, but suggest that this is an unwarranted assumption. In fact a number of studies (Ellis et al., 2004, Georgiou, Parrila, & Papadopoulos, 2008, and Ziegler & Goswami, 2005) that compare aspects of reading across languages with consistent (or shallow) orthographies (basically where graphemes always represent the same phonemes) and languages with inconsistent (or deep) orthographies (basically where graphemes do not always represent the same phonemes) suggest the opposite. Georgiou et al conclude from these studies that in orthographically consistent languages such as Finnish and Italian, readers rely heavily on recoding from grapheme to phoneme (i.e. reproducing elements of speech from small elements of print – exemplifying Henderson's notion of an orthographic process), because readers can rely on the unambiguous, dependable relationship between letters and speech sounds; they also suggest that in languages such as Danish, French, and especially English, readers cannot rely on the smallest units of print to lead them to words because of an inconsistent relationship between letters and speech sounds, and therefore must develop a range of flexible strategies that include seeking patterns in larger units of print such as whole word recognition (Georgiou, Parrila, & Papadopoulos, 2008, p. 566, and Ziegler & Goswami, 2005, p. 16), thus exemplifying Henderson's notion of using a mental lexicon.

In terms of psycholinguistic grain size theory, the argument is that reading in orthographically inconsistent languages is likely to require multiple recoding strategies that are important for reading. This is because the inconsistency in the orthography requires readers to recognise single graphemes and retrieve corresponding sounds but frequently to deviate and recognise larger "grain size units" (Georgiou, Parrila, & Papadopoulos, 2008, p. 566-567.) Concomitantly, in orthographically consistent languages, if reading relies on "a grapheme – phoneme recoding strategy then phonological short term memory should play a larger role... because the phonological information of each grapheme must be available for ... word naming" (ibid, p. 567). In their 2008 study, Georgiou, Parrila, and Papadopoulos compare children's reading in Greek, (an orthographically consistent language), and English, (an orthographically inconsistent language), and, like a number of other studies, conclude that reading development in consistent orthographies imposes fewer demands on readers than inconsistent orthographies do to interpret large grain size units of text (ibid., p. 576).

If readers of languages with consistent orthographies rely on the reading strategy of small grain size processing of print, and direct linking of grapheme to phoneme, as suggested above, it would not be unreasonable to expect that this pattern would be a dominant strategy in reading Zulu, a language that not only has a consistent orthography, but is agglutinative. This prediction would be reasonable firstly because readers can depend on the unambiguous relationship between letters and speech sounds (Zulu has almost complete regularity in terms of letter–sound representation), and secondly because of linguistic and structural features of the Zulu language.

In comparing readers of Swedish and Finnish, Lehtonen et al. (2009) note that Finnish is different from its Indo-European language neighbours in its structure, and, because it is an agglutinative language, has a far higher number of possible inflected word forms than Swedish. With reference to reading, Lehtonen et al. state that "it is reasonable to speculate that processing of morphologically complex words might differ between these two languages. Because of the immense number of possible word forms in Finnish, it is plausible that most Finnish inflected words are not listed as a whole in the mental lexicon" (ibid., p. 495).

Similarly, while Zulu has a number of common words that always take the same form, such as conjunctives, the majority of its words change their form because of the agglutinative structure of the language and its orthography[5], and the concord system[6]. Words take a wide variety of forms (where roots or stems are combined with various permutations of prefixes, infixes and suffixes, all modifying meaning). As an example, the verb –*fa* (die)appears only as the letter 'f' in some of its possible constructions, a few examples of which include *ifile* (it has died)*, uzofa* (you will die) *, afe* (he died)*, ungafi* (don't die). Since "f" is a letter used in a great many other Zulu words too, this example should serve to show that it would be impossible or at least extremely uneconomical for readers to develop schemas for each

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[5] In which, for example, the prefix that performs a similar function to "and" is joined to the word stem it relates to – and takes three different forms: na-, no-, or ne-, for example "**na**bantu" (and the people) "**no**mntwana" (and the baby) and "**ne**ngane" (and the child).

[6] The concord system functions as a sort of echoing prefix or infix in a sentence and always refers back to a noun, so that words such as adjectives and verbs usually consist of a prefix (one of 9 different concords of one or two syllables), possibly other infixes that modify meaning, a stem, and possibly a suffix.

possible form taken. To further illustrate the implications of agglutination for differences between reading isiZulu and English, consider that a competent reader can read the English sentence "They have not yet been employed" by looking very briefly at the whole words without paying particular attention to the makeup of each word. In contrast, to read the Zulu equivalent "Abakaqashwa", a reader has to be aware of the same elements of meaning, represented not by visually separated words, but within the syllables of a single compound word (A/ba/ka/qash/wa). In this case the change of one letter, a "b" to a "k" to form "Akakaqashwa" changes the subject of the sentence from plural to singular. While words in English do take different forms as in inflections and changes of tense and so on, they do so to a much lesser extent than do Zulu words, and changes in form tend to be in the form of the addition of a prefix a suffix or both (as in "unemployment"), but not in the ever shifting clusters that characterise languages such as those of the Nguni language group of Southern Africa, to which Zulu belongs.

In terms of psycholinguistic grain size theory, this language characteristic is likely to result in small grain size being salient for readers; if readers do develop schemas for clusters of letters it is likely to be of meaningful morphemic elements, with the larger grain size salience perhaps coming into play when readers register on the limited number of unvarying short common words such as conjunctives, and on unvarying segments found within compound words.

In discussing the effects on readers' eye movements of word spacing in languages represented in alphabetic script, Winskel, Radach, & Luksaneeyanawin (2009) claim that a number of studies show that eye movements of readers of Indo European languages using alphabetic text are guided by word divisions, and that readers' eyes tend to fix on a point on the left of but near to the centre of a word as the "optimal viewing position". The plausible argument of these authors is that inter-word spaces serve to mark boundaries of lexical entities. Although Zulu text is in the form of alphabetic script, the pattern of eye movement described by Winskel et al is unlikely to be exhibited by readers of Zulu text. This is because, as noted above, its agglutinative form dictates a very different pattern of word segmentation than languages with less varying and agglutinated word forms. It would seem likely that the requirement for readers to register on elements of compound words that form semantic intra-word orthographic units dictates a pattern of eye movements that is consistent with the reading pattern suggested by reliance on small grain size as described by Ziegler and Goswami (2005).

In their study of readers of Thai and English script, Winskel et al. (2009) noted that Thai speakers who were accustomed to reading Thai script, which uses symbols for speech sounds other than the alphabet, were adept at perceiving word boundaries in this script even though word boundaries are not traditionally delineated in it. They found that points of fixation did not differ for these readers between unspaced and (artificially) spaced text, and, on the basis of a 2005 study of letter combinations in Thai by Reilly, Radach, Corbic, & Luksaneeyanawin (cited in Winskel et al, 2009, p. 341) suggest that these Thai readers may be using strategies such as registering on letters that most commonly occur on word boundaries in Thai script, as one of a possible set of language specific word segmentation cues. Similarly, work done on reading in Finnish (Bertram, Pollatsek et al. 2004), which, like Zulu, is regarded as an agglutinative language, demonstrated that readers of Finnish process compound words as wholes where the compound is short, but use cues to disaggregate long compound words into constituent parts. These cues include recognising boundaries of constituent parts by identifying vowels that do not occur consecutively in Finnish in the same constituent, but may occur consecutively where different constituents meet in compound words.

Although it is clear that agglutination occurs completely differently in Finnish and Zulu, readers of both texts must recognise constituents as distinct elements, and register on the information they signify in order to access the meaning of the text, and there are a number of possible cues in the written form of isiZulu that readers could use to register on separate constituents of complex agglutinated words. Therefore, it is possible that, like their Thai and Finnish counterparts, readers of Zulu text develop language specific skills that enable them to parse compound words into morphemic units that correspond with expected semantics. If this was true of Zulu readers, they would exemplify Ziegler and Goswami's psycholinguistic grain size theory in relying on small grain units of text as the most effective strategy for reading a language that is orthographically consistent. Reliance on small grain size units of text may also be an effective strategy in reading languages which feature the kind of complex agglutinative structure that characterises Zulu.

THE BASIS FOR THIS STUDY

If we accept the principle that eye movements are governed by the direction of attention, and concomitant cognitive processes, and we accept that it may be true that readers of Zulu text arrive at the meaning of text by relying mainly on reference to small grain size units of text, while readers of English rely mainly on reference to large grain size text units, then it would seem reasonable to predict that readers are likely to make more frequent visual fixations as they read Zulu text than they do when they read English text, and that the span of recognition (see definition below) would be smaller when reading Zulu text.

In summary of the discussion above, the reasons for this prediction are:

1. The work of Ziegler and Goswami (2005) on psycholinguistic grain size, and Georgiou, Parrila and Papadopoulos (2008), and Ellis et al (2004) comparing readers of different languages suggests that readers of a language with consistent orthography are likely to rely to a large extent on direct grapheme to phoneme recoding. Since the orthography of Zulu is almost perfectly consistent, this would indicate that readers of Zulu text will register on small units of text;

2. Due to the agglutinative nature of Zulu, meaning that is carried in separate words in English is often carried in small units of adjoined text in Zulu, and, (as suggested by Lehtonen et al in their 2009 work on readers of Finnish) readers would need to register on each one in order to arrive at the meaning of the text; it would seem reasonable to predict that this might lead competent readers of Zulu text to make more fixations and as a result to have a smaller span of recognition than competent readers of English text.

TESTING THIS HYPOTHESIS

In order to test this idea, I persuaded a number of students and colleagues at the University of KwaZulu-Natal[7], most of whom were Zulu first language speakers, to submit themselves to a scrutiny of their minute reading actions as they read English and Zulu texts. All participants were adults who considered themselves competent readers in both English and Zulu and who were interested in participating in the study. Using the same readers to test reading behaviours across English and Zulu has the advantage that readers act as their own controls, obviating the need to find participants that match in terms of age, educational level, occupation, and so on, but has the disadvantage that there might be carry over effects of reading skills developed in the course of learning to read in one language. In terms of psycholinguistic grain size theory, readers who have developed their initial reading skills in a language where reading is based on processing small grain size units of text might continue to rely on this strategy when reading English text, even though it is not the most effective strategy because of the orthographic inconsistency of English text.

As part of the analysis of readers' eye movements I used the Visagraph testing apparatus and programme, which records all eye movements made, thus showing the number and duration of fixations made, the number of regressions, and the span of recognition. This programme has a graded set of pieces of English text, on which readers' eye movements are minutely recorded as they read them so that it is possible to pinpoint exactly where on each word a reader fixates, how long the readers' eyes spend fixated on each point in the text, and records exactly where in the text the reader looks back to when regressions are made. I had hoped to insert Zulu text into the programme and to record eye movements of readers minutely as they read text in both languages, so as to see where they were directing their attention. Visagraph staff (based in the United States) expressed interest in the idea, but indicated that the Zulu text would have to form an exact parallel of the English version in terms of the number of words in the text and the length of the words. Although this would have enabled the existing software to accommodate the new text without any modification, it was obviously completely

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[7] The University of KwaZulu-Natal (UKZN) is in eastern South Africa in the province of KwaZulu-Natal, where Zulu is the home language of 84.9% of the population (Statistics South Africa 2010 p. 2.9). This study was conducted on UKZN's Pietermaritzburg campus.

impossible, as it would be with any two languages, never mind two with completely different structures. In the end nothing came of my attempts to set up some kind of agreement with them[8]. Not having the eye movements of readers mapped directly onto Zulu text meant that it was not possible to ascertain exactly the points of fixation on the text. However, it is possible to use the apparatus on any piece of text and to record and analyse eye movements without their being mapped directly onto the text, and therefore, although not as exact as I had hoped it would be, this still seemed a worthwhile exercise for the purpose of this study, which was to compare observable components of reading behaviour across languages.

The texts I used for this test (Appendix 1 and 2) came from a South African website that offered information on Zulu cultural history, but that is no longer available on the internet. These parallel texts in English and isiZulu were the most suitable I could find for testing reading across Zulu and English because they were unfamiliar yet contained information from a historical context that tends to form part of common knowledge among Zulu people, and therefore related to a context familiar to the readers. Being excerpts from parallel texts that the website offered in each language, these English and Zulu texts dealt with the same content at the same level of detail, and, in my judgement as a bilingual reader, were pitched at the same level of complexity. However, as noted under "Flaws in the study" below, judging the level of complexity of texts across languages cannot be easily done, especially in languages as different in structure as English and Zulu.

I tested each participant's reading in two stages. In the first, I asked each participant to read aloud a short unseen excerpt of the texts (Appendix 1) that switched from the Zulu version to the English version half way through with no interruption in meaning. I recorded their reading on a voice recorder and noted miscues, repetitions, and any other features of their reading, and immediately after they had completed reading I discussed their experience of this reading with them, comparing what I had noted of their reading with what they had experienced, with particular attention to the shift from reading isiZulu to reading English.

In the second stage I used the Visagraph equipment (described above) to track and record the eye movements of these research participants as they silently read another excerpt from the Zulu history texts (Appendix 2), that again switched from isiZulu to English half way

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[8] But subsequently the package was set up, and is referred to in subsequent papers.

through. Although the differing structure and orthographies of these two languages obviously make it completely impossible to match texts for number of words, the Zulu and English texts used for the test were exactly equal in terms of font size, length of lines of text, and number of lines. I tampered with these texts so that towards the end there was one sentence that directly contradicted information that preceded it. My purpose in doing this was to observe readers' eye movements when they come across contradictory information in text that they are reading, as well as to their cognitive process in as far as they were aware of it, and could describe what they experienced, and to note if there was any differences in response to encountering contradictions across the two languages.

A significant limitation in this study is the effect of the readers' awareness that their reading behaviour was being observed. In this case this was especially strong since the observation involved not only the presence of a familiar colleague as an attentive observer, which would undoubtedly affect anyone's reading performance, but also, for the second stage of the test, the wearing of a sort of mask that participants knew enabled their eye movements to be tracked. As a researcher I was amazed at the extent of the good nature of my participants in putting up with this degree of invasiveness; without exception they remained cheerful and extraordinarily cooperative, even when I had trouble adjusting the apparatus to suit them, and as a result had a couple of false starts in some recordings.

I had anticipated that my participants would show equal competence in reading aloud in isiZulu and English, but, as noted in relation to psycholinguistic grain size theory above, was curious to see whether tracking of their eye movements as they read silently would show that when reading isiZulu text, readers make more frequent fixations and have a smaller span of recognition, in other words that they would process Zulu text in smaller chunks than they would English text.

Ultimately, the recordings showed an interesting pattern that contradicted not only my own hypothesis, but also what most of my participants expected in relation to the their own reading across the two languages. The recordings of eye movements during silent reading showed that my expectations of the pattern of fixations were completely wrong for these 13 readers, and the consistency of the pattern that emerged here suggests that it might reflect a wider reality. Only one of the people tested (a first language English and second language isiZulu reader) showed the pattern I expected.

It is well known that as readers develop competence in reading English text, their speed increases, and the number of fixations they make per line of text decreases, as does the number of regressions they make. Fixations are moments of fixed focus in which the eyes are fixed on a particular point in a text, and regressions are instances where a reader shifts his or her focus to the left in a line of text to reread pieces of text for a second (or sometimes a third) time. Highly competent readers of English text make fewer fixations and fewer regressions as they scan lines of text than do poor readers. This indicates that they process a larger piece of text in each fixation than poor readers do. In other words, a reader's span of recognition grows as reading skills in English develop.

In Table 1, scores in the paired columns in the must be compared in order to compare each reader's eye movements across languages in each category of scoring. The first pair of columns refers to the number of fixations readers made in each language, the second pair of columns refers to the number of regressions readers made, and the third pair of columns refers to their span of recognition, and the fourth pair to the duration of readers' fixations.

TABLE 1: READING SCORES RECORDED ON THE VISAGRAPH RECORDING EQUIPMENT

Reader	English fixations	Zulu fixations	English regressions	Zulu regressions	English span	Zulu span	English fixation duration	Zulu fixation duration
1 (Z)	182	151	23	16	.55	.67	.29	.37
2 (Z)	201	260	22	46	.50	.38	.24	.26
3 (Z)	166	123	32	23	.66	.81	.22	.22
4 (Z)	159	108	34	22	.63	.93	.30	.36
5 (Z)	151	129	23	12	.66	.78	.35	.36
6 (Z)	441	376	141	118	.20	.27	.11	.12
7 (Z)	110	69	13	2	.91	1.45	.25	.25
8 (Z)	162	103	33	22	.62	97	.22	.25
9 (P)	150	188	19	52	.67	.53	.25	.24
10 (E)	60	105	7	12	1.67	.95	.22	.25
11 (Z)	122	105	16	20	.82	.95	.23	.25
12 (Z)	207	164	49	40	.48	.67	.30	.31
13 (Z)	177	198	37	51	.56	.51	.25	.25

Participants are numbered 1 – 13 and their home language is shown after the number of each one as **Z**, **P** or **E,** where Z means Zulu, P means Pedi, and E means English. Their reading was measured on English and Zulu texts that were matched for level of complexity, font, line length and number of lines. Results in the table are displayed as follows:

- Columns 1 and 2 show the number of fixations each reader made while reading the English and Zulu texts respectively.

- Columns 3 and 4 show the number of regressions each reader made as they read English and Zulu texts respectively.

- Columns 5 and 6 show span of recognition of readers as they read the English and Zulu text respectively. For the English text (column 5) this figure shows the average of the number of words recognised or processed in each visual fixation. The figure in column 6 refers to how much of a comparable section of Zulu text is recognised in each fixation[9].

- Columns 7 and 8 show the average length of time each fixation lasted for each reader as they read the English and Zulu texts.

DISCUSSION OF RESULTS

IN RELATION TO THE QUESTION OF WHETHER READERS' EYE MOVEMENTS WOULD REFLECT PREDICTIONS MADE ON THE BASIS OF PSYCHOLINGUISTIC GRAIN SIZE THEORY

The aim of this study was neither to measure readers' levels of skill against any benchmark, nor to nor compare their scores with each other, but to compare the eye movements of each reader when they read Zulu text with the eye movements the made as they read English texts. The pattern shown in the table was wholly unexpected, surprising the researcher and the readers alike.

As explained above, there are good reasons to expect that in terms of psycholinguistic grain size theory, Zulu exemplifies a language for which readers would rely on recoding strategies based on small grain size units of text, while English is a language for which readers would rely on recoding strategies based on large grain size units of text. On this basis, I was interested to see whether the eye movements of readers who are competent readers of both

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[9] In measures of reading English text, the span of recognition is expressed in terms of an average of the number of English words recognised or processed in each fixation. It would make no sense to compare span of recognition across languages by referring to the number of words recognised in English with the number of words recognised in isiZulu because Zulu words are so much longer and more complex, containing many more semantic elements than English words. This figure makes sense only if one regards it as referring to sections of lines of Zulu text comparable in length with English words, which is possible here because the text read was matched for font size, length of lines and number of lines.

languages would reflect the theory, in that I thought that they would exhibit more fixations and a smaller span of recognition, but not more regressions when reading isiZulu text than when reading English text.

The scores in Table 1 show that this was definitely not the case. Overall, the scores revealed that the number of fixations made did not seem to depend on the language of the text (and hence the orthography). Instead the scores indicate that readers who made a high number of fixations did so in reading the text in both languages, and tended to also make a high number of regressions, indicating that the number of fixations was linked to the particular reading pattern of an individual rather than the language read.

Only the four readers whose scores were consistent with overall higher competence in reading English recorded a higher number of fixations when reading Zulu text than English text. Their scores have a yellow background in the table. The nine readers whose scores were consistent with overall higher competence in reading Zulu (scores with a blue background) all recorded a lower number of fixations reading Zulu text than they did reading English text.

With regard to the records of regressions, 8 of the 11 first language Zulu speakers made considerably more regressions reading English than they did read reading Zulu. It is interesting that the 3 who made more regressions reading Zulu than English made just about twice as many regressions in Zulu.

Records of duration of fixation, in other words, the length of time a reader's eyes spent focussed on a particular piece of text, showed very little difference across texts.

The texts used in this study contained deliberately inserted contradictions, for example a sentence stating that Shaka's warriors were not allowed to marry (a well known fact), was followed by a reference in the next sentence to their wives (a fabrication). The purpose in inserting the contradiction was to observe what readers do at the level of eye movement as well as at the level of conscious experience as described immediately after reading the text. I had expected that on coming across information that contradicted something that they had just read, readers would reread the contradictory parts of the text, and that this rereading would reflect in the recorded eye movements, and that they would mention something about the contradictions or confusing aspects of the test in the discussion of their experience of their experience of reading the text. In the test, none of the readers spontaneously remarked on the

contradiction, and the recording of eye movements showed no noticeable regressions at that point. Most responded to probing questions about whether they had noticed anomalies in the text only after a couple of prompts, and then vaguely, for instance "Yes there was something ... what did the text say again?" Three offered the reasonable explanation that since they knew their reading was being recorded their attention was more on the physical activity of reading than on the meaning of the text. If this was the case for all the readers, including those who did not even notice the contradiction, this underlines the difficulty or impossibility of recording real reading – the kind that happens when a reader is not under observation and completely free to move through text without thinking about the reading process.

IN RELATION TO PARTICIPANTS' EXPECTATIONS

Nine of the readers who speak Zulu as a first language stated that they expected to read better in English because they read much more in English than they do in isiZulu, and, when asked straight after they had completed the testing process, they indicated that they thought they had done so in this test: their self-reports included comments such as (Reader 4): "in Zulu one struggles reading smoothly as one would reading English…"   and (Reader 5): "I think I'm better in terms of speed fluency, the eye runs more fast in English than in Zulu."

In fact, there was not much difference in their oral performance in reading a Zulu text aloud and reading an English text aloud. All of the participants read competently, but all the participants whose first language is isiZulu read Zulu text with slightly more confidently and fluently than they read English text.

The record of eye movements of the two participants whose expectation that they would perform better reading Zulu text were matched by indications from the recording (readers 5 and 7), showed that they made fewer fixations when reading the Zulu text than the English text, thus disconfirming my hypothesis about readers making more frequent fixations for Zulu text. They also made fewer regressions when reading the Zulu text. Of interest is that reader number 7 is a journalist in a Zulu language newspaper and in the course of her work reads, writes and edits a great deal of Zulu text on a daily basis.

Before each recording, participants were asked which language they thought they read more competently in, and since they readily gave their own estimation of their relative competence

across languages, the comparison of their estimations with indications from the Visagraph scores[10] are of interest.

- 2 of the 13 (both first language Zulu speakers) expected to read better in Zulu

- ☐11 of the 13 (9 first language Zulu speakers, a Pedi first language speaker and an English first language speaker) expected to read better in English.

Of the eleven participants who expected to perform better reading the English than the Zulu texts, four registered fewer fixations and made fewer regressions when reading English text. Two of these (readers 2 and 13 in the table) were first language speakers of isiZulu, one (reader number 9 in the table) was a first language Pedi speaker, and one, (reader number 10) was a first language English speaker. This meant that, according to the Visagraph test, seven of the nine first language speakers of isiZulu who expected to perform better reading English text actually performed better reading Zulu text.

The two first language Zulu speakers whose prediction that they would read more competently in English matched the indications from the recordings of their eye movements were participants 2 and 13. 2 is a university lecturer in his 40s who holds a PhD and is very active in his church as a lay preacher. He prefers to use English in his activities related to the church, his children attend English medium schools. He states that in his home English is used as much as Zulu.

The seven whose predictions that they would read more competently in English than in Zulu did not match the indications from the recordings of their eye movements; they were surprised at their scores since even after they had read the texts they felt they had read more smoothly and fluently when they read the English texts than when they read the Zulu texts. According to one of them: "I think I'm better in terms of speed fluency, the eye runs more fast in English than in Zulu," (5). Yet, as can be seen in the first two columns of the table,

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[10] For all the readers but one, the language in which they made the highest number of fixations was also the language in which they made the highest number of regressions. Reader number 11, however, made fewer fixations reading Zulu text than English text, and made more regressions when reading Zulu text than English text. His pattern of eye movements contradicted not only my expectation that readers would make a higher number of fixations as they read Zulu text, but also the usual pattern of fixations and regressions, where a high number of fixations tends to be accompanied by a high number of regressions.

they made substantially fewer fixations as they read the Zulu text than as they read the English text, and the figures in the 3rd and 4th columns show that all except one of them (number 11) made fewer regressions when they read Zulu text than they did when they read English text. Both of these scores are strong indicators of greater facility with Zulu text. I hesitate to assume that the recordings reveal more valid information than readers' own perceptions of their reading, but the pattern of a higher number of fixations and a higher number of regressions in English revealed by the scores of most of the participants is difficult to discount in spite of their being a large number of flaws in this study.

FLAWS IN THE STUDY

- The most immediately obvious limitation in the study is that the number of readers tested constitutes too small a sample for any generalisations to be made. Although it was originally intended to test a large enough number of readers to reach statistical significance, problems that became obvious in the course of testing the readers and considering their scores made it clear that it would not make sense to test more readers than had been done on reaching this point. However, the problems themselves are worth noting and discussing, particularly since at least some of them are likely to arise in the context of other possible cross lingual reading studies.

- Ensuring that reading is being tested on texts of equal difficulty when comparing reading skills across languages is essential, yet probably impossible. Texts used in this study were parallel versions of the same content on a website offering historical information on the people of KwaZulu-Natal. It seemed to me that the text had been written in Zulu and then translated to English, yet just as it is difficult to say exactly why this seemed to me as a reader to be so, it is at least as equally difficult to compare the level of difficulty of texts across languages. In English the levels of reading difficulty are measured by using readability indexes that depend on average length of words in terms of syllables, and the average number of words in sentences. These are exactly the areas in which agglutinative and non-agglutinative languages differ, and therefore official indexes such as these are of no help in judging the level of difficulty across languages. In this study I based my judgement that the texts were of a comparable level of difficulty on the basis that they were parallel versions of

particular content on a website, and therefore dealt with the same content at the same level of detail. However, translation is a practice subject not only to the idiosyncrasies of each translator, but also to the vocabulary of each language and the culture of its speakers. For example, the excerpts of texts used in this study related to the armies of King Shaka, which is surely home ground for the Zulu language, but not so for the English language, and a translator might have to use circumlocutions and abstract descriptions of objects and practices unfamiliar to English readers. This would obviously affect the level of cognitive difficulty for readers. While it might be suggested that the use of "culture free" text would solve the problem, a researcher in pursuit of this quickly discovers that culture free text is actually a unicorn of the reading world, and impossible to find. Therefore the limitation that some uncertainty in ensuring a comparable level of difficulty across texts must be admitted.

- The effect of observation will always be a factor in studies of reading. The close and invasive observation that characterised this study would probably affect the reading behaviour of absolutely everyone, even reading super-heroes. In the case of this study, occasional malfunctions of the equipment, or difficulties in adjusting the apparatus to suit each reader was a nuisance, but one that could not be avoided in the course of recording eye movements. The scores recorded are those of readers who read while wearing a mask and knew that they were under observation. It is impossible to know how closely these scores reflect unobserved reading under natural conditions.

- A more subtle limitation lay in what first seemed like a good idea. This was the decision to assess and record the eye movements of each reader as they read texts in both English and Zulu, so that in effect each reader provided his or her own match for comparison across languages, thus controlling for variables such as age, educational level and personal idiosyncrasies. However, what this strategy cannot control for is differing levels of reading competence between first and additional languages in the same person. It can also not control for carry-over effects of reading habits learned early in life. To illustrate, it might be that as a child learns to read, he or she develops a set of reading skills that serve as the most economical and effective means of reading in the language in which this early learning takes place. It is possible that when these habitual patterns are set, they are applied to the reading of all languages

73

learnt thereafter, whether or not they are the most effective for reading the newly acquired language and its orthography.

- The use of number of fixations and extent of span as established measures of competence in English (where a low number of fixations and a wide span are associated with skilled reading) conflates features that are currently used to judge the extent of reading competence with the eye movements that one would expect of competent readers processing large grain size chunks of text if indeed eye movements are influenced by grain size of textual processing by readers.

- The units of measurement and their lack of direct applicability to reading in a language other than English, for which they have all been developed, made comparisons across languages difficult. Measurements that accommodate cross lingual comparisons are essential for studies in this area. For example, measures of reading speed could perhaps be based on characters per minute instead of words per minute, and a cross lingual measure of span of recognition could be expressed in terms of the number of character spaces recognised in a single fixation, instead of as a portion of an English word.

- Finally, it had not been possible to adapt the Visagraph programme to map readers' eye movements directly onto words read in the Zulu text, which would have pinpointed the focus of each fixation. Without this it was impossible to judge exactly how readers were segmenting or parsing the text as they read.

Some of the factors listed above may possibly account for an anomaly in the scores that will have been immediately apparent to anyone familiar with this form of reading testing. The anomaly is that the scores of nearly all the readers are consistent with very low levels of reading skill, and yet all these readers had had the benefit of tertiary education, some to the level of PhD. A number of different interpretations of this feature are possible: scores may have been depressed by the intrusive nature of the testing process as described above, or the scores may simply be wrong, or the scoring system may not be related to actual reading skills, or perhaps the scores do reflect the actual reading competence of these second language academics. If this is so, and if it is reflective of a wider pattern, it is possible that the reading difficulties faced by second language academics are underestimated.

CONCLUSIONS

The value of the contribution of this study is not in conclusions that could be drawn from it but rather in the issues it raises and the illustrations of pitfalls in the path of researchers attempting to compare reading skills across languages.

The outcomes of the testing process described above should by no means be taken to suggest that psycholinguistic grain size theory does not apply to readers of English and Zulu text. On the contrary, the contrasting orthographies of these two languages seem to me exemplify extreme positions on the continuum described by Ziegler and Goswami (2005) and by Ellis et al (2004) in their analyses, and it is very possible that studies that avoid the pitfalls highlighted by this first attempt at researching the area will show that their theory applies to reading strategies developed by readers of these two languages.

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APPENDICES:

Appendix 1

Izimpi

Nina beSilo! UZulu unomlando wamaqhawe alwa izimpi ezama ukuvikela elikaMthaniya ezitheni ezase zingenisile. Amasu nobuhlakani bokulwa impi buyehluka esizweni ngesizwe. KwaZulu abafanyana bebefunda ubuciko bempi besalusa izinkomo.

Ukungcweka kwakuba njengomdlalo lapho abafanyana beqhathwa. Kungcweka abafana ababili ngesikhathi. Umfana ngamunye uphatha izinduku ezimbili, enye eyokugadla enye eyokuvika.

Umfana owehlule bonke abafana besigodi uba yingqwele kulomdlalo.Ubuchwepheshe bokungcweka kanye nobuqhawe bomuntu bubonakala ngokuthi umuntu ongcwekayo akwazi ukuvikela izitho zomzimba ezibalulekile, ikakhulukazi ikhanda.

In a boy's life would come a time when they would be drafted into a regiment. This is a time where the King would call on all the boys from different villages to be drafted into the royal regiment. However, before the boys would form a complete regiment they were trained and taught in detail about various weapons, their use as well as the art of war.

Most of the expertise and strategies of war came about during King Shaka's rule. One of these strategies was one he had picked up while he was a commander of one of the regiments of the Mthethwa king, Dingiswayo.

Appendix 2

Kuthe esethatha ubukhosi bakwaZulu, uShaka wasebenzisa lamaqhinga akwaMthethwa. Amanye alamaqhinga uShaka wawaguqula.Amanye kwakungakaze kuzwiwe ngawo ngaphambili. Umkhonto obizwa ngeklwa,okudla kwawo kubanzi kanye nenduku emfishane wasungulwa yileqhawekazi. UShaka waphinde waqala uhlobo olusha lwehawu olude, elicishe lilingane nomuntu emile.

Esikhundleni sokuba nebutho elilodwa elikhulu, uShaka walehlukanisa ibutho laba ngamaqembu amancane.Lamaqembu ayevunula ngemibala eyahlukene. Iqembu ngalinye laliyanyaniswa nezinkomozohlobo oluthize noma mibala ethize emele lelobutho. Lokhu kwakwenza kubelula ukubona ukuthi insizwa ngayinye eyaliphi iqembu noma ibutho.

One strategy that had a huge impact in battle was that of arranging the regiments in the shape of a bull's head - some regiments would form the head and some the horns. The regiments forming the horns would quickly rush forwards from both sides so that the army would surround the enemy, and attack it from the two sides. Once the horns had the enemy covered, the group forming the head would attack and go forward thus entirely destroying the enemy.

Being a member of a regiment was no small matter among the Zulus since the training was demanding. The regiments would rise very early in the morning at dawn to start training. Likewise there would be days where the warriors would not sleep a wink and also spend days without food or water. The warrior would run for long distances on foot, walking over hot coals and thorns.

CHAPTER 4

A PROFILE OF COMPETENT READERS OF ISIZULU

ABSTRACT

This exploratory study aims to extend our understanding of reading in isiZulu, the most widely spoken indigenous language in Southern Africa, by exploring measurable aspects of eye movement patterns of a group of competent adult readers of isiZulu. In doing so, the study offers an exploration of the particular demands that Zulu orthography makes on readers, and offers a tentative profile of the reading processes currently exhibited by proficient adult readers of isiZulu. The study indicates that with an average reading speed of 815 lpm, isiZulu text takes more time to read than text in other alphabetic languages for which data is available. Relative to other languages, readers showed short saccades (4.05 letters) long durations of fixation (.3 seconds) and more frequent regressions over spans of text (an average of 1 regression every 24 letters).

INTRODUCTION

Although reading became commonplace a couple of centuries ago, and books and papers started to be published in African languages in the 1800s (Moropa, 2010), much remains to be discovered about reading in African languages.

Writing systems in Southern African languages were developed using the Roman alphabet, and until recently, there appears to have been a general assumption, perhaps linked to the thinking in the linguistic interdependence hypothesis referred to by Pretorius and Mampuru (2007), that readers of all languages using this alphabet use similar reading skills that transfer directly across languages. However, research suggests that reading patterns differ across languages and orthographies (Ellis *et al*., 2004; Georgiou *et al*., 2008; Tong & McBride-Chang, 2009; Ziegler & Goswami, 2005; Hutzler *et al*., 2008), but that the many variables involved in the differences are little understood (Rayner *et al*., 2009).

With 10.7 million first language speakers, isiZulu is the most widely spoken indigenous language in South Africa (van der Merwe and van der Merwe 2006). Most first language speakers of isiZulu learn to read in their mother tongue and in English - two languages that differ radically from each other in both structure and orthography. The implication of this is that children and adults learning to read in both these languages might be required to develop parallel and contrasting sets of skills. It seems that this possibility has not yet been considered by developers of readers or training programmes for teachers of reading.

A great deal has been documented about English orthography and optimal reading strategies for its readers, but there is as yet scant research on reading in African languages (Pretorius and Mokhwesana 2009). This paper reports on a study that investigated silent reading of authentic continuous isiZulu text by competent adult first language readers. The aim of the study was to profile the reading processes currently exhibited by proficient adult readers of isiZulu in the light of particular features of its orthography. The study follows an earlier one on the same area by this author (Land, 2011), whose doubtful findings were that adult readers did not appear to read isiZulu with more frequent fixations than English, that some participants made more regressions reading English than they did reading isiZulu, and that there was little difference in the duration of fixations across languages. The study suggested that readers who made a high number of fixations and regressions did so in both languages,

indicating that the particular reading pattern of an individual was a more telling factor rather language or orthography. However, this 2011 study had severe limitations. It was based on only 13 participants who were not asked to demonstrate their reading speed and competence before their eye movements were recorded. Also, it was conducted before the isiZulu package that maps eye movement directly onto text was developed, so on the isiZulu texts, eye movements were not as precisely measured as they were in the study reported on in this paper. A striking feature of participants' eye movement records in the 2011 study was that 'the scores of nearly all the readers are consistent with very low levels of reading skill, even though all the readers had had the benefit of tertiary education, some to the level of PhD' (Land, 2011:64). With participants' level of reading proficiency called into question, the study was curtailed and the focus of the paper that reported on it (Land, 2011) is squarely on the difficulties in comparing reading across languages.

In contrast, the study reported on in this paper was designed to avoid the pitfalls of that earlier study; it required participants to demonstrate a high level of competence in reading prior to participation, is based on a sample large enough to reach statistical significance, and used Reading Plus's isiZulu package (described below), which enabled the researcher to collect more extensive and precise data than had been possible in the 2011 study.

FEATURES OF THE ORTHOGRAPHY OF ISIZULU

ORTHOGRAPHIC DEPTH AND CONSISTENCY

With regular, near perfect letter-sound representation, the orthography of isiZulu is consistent and transparent, and pronunciation of words is predictable from their spelling. In contrast, orthographies termed deep or opaque, such as that of English, do not have a regular relationship between graphemes and phonemes, so that it is impossible to predict without prior knowledge how a printed word will sound. According to the orthographic depth hypothesis (Frost, 2007), in orthographies where pronunciation of words is predictable from their spelling, readers are likely to read by reconstructing the sounds of speech in their minds on the basis of the relationship between orthographic cues and phonology. An extension of the above hypothesis is Ziegler and Goswami's psycholinguistic grain size theory (2005),

which suggests that readers of transparent orthographies are likely to rely on small grain size units of text, in other words to process pieces of text of only a few letters at a time, such as a syllable. This strategy contrasts with that which seems to be optimal for languages with irregular sound-letter representation where readers must respond to larger grain size units of text, such as whole words, or even clusters of frequently collocated short words.

The strategy of reconstruction of speech sounds from units of text at possibly the level of the syllable may well be used by proficient readers of isiZulu not only because they can rely on the direct sound-letter correspondence in its consistent orthography, but also because it might give them an effective way of navigating through its agglutinative structure and conjoined writing system.

Agglutination

Agglutination differs across languages in pattern, degree and parts of speech where it occurs. IsiZulu and other Nguni languages of Southern Africa do not feature the compound nouns that result in astonishingly lengthy words such as German's

Donaudampfschiffahrtselektrizitätenhauptbetriebswerkbauunterbeamtengesellschaft. (Association for Subordinate Officials of the Head Office Management of the Danube Steamboat Electrical Services) (H2G2, 2007). In contrast, in the Nguni agglutination pattern, meaning is often modified by very short conjoined morphemes that cluster round word stems in single words. It is not uncommon for complex words to contain five or more morphemes modifying meaning, for example the second word in the phrase: *Isithombe esingakwesokunxele* (the picture which is on the left), has six affixes: *e/si/nga/kwe/so/ku-/* before the root word for 'left': *-nxele*.

Agglutination does not always result in longer, more complex words. Like isiZulu and other Nguni languages, the Sotho languages are agglutinating Southern African Bantu languages, but in their writing system, agglutinating morphemes are not conjoined.

The contrast between agglutination patterns in five agglutinating languages, isiZulu, Finnish, Turkish, Northern Sotho and Setswana is demonstrated in their equivalents for the sentence 'Let us not allow the languages of this country to be destroyed' (12 English words):

- In isiZulu: *Masingavumeli ukuthi izilimi zakulelizwe zishabalale* (5 words)
- In Finnish: *Älkäämme antako että kielten tämän maan tuhoutua*, (7 words)
- In Turkish: Bize bu ülkenin dilleri yok edilmesine izin vermeyelim (8 words),
- In Northern Sotho: A re se ke ra dumela gore dipolelo tša naga ye di senyege (13 words), and
- In Setswana A re se dumelele dipuo tsa naga e go senngwa (9 words)

The comparison between the number of words in English and the two Sotho languages (i.e. Northern Sotho and Setswana) shows that agglutination itself does not necessarily result in lengthy complex written words.

CONJOINED WRITING SYSTEM

Linguists who developed the written form of isiZulu opted for a conjoined orthography to represent its agglutinative structure because its patterns of inter-morpheme vowel elision and coalescence would be difficult to accommodate in a disjunctive writing system (de Schryver & Wilkes, 2008). However, there might be costs to this that are borne by readers, who must deal with long, complex words whose composition changes with semantics. Average word length in the four isiZulu texts used in this study is 7.73 letters. This is similar to average word length in text from *Isolezwe*, a popular isiZulu newspaper in KwaZulu-Natal (KZN), which is 7.17 letters (based on a collection of articles comprising 5055 words from issues in November 2013). In comparison, average overall word length in *The Mercury,* a popular English newspaper in KZN is 4.85 letters (based on a collection of articles comprising 5184 words from issues in November 2013). This figure is close to that found in a study of European newspaper text, which found average word length to be 4.6 letters in English, 4.7 in Danish, 4.9 in Swedish, 5.6 in German and 7 in Finnish (Björnsson, 1983).

The most immediate implication of this for reading isiZulu text relates to automaticity. Essential for proficient reading, this is the 'direct recognition of multi-letter units and whole words' (Verhoeven *et al.*, 2011:387) or the 'ability to quickly recognize words automatically,

with little cognitive effort or attention' (Penner-Wilger, 2008:2), gained through extensive practice in decoding words or parts of words. Its development is related to the ease of recognition of these units, and it appears that in all languages, short, high frequency words are the most easily recognised, and the most readily automaticised (Abadzi, 2011).

There are some short high frequency isiZulu words that do not change form, e.g. verbs used as commands, conjunctives such as *ngoba* or *uma*, and common forms of nouns. However, most words appear in a wide range of flexible forms consisting of the root embedded in many possible permutations of conjoined prefixes, infixes and suffixes that modify meaning, and inevitably make the word stem visually indistinct. For example, among the many possible forms in which the root word *-funda* (meaning 'read' or 'learn') appears are:

- *Funda! (Read!)*
- *masifunde* (let's read)
- *masifundelane* (let's read to one another)
- *usefundile* (he/she has read)
- *njengomfundi* (as a learner)
- *akafundanga* (he/she has not learned)
- *emfundweni* (in the learning)
- *ofundisiwe* (that which was taught) and so on.

The agglutinative nature of the language combined with the conjoined orthography means that readers must parse compound words into a number of morphemic units and register the meaning conveyed by each one in order to access the meaning of text. For example, readers must parse the compound word *masithandazelane* (let us pray for one another) into six morphemic units (*ma/si/thandaz/el/an/e*) which in this case comprise a root word preceded by two affixes and succeeded by three more. A small change in one of the morphemic units changes the meaning, (e.g. *manithandazelane* 'you should pray for one another'), therefore reliance on a lexicon of whole word schemas is unlikely to be an effective reading strategy, because it would not enable readers to register and respond to small but semantically important shifts in compound word forms.

HOMOGENEITY IN VISUAL TEXTUAL PATTERNS

A third characteristic of isiZulu orthography that might influence reading patterns has to do with its vowel sounds (only five), and its Consonant-Vowel (CV) syllable pattern, and partly to do with decisions made when the language was first written. In the orthography of isiZulu, there are no contiguous vowels, since the orthography has no distinction between long and short vowels, and in diphthongs vowels are separated by consonants, (e.g. *ngayiphawula* - 'that I told'). There are also no double consonants in isiZulu (as there are in the English word 'adder'), although combinations of up to five consecutive consonants are possible, for example *Izontshontshwa* ('it will be stolen'). The effect of this is that there are fewer permissible letter combinations in isiZulu orthography than in English orthography. Hence the long words of isiZulu are composed of differing permutations of a limited number of frequently recurring syllables, so that the same combinations of letters (e.g. *zi, ku, ka, nga,* or *ngu*) recur frequently in words that might or might not be semantically related.

Analysis of text from the popular isiZulu newspaper *Isolezwe* reveals that 44 three letter strings recur 100 times or more, with 10 of them recurring more than 200 times. In comparison, in text from the English newspaper *The Mercury,* only 5 three letter strings recur 100 times or more, and only 1 of them (the) recurs more than 200 times.

This results in a high degree of visual homogeneity amongst units of text in isiZulu; in other words, unrelated units of text can be visually quite similar.

TONAL PATTERNS

Finally, tonal patterns are a crucially important cue for meaning in oral communication in isiZulu, and facilitate a listener's interpretation of its limited range of permitted syllables as they group and regroup in abundant possible permutations. Second language speakers are often frustrated when, having mastered vocabulary, the concord system and word order, they are still not understood by native speakers because their tonal patterns are wrong. In spite of this central importance, isiZulu orthography carries no tone markers.

Implications of this for readers are that they must seek cues for meaning in other sources such as context, and there is a high degree of potential for confusion in relation to the many morphemes which are homographic but differ completely in meaning according to their tone. For example, *-nga-* spoken in a low tone negates a sentence, or, spoken in a high tone, indicates potential. Thus *Le nkomo ingahlatshwa*[1] can mean 'this cow must not be killed' (if *-nga-* has a low tone) or 'this cow may be killed' (if *-nga-* has a high tone), an ambiguity which presumably would leave its recipient in a bit of a quandary if the communication was sent in a note.

DATA FROM EYE MOVEMENT RECORDINGS

Recordings of the eye movements of competent readers in different languages show that as they read, the point of their visual focus fixes on successive points in the text. The brain receives information from the eye only during moments of fixation (Prime *et al*., 2011; Rayner, 2009). In cognitive processes based on learned associations, readers transform information from visual patterns of print into representations of spoken language. The decoded print is produced as speech if the reader is reading aloud[2], or, in silent reading, perceived as an inner voice (Rayner *et al.*, 2009). This inner voice produces clear language within the mind at a speed far in excess of speech and should not be confused with sub-vocalised reading, where the speech organs mimic motions of reading aloud, limiting reading to the speed of speech.

Equipment used to record eye movements in reading produces records of:

- Fixations, or points of focus on lines of text as the reader repeatedly shifts his/her focus through text, usually towards the right,
- saccades: the movement of the eyes from one fixation to the next,
- regressions made if a reader shifts the point of focus to the left, thus 'reversing' in relation to the direction in which text is read,
- the duration of fixations: the length of time the gaze is directed at particular points in text.

There is now general agreement that linguistic and cognitive processes are strong determinants of eye movement (Reichle *et al*., 2008; White, 2008), and the association between fixations and attention (Paulson, 2005:342; Miellet *et al*., 2009:721) implies that

patterns of eye movements during reading may yield information about how different orthographies or different languages influence eye movement patterns. A survey of eye movement studies of skilled readers of continuous text in different languages shows that:

- Fixations of readers of German tend to be shorter than those of readers of English, lasting between 190 and 201 ms (Hutzler *et al*., 2008), which is 20 to 60 ms shorter than fixations of English readers (Rayner, 2009; Hutzler *et al*., 2008). As cognate languages German and English share many characteristics, but German has a transparent orthography. Thus the difference between average fixation duration suggests that readers devote longer periods of gaze to points in English text with its opaque orthography, than do readers of German's more transparent orthography.

- Span of recognition too seems influenced by orthographical features. Bilingual readers exhibit different spans of recognition in different languages (Reichle *et al*., 2003). The average span of recognition among readers of Hebrew text is narrower than it is for English text because Hebrew text is more densely packed than English, and readers of Japanese and Chinese scripts (even more dense than Hebrew because of ideographic components), record an even narrower span of recognition (Reichle *et al*., 2003). The span of recognition is always asymmetrical, skewed towards the direction in which the text is read, therefore apparently dependent on orthographic context (Liversedge & Findlay, 2000). In English the span extends from about three characters left of the point of focus to about fourteen characters to the right of this point (Rayner, 2009); however, in Hebrew (read from right to left) the span extends further towards the left of the point of focus (Liversedge & Findlay, 2000:10; Miellet *et al*., 2009:726).

- Hautala *et al*. (2011) found a 25% rate of regressions on Finnish text compared with the English rate of 10 – 15% noted above, tempting speculation that this may be linked to orthographic features of an agglutinative language.

In an interesting eye tracking study of grade 4 children whose first language was isiZulu and whose second language was English, van Rooy and Pretorius (2013) found that they read English text faster than isiZulu text, and exhibited more fixations and refixations, and longer duration of fixations reading in isiZulu than in English. This was the case even though these children were in their first year with English as the medium of learning, and half of them could not understand instructions in English. Since the children had normal oral proficiency

in isiZulu these findings were surprising, and the researchers concluded that the children might be struggling with particular features of the orthography of isiZulu.

Reading subtitles on a TV screen while watching a programme is very different from reading continuous text, but Hefer's observation (2013) that first language Sesotho speakers read subtitles in English faster than in Sesotho, yet read Sesotho with greater comprehension is telling. This is especially so since Sesotho is an agglutinating language with a disjunctive writing system, so slower reading speed here cannot be because of very long words. This researcher concluded that lack of practice in reading Sesotho was as a result of reading almost exclusively in English at school. This may indeed be the case, but it would be useful to consider possible effects of orthographical features, such as potential for ambiguity as well.

METHODOLOGY

In this exploratory study, eye movements of a group of proficient first language isiZulu readers were tracked as they silently read passages of authentic continuous text. In this exercise, the researcher aimed to:

a) establish a tentative profile of eye movement patterns that currently characterise well developed reading skills pertaining to the orthography of isiZulu, and

b) to consider links between recorded eye movement patterns and factors that possibly shape them.

SAMPLE

Since there are as yet no standardised measures of reading proficiency in isiZulu (van Rooy & Pretorius, 2013), an invitation to readers who regarded themselves as proficient was put on the UKZN notice system, inserted into copies of isiZulu newspapers for sale in a supermarket, and sent to local Zulu journalists, publishers of isiZulu texts, post graduate students and high performing learners at a local high school. Close to 150 people responded and, to ensure that they were indeed proficient readers, underwent a screening test (Appendix

1). 38 participants (the most proficient 25% of the pool of respondents) were selected, all of whom were first language isiZulu speakers.

Five participants were excluded because of imperfect recordings. The remaining group of 33 included:

- 15 women and 18 men
- 24 professionals (11 of whom were part time post graduate students), 5 full time university students and 4 high school students.

The group ranged in age from 16 to 61, with 4 under 20, and another 4 over 50.

INSTRUMENTS

Two instruments were used in this study: isiZulu texts and the Visagraph eye movement recording system. Texts used (Appendix 2) were excerpts from authentic (as opposed to translated) isiZulu novels.

Table 1: Characteristics of texts (excluding first and last lines).

Texts	Word count	Letter count	Line count	Sentence count
A. Sengikhulile	100	765	16	19
B. Ubudoda abukhulelwa	100	747	14	14
C. Amahlaya alala insila	100	831	17	9
D. Ukufika Kosuku	100	762	14	10
E. Ingwe idla ngamabala	100	749	15	6

There is as yet no official grading system for isiZulu texts[3] Therefore, three lecturers in Education at UKZN whose first language is isiZulu were asked to comment on a number of texts considered for this study, and judged these four texts to represent isiZulu literature well,

with two texts exemplifying easy to read text, and two exemplifying demanding text. Although the judges relied purely on 'gut feel', their ranking matched measures of sentence complexity on the four texts. The two texts they judged to be the easiest are referred to here as Text 1 and Text 2. Text 1 has 19 sentences with an average number of 1.4 clauses per sentence, and Text 2 has 15 sentences with an average number of 1.8 clauses per sentence. The two texts judged to be more difficult are referred to here as Text 3 and Text 4. Text 3 has 10 sentences with an average number of 2.7 clauses per sentence. Text 4 consists of only 6 sentences with an average number of 4.2 clauses per sentence. There was not much difference in word length between the texts:

- Text 1 (*Sengikhulile*) had an average number of characters per word of 7.65.
- Text 2: (*Ubudoda abukhulelwa*) had an average number of characters per word of 7.47.
- Text 3: (*Amahlaya alala insila*) had an average number of characters per word of 8.31.
- Text 4: (*Ingwe idla ngamabala*) had an average number of characters per word of 7.49.

This similarity in word length across the texts in spite of differences in difficulty level perceived by these readers is interesting, since word length in terms of letters or syllables is a key factor in readability formulae for text in European languages, (e.g. SMOG index, Flesch–Kincaid formula, Gunning Fog index, LIX) (Readability formulas, 2014).

 Vocabulary in Text 1 and Text 2 was seen to comprise high frequency words and expressions common in isiZulu currently spoken in urban areas, and Texts 3 and 4 to include words and expressions associated with 'deep isiZulu', which is the basis of formal academic studies in isiZulu and tends to be spoken in remote rural areas.

These texts were slightly adapted to suit the requirements of the Visagraph equipment, which specified font type, point size, and line spacing, and required there to be 100 words in the lines between the first and last lines of each text. Texts ranged from 14 to 17 lines.

The Swedish-built Visagraph eye movement recording system uses infrared differential reflectivity to detect eye movement, at a sampling speed of 60 Hz (Compevo, 2012:1). The system requires readers to wear a mask with receptors aligned to the pupils of their eyes. Although systems with higher sampling speeds are available, several features of this system made it suitable for this study, the focus of which was on natural silent reading of authentic texts. These features were:

- the system affords free head movement, since the mask connects to a computer via a flexible 2.4m computer cable. Thus readers can assume natural reading positions not possible in systems requiring readers to rest their faces in a frame;

- the system works in natural light;

- the movement detectors are in the mask, and so texts are read from printed paper, and not computer screens.

DATA COLLECTION

Both qualitative and quantitative data were collected, in a process that took approximately one hour for each participant.

Readers first proved their reading competence by repeating the reading test in Appendix 1 while being timed by the interviewer and asked to recount what they recalled of the content. Thereafter, they were interviewed about how they learnt to read and their reading habits, and then their eye movements were recorded as they silently read the texts described above, each of which was printed on a A4 sheet of plain paper held by the reader at a reading distance he or she found comfortable. Immediately after reading each text, readers recounted what they had understood of it, and while the reading experience was fresh in their minds, participated with the researcher in a detailed examination and voice recorded discussion of the tracks of their eye movement (mapped directly onto electronic versions of the texts they read). Since the researcher is a fluent speaker of isiZulu, participants were free to use either isiZulu or English, or both languages in this process. In this discussion readers related features in the recorded eye movements with what they remembered of the smallest moments of their reading experience as they read each text and constructed a mental representation of its meaning.

The mapping of their eye movement tracks onto electronic versions of the texts they read was possible because the Reading Plus organisation in the United States had created an isiZulu language package containing the selected texts for this piece of research. The number of successful recordings with good recall of the contents differed across the texts. There were 32 successful recordings of Text 1, 31 of Text 2, 30 of Text 3, and 31 of Text 4.

Only 2 of 33 indicated that they read mainly in isiZulu (they are journalists of an isiZulu language newspaper), but all participants said that they were in the habit of reading isiZulu text regularly. This ranged from about twice a week for some to several hours every day for others. The type of texts they reported reading included draft articles and text book sections (read by the journalists and staff in a publishing company), students' assignments written in isiZulu (read by lecturers), and isiZulu newspapers or books.

RELATIONSHIP BETWEEN READING RATE AND OTHER VARIABLES

The graphs below show readers' scores for each text ranked from highest to lowest in terms of reading rate. Three scores are shown for each reader: reading rate in terms of wpm, number of fixations, and number of regressions. Scores show the same inverse relationship between reading speed and number of fixations, and reading speed and number of regressions that is seen in other languages.
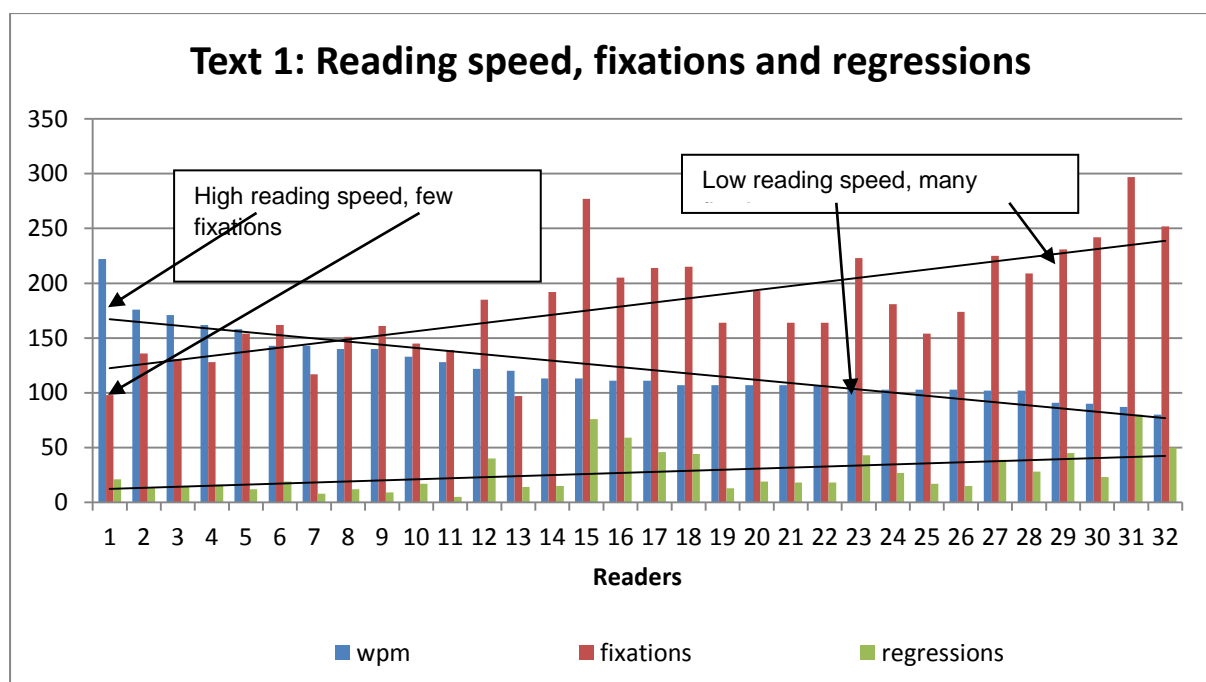
Figure 1: Text 1: Reading speed, fixations and regressions.
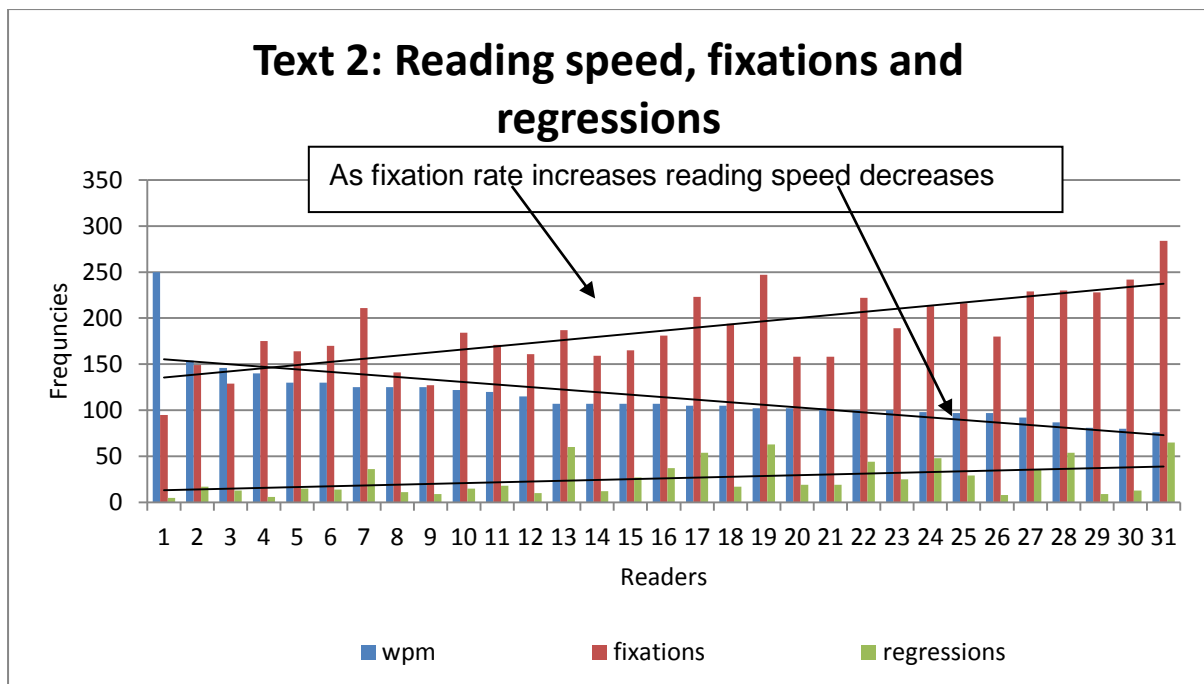
Figure 2: Text 2: Reading speed, fixations and regressions.

A comparison of the graphs above (showing readers' performance on the two easier texts) with the two below (readers' performance on the two more difficult texts) shows the readers' lower reading rate, and higher number of fixations and regressions on the more difficult texts.
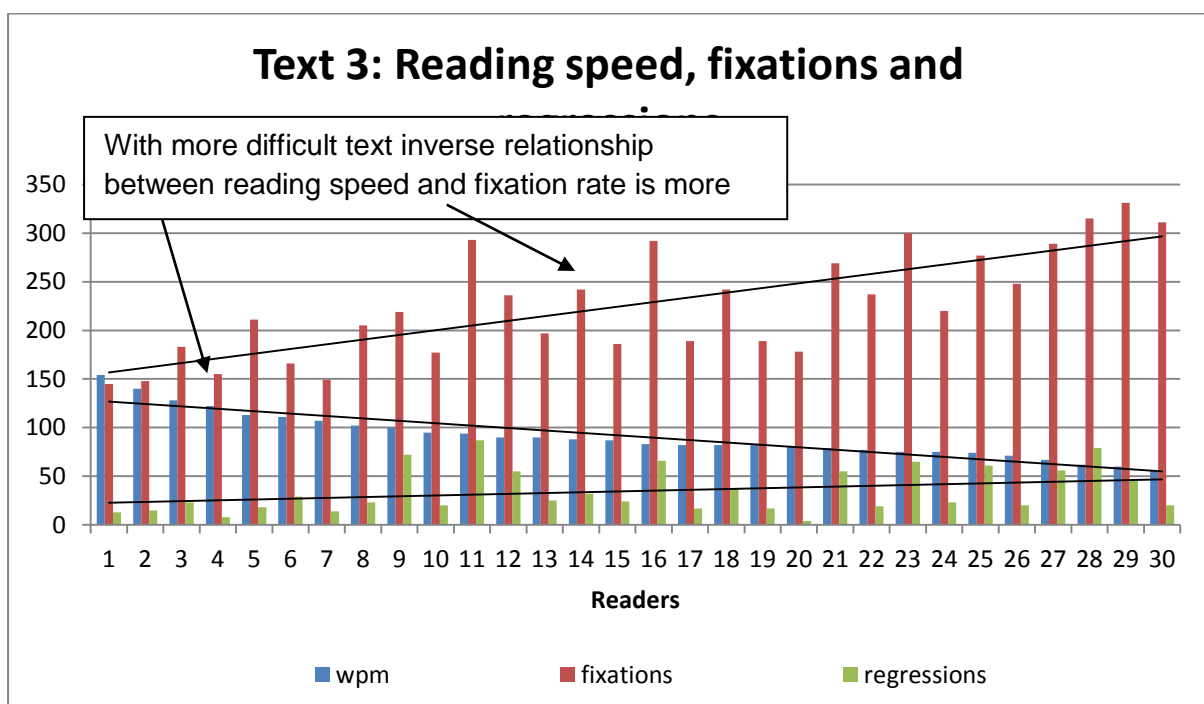
Figure 3: Text 3: Reading speed, fixations and regressions.
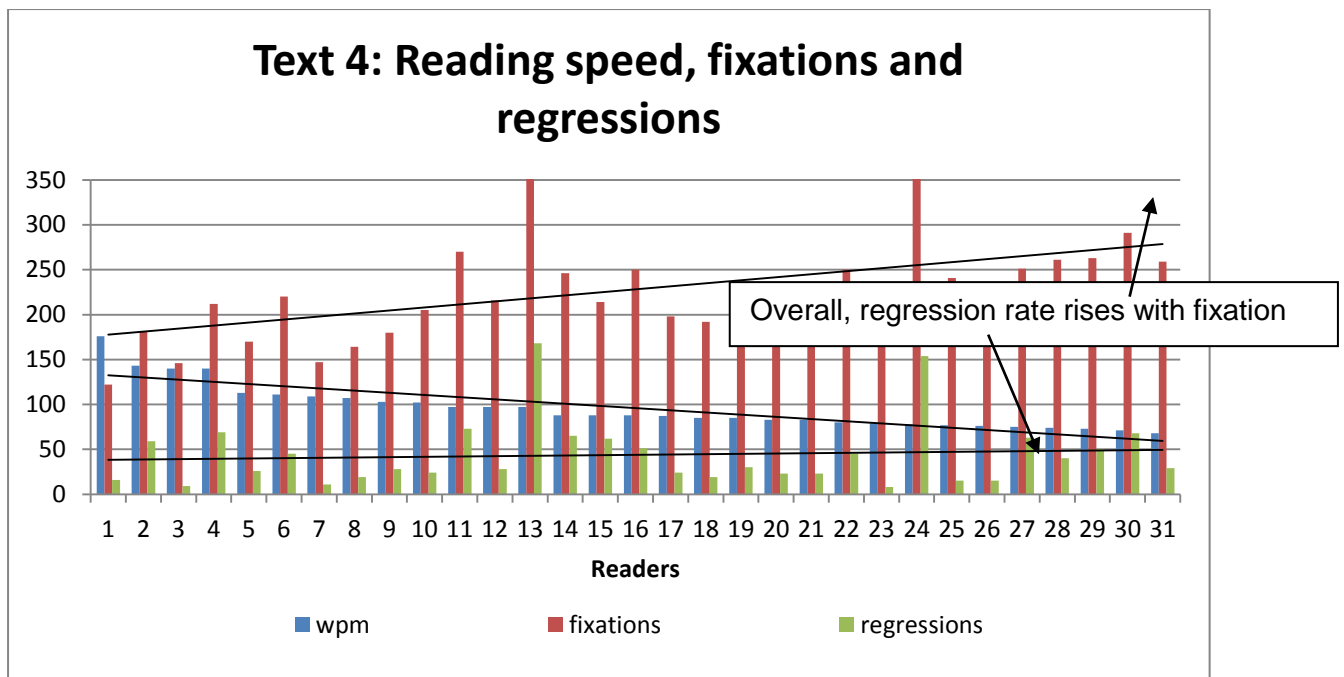
Figure 4: Text 4: Reading speed, fixations and regressions.

Table 2: Analysis of variance across the texts

		N	Mean	Std. Deviation	ANOVA Tests	
					F	p value
Fixations	Text 1	32	181^a	48.9		
	Text 2	31	187^a	40.1		
	Text 3	30	213^b	55.7	8.114	0.000*
	Text 4	31	236^{ab}	72.8		
Regressions	Text 1	32	26	19.3		
	Text 2	31	27	18.4	2.767	0.045*
	Text 3	30	36	23.9		
	Text 4	31	41	37.0		
Saccade length	Text 1	32	.6^a	1.3		
	Text 2	31	.57^{ab}	1.04	7.192	0.000*
	Text 3	30	.45^c	1.01		
	Text 4	31	.49^{bc}	.98		
Duration of fixations	Text 1	32	.29	.58		
	Text 2	31	.3	.04		
	Text 3	30	.31	.04	.551	0.648
	Text 4	31	.31	.06		
Words per minute	Text 1	32	122^a	232		
	Text 2	31	114^{ab}	235	8.669	0.000*
	Text 3	30	91^c	56		
	Text 4	31	96^{bc}	187		
Time taken to read (in seconds)	Text 1	32	52^a	10.9		
	Text 2	31	55^a	11.7	12.742	0.000*
	Text 3	30	66^b	16.4		
	Text 4	31	70^b	13.81		

*significant at 5% level

DISCUSSION

READING RATE

Participants averaged 122 and 114 wpm on Texts 1 and 2, and 91 and 96 wpm on Texts 3 and 4, and the average reading rate calculated over all four texts was 105.75 wpm. The differences across texts were significant ($F(3, 29) = 8.669$, $p < .01$), with participants reading the two texts judged easy to read faster than the two texts that were seen to be more difficult. Thus reading rate slowed as sentence length and perceived level of difficulty increased. In terms of words per minute all these scores sound low in comparison with the 300 wpm established as a benchmark rate of competent silent reading[4] in English (Rayner & Pollatsek, 1989). However, a comparison of words per minute across different languages is not useful because of differences in average word length, such as those noted above across European languages, ranging from 4.6 characters per word in English to 7 in Finnish (Björnsson, 1983). Since average word length across the four isiZulu texts used in this study is 7.73 letters, measures based on letters or syllables read per minute provide a more meaningful comparison of reading speeds.

Average reading speeds per text in terms of letters per minute (lpm) were:

- 934 lpm on text 1 (*Sengikhulile*)
- 851 lpm on text 2 (*Ubudoda abukhulelwa*)
- 755 lpm on text 3 (*Amahlaya alala insila*)
- 718 lpm on text 4 (*Ingwe idla ngamabala*)

The average reading speed on the easy to read texts was 892 lpm, and on the difficult texts 736 lpm, with an overall average of 815 lpm. So on the basis of lpm too it appears that reading the orthography of isiZulu is more time consuming than the orthography of English: at 300 wpm, competent English readers are reading about 1380 characters per minute.

FIXATIONS

The number of fixations recorded per 100 words varied widely between readers and across the texts, but a significant trend in the recordings was a higher rate of fixations in the more difficult texts (3 and 4) compared with the easier texts (1 and 2) ($F(3, 29) = 8.114$, $p < .01$).

- In text 1 (*Sengikhulile*) readers averaged 181 fixations per 100 words and 122 wpm, which equals 220 fixations per minute, or 3.67 fixations per second.
- In text 2: (*Ubudoda abukhulelwa*) readers averaged 187 fixations per 100 words, and 113.84 wpm, which equals 212 fixations per minute, or 3.54 fixations per second.
- In text 3: (*Amahlaya alala insila*) readers averaged 213 fixations per 100 words and 91 wpm, which equals 194 fixations per minute, or 3.63 fixations per second.
- In text 4: (*Ingwe idla ngamabala*) readers averaged 236 fixations per 100 words and 96 wpm, which equals 227 fixations per minute, or 3.78 fixations per second.

With an average reading speed of 105.7 wpm, and 204.25 fixations per 100 words, the average number of fixations per minute was 215.6, or 3.6 fixations per second.

This is markedly fewer fixations per second than the 5 fixations per second noted by Reichle *et al*. (2003) for competent readers of English, and the 5.2 fixations per second noted for readers of German (Hutzler *et al*. 2008)[6]. Implications are that possibly there are a relatively high degree of ambiguities for readers to resolve in isiZulu orthography, or that its features require a relatively long integrative process of readers as they construct their conceptualisation of the meaning in the text.

Readers' fixations averaged .3 seconds overall, with an insignificant difference ($F(3, 29) = .551$, ns), between the duration of fixations on the easier to read texts (.29 and .3 of a second) and the more difficult to read texts (.31 and .3 seconds).

Duration of fixations is known to vary with factors such as text difficulty (Rayner, 2009). This average duration is longer than the average recorded for competent readers of English of (.2 - .25 seconds) (Rayner, 2009; Hutzler *et al*., 2008), and also longer than the average recorded by German readers (190 - 201 ms) (Hutzler *et al*., 2008). This suggests that if readers of German (an orthographically transparent language, like isiZulu) are able to perceive enough information to move to the next point in the text after only about 200 ms, there are features of isiZulu orthography that require readers to make longer fixations before they gain enough information to move on.

The limits of each saccade are marked by the points of successive fixations on the text. On these isiZulu texts, readers' average saccade length was 4.05 characters. Their saccades varied significantly across texts ($F(3, 29) = 7.192$, $p < .01$), and were shorter on the more difficult texts (3 and 4) than on the easier texts (1 and 2).

- In text 1 (*Sengikhulile*), the average saccade length was 4.59 characters.
- In text 2: (*Ubudoda abukhulelwa*) the average saccade length was 4.26 characters.
- In text 3: (*Amahlaya alala insila*) the average saccade length was 3.74 characters
- In text 4: (*Ingwe idla ngamabala*) the average saccade length was 3.67 characters

Competent readers of English tend to record saccades of between 7 and 9 characters, but these can vary from 1 to 20 characters (Rayner, 2009)[7].

While the limits of each saccade are marked by the points of successive fixations, the span of recognition is anchored around one point of fixation, and refers to the stretch of text processed by the reader from that point of fixation. Therefore although saccades refer to movements of the eyes between fixations, and span of recognition to the stretch of text recognised during a fixation, short saccades suggest short spans of recognition.

Thus the relatively short saccades of these readers indicate that, like the densely packed orthographies of Hebrew, Japanese and Chinese (Reichle *et al.*, 2003), the orthography of isiZulu limits readers to a relatively short span of recognition.

REGRESSIONS

Rates of regressions can be viewed as a percentage of fixations or as frequencies over time, or over spans of text.

The average number of regressions among the group was 32.97 over 100 words, and as a percentage of total fixations (32.97/205.48), this equals 16%. The rate of regressions was significantly different across the different texts ($F(3, 29) = 2.767$, $p < .05$); readers made on

average approximately 50% more regressions on the two more difficult texts than on the two easier to read texts.

In the easier texts, 1 (*Sengikhulile*) and 2 (*Ubudoda abukhulelwa*), readers averaged 26 (14.3% of fixations) and 27 (14%) regressions respectively. On text 1, three readers made less than 10 regressions, and on text 2, five readers made less than 10 regressions. On text 3 and 4, the more difficult texts, the rates of regression were 36 (16.9%) and 41 (17.3%). On both the more difficult texts, only two readers made less than 10 regressions.

The overall rate of regression as a percentage of fixations was lower than the rate of 25% found among Finnish readers (Hautala *et al.*, 2011), but similar to the rate found among competent readers of English text, where roughly 10 – 15% of fixations are regressions (Paulson, 2005; Reichle *et al.*, 2003; Rayner, 2009).

In terms of time, on texts 1, 2 and 3, readers regressed on average once every 1.99, 2.05 and 1.94 seconds respectively, and every 1.6 seconds on text 4. This rate is similar to that of English readers of about one regression every two seconds (Paulson, 2005, p. 342; Reichle *et al.*, 2003:348; Rayner, 2009).

In relation to regressions made over spans of text, readers made on average one regression every 29 characters and every 28 characters on texts 1 and 2 respectively. On texts 3 and 4, readers regressed more frequently, with on average once every 23 characters on text 3 and once every 18 characters on text 4. This rate is more frequent than the usual regression rate of competent readers of English over spans of text: if we consider that at 300 wpm, English readers read approximately 10 words in two seconds, and therefore make 1 regression over +/- 46 characters (assuming an average word length of 4.6 characters). In comparison, over all four texts, these readers made an average of 1 regression for every 24 characters.

FACTORS THAT MAY CONTRIBUTE TO OBSERVED PATTERNS

The above findings indicate that isiZulu text takes more time to read than text in other alphabetic languages for which data is available, with shorter saccades and thus more frequent fixations, and more frequent regressions over spans of text. Factors possibly influencing these scores can be associated with readers, contexts and texts.

Since most of the readers in this sample stated that they read more often in English than isiZulu, it is possible that, like the Sesotho readers observed by Hefer (2013), only the speediest amongst them demonstrate eye movement patterns that characterise really highly developed silent reading skills in isiZulu. In the graphs above, readers' scores are ranked from the swiftest downwards, and the trend of an inverse relationship between reading speed and number of fixations is significant and clear ($r = -.712$, $p < .01$). As with readers of other languages, the comparatively low number of fixations made by swifter readers suggests that they have instant or automatic recognition of more words or text units than the slower readers, whose more frequent fixations point to more cognitive effort in decoding words, and thus less automatic recognition. It is possible to achieve a high rate of automaticity only with high exposure to text, and regular reading practice (Abadzi, 2012), and since two of the swiftest readers in this sample are journalists who spend their working hours writing or proofreading isiZulu text, it is likely that their high speed and low fixations rate relative to the rest of the sample results from thousands of hours of reading practice. Their situation is unusual, since in most work and study contexts in KwaZulu-Natal, people are more likely to read more text in English than isiZulu, and thus probably have less practice in reading text in isiZulu. However, the selection process for this study shows that it is nevertheless likely that the scores of people in the sample are currently representative of skilled readers of isiZulu text in KwaZulu-Natal today.

CONTEXT

The recording process in this study simulated natural reading in that readers' head movement was not restricted, they read text printed on A4 paper, in natural light, and held the paper at a distance they found comfortable. But they wore a mask, and knew that their eye movements were being recorded. This will have influenced their reading, and it is impossible to know for certain how closely these scores reflect their unobserved natural reading. However, since one cannot observe unobserved behaviour, it is hoped that participants' positive responses to efforts of the researcher to put them at their ease, and their statements indicating enjoyment

of the recording process suggest that their recorded eye movements at least approximate their usual reading behaviour.

It is possible that, as suggested by van Rooy & Pretorius (2013), features of isiZulu orthography present its readers with particular demands that could be strong contributing factors to the reading patterns discovered in this study.

Lix is a readability formula developed specifically to assess readability across languages. The formula, tested for validity on thousands of texts in different languages (Björnsson, 1983) is based simply on word and sentence length. Lix values of 20 correspond to very easy text, of 40 to average text, 50 to difficult text (55 = technical literature) and 60 to very difficult text. In a study that compared readability of several newspapers in 11 European languages, Björnsson found Lix values of between 47 and 65 for text in newspapers in Sweden, Norway, Great Britain, France, Germany, Italy, Spain, Portugal, Finland and Russia (Björnsson, 1983).

In a cautious comparison, since validity of the Lix formula for African languages has not been tested, the Lix score for *Isolezwe*, an isiZulu language newspaper, is 97 – way beyond 60, the Lix measure of very difficult text. The application of the Lix formula to the texts used in this study yields the following scores:

- Text 1 (*Sengikhulile*):   87
- Text 2 (*Ubudoda abukhulelwa*)   83
- Text 3 (*Amahlaya alala insila*)   97
- Text 4 (*Ingwe idla ngamabala*)   94

This does indicate that in respect to aspects measured by the Lix formula, the orthography of isiZulu requires particular reading skills.

Implications of psycholinguistic grain size theory

If one accepts the logic of psycholinguistic grain size theory, it is very likely that readers of isiZulu rely on small grain size units of text, since it is clearly dependable, and a quick route to accurate reading (Ziegler & Goswami, 2005). This logic would provide an explanation for the pattern of frequent fixations, relatively slow reading speed, longer duration of fixations, and short saccades described above.

Agglutination and conjoined writing system

The need for readers to take cognisance of small but semantically important shifts in affixes in compound word forms could account for the relatively high number of fixations and longer durations of fixations recorded in this study. This finding resonates with much cited research by Rayner *et al.* (1998) which found that readers rely heavily on spaces between English words, and that unspaced text is difficult to read. A readers' account of making sense of a compound construction illustrates this:

- SL   …then you went back to *kwakukhona* and in that line to *wayesebenzela* and regressed there - *Nalapho ayesebenzela khona.*
- KZ   I thought the *ayesebenzela khona* ….in my mind it was *ayesebenza*, so I have to confirm it not *ayesebenza,* actually is *ayesebenzela khona*.

Homogeneity in visual textual patterns

As noted earlier, repeated recurrence of particular strings of letters is a feature of the orthography of isiZulu. The consequent similarity in the visual appearance of many words would possibly be one of the reasons for the relatively long duration of fixations and short saccades described above. Distinction between visually similar words is more difficult and slower than between words that are obviously dissimilar (Abadzi, 2011). Thus the visual homogeneity between units of text may compel readers to take more time to distinguish among them, and to deal with comparatively short spans of text, for example, as one reader explained:

MS: Yes there, *wawune-* then I went back to *nekhwane*. It was like *khiwane* if you put i between kh and w, *ikhiwane* is a mushroom so I have a picture of a mushroom and the river.

LACK OF INDICATIONS OF TONE

The high rate of regressions recorded in this study may be partially accounted for by readers' needs to adjust their expectations and possibly refer back to text already read as they search for cues to resolve ambiguities resulting from the absence of markers of tone. Many readers spoke of their need to pronounce words correctly in their minds, for example:

NM: Yes you have to separate the word *okwakungowokuphatha* because if you just carried on, sometimes you just do not find the meaning of it and you will not pronounce it correctly.

SL: Even though you are not reading aloud, you still have to pronounce the word correctly in your head?

NM: You see you have to pronounce correctly in your head to get the meaning.

LIMITATIONS

The sample was composed of 33 of the most proficient readers selected from a pool of 150 volunteers who identified themselves as competent readers of isiZulu, and therefore it is reasonable to regard the data as a valid representation of reading patterns of adults who are skilled readers of isiZulu. Conclusions could be drawn more confidently from a larger sample, and the picture may change with changes in reading practices.

As noted above, the Visagraph equipment used in this study is not as sensitive as some other makes of equipment available. However, features of the equipment enabled a closer simulation of natural silent reading of authentic texts than would have been possible with some of the other more sensitive types of equipment.

As with all research involving recorded eye movement, the effects of readers' awareness of being recorded are completely unavoidable.

CONCLUSION

A tentatively suggested profile of eye movement patterns that currently characterise proficient readers of isiZulu is:

- A reading rate of 736 – 892 lpm depending on text difficulty, with an overall average of 815 lpm; this suggests that isiZulu is read relatively slowly in comparison with other alphabetic languages;
- A fixation rate of on average 3.63 per second, with fixations lasting on average for .3 seconds. This suggests that readers require a relatively long period to process text perceived in each fixation compared with readers of other alphabetic languages for which data is available;
- An average saccade length of 4.05 characters, which indicates that readers' span of recognition is relatively narrow. This suggests that readers are likely to be relying on small grain size units of text to reconstruct language as they read;
- A regression rate similar to other languages as a percentage of fixations (16%), and in terms of time (1 regression every 1.89 seconds), but at 1 regression for every 24 characters, relatively high in terms of regressions over spans of text.

The pattern that emerges of frequent fixations, relatively slow reading speed, lengthy fixations, and short saccades does suggest that the logic of psycholinguistic grain size theory (referred to above) indeed applies to readers of isiZulu. Like readers of other transparent orthographies they appear to rely on small grain size units of text, using them as a dependable, quick route to the reconstruction of the phonology of isiZulu, and the most efficient way of reading this language.

Further research will test these initial suggestions. More investigation is needed for clarification of the implications of these findings for teaching of reading in similar African languages to both mother tongue and non-mother tongue students. Nevertheless, especially since there is increasing agreement about the advantage that mother tongue facility brings to

reading and learning, it is hoped that this will bring useful insights to the understanding of how readers respond to the demands of isiZulu orthography.

Notes

1.   Thanks to Mr Ndela Ntshangase, lecturer in isiZulu at the University of KwaZulu-Natal for this example.

2.   The meaning of speech produced in reading aloud may or may not be grasped by the reader. When it is not, the reader may be attending primarily to producing speech, or to thoughts unrelated to the text or the reading performance, thus decoding print to speech without engaging with its meaning. Although this is often described as 'barking at print' (Smith, 1994), readers may purposefully read aloud without understanding, e.g. in ritual readings of scriptures in languages readers do not understand but produce as speech, or when concepts are comprehended by listeners but not readers, e.g. academic texts produced for Tape Aids for the Blind.

3.   Personal email communication 2013/04/12 from Sabelo Zulu, of Shuter & Shooter Educational Publishers.

4.   Literature searches yield rates for reading aloud, but not silently in other languages.

5.   Literature searches do not yield comparative data for other African languages.

6.   Comparative data is not yet available for African languages.

7.   Literature searches do not yield comparative data for other African or European languages.

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APPENDICES

Appendix 1: Invitation to participate in the study, including a self test of reading rate

UYAMENYWA UKUBA UZIMBANDAKANYE NOMSEBENZI WOCWANINGO LOKUFUNDA ISIZULU

Ungakwazi ukufunda lokhu ebhokisini ngaphansi komzuzu owodwa? Zikalele ngewashi:

Sidinga ukusebenza ngokushesha ukuthuthukisa izilimi zase Africa enyuvesi yethu. Ukuthuthukiswa kwezilimi zase Africa njengezilimi esiphathelene nemfundo ephakeme kubalulekile. Sonke sidinga ukuzinikela kuzona. Akusiyena uhulumeni kuphela okungafanele abone ukuthi lezilimi zase Africa zisetshenziswa endaweni efanele emphakathini wethu. Ngokweqiniso lokhu kungumsebenzi wethu sonke. Ezikhungweni eziphezulu zemfundo, abathuthukisi bezilimi, kanye nomphakathi wonkana kufanele baqiniseke ukuthi izilimi zase Africa ziqinisekiswe.

Izilimi zase Africa zibalulekile kulelizwe. Zisivezele ukuthi singobani, futhi sifuna ukuba ngobani, kanye nendlela esifisa ukwakha ngayo i South Africa.

Ukuthuthukiswa kwezilimi zase Africa kwimfundo, nakwezemfundo ephakeme, kusemthethweni sisekelo. Uthi umthethosisekelo, bhekisisani ukushabalala kwesisindo sezilimi zabantu bakithi kuleli, uhulumeni kumele athathe izinyathelo ezinqala zokuphakamisa isisindo nenqubo yokusetshenziswa kwezilimi zethu. Masingavumeli ukuthi izilimi zakulelizwe zishabalale. Kodwa masiziqinisekise.

Uma kuwuthi thina esiluncele ebeleni lolulimi asiluthuthukisi, ubani ozoluthuthukisa?

Uma ungafunda kulelibhokisi isikhathi esingaphansi komzuzu owodwa , kungenzeka uthande ukuba ingxenye yocwaningo lomsebenzi wokufunda imibhalo yesiZulu. Indlela okubhalwa ngayo isiZulu kuhluke kakhulu endleleni okubhalwa ngayo isiNgisi. Kanye namakhono okufundwa kwesiZulu awakaqondisiseki namanje.

Ngidinga abantu abakwazi ukufunda isiZulu ngokushesha futhi okulula kubona ukufunda, abangaba nothando lokuvolontiya. Ngidinga ukuqopha indlela amehlo abo anyakaza ngayo uma befunda. Inhloso yami eyokuhlola amakhono okufunda incwadi yesiZulu.

Uma uzinikezela kulomsebenzi ungsiza entuthukisweni yolimi lwesiZulu njengolimi olufundwayo. Bonke abazozinikela kululucwaningo bayothola ulwazi mayelana namakhono okufunda kwabo.

Ayikho imali ezotholakala ngokwenza lomsebenzi.

Sandra Land   Centre for Adult Education   University of KwaZulu-Natal

(though obviously not in this format)

Memela, N. (1992). *Sengikhulile.* Durban: New Readers Publishers. p. 1.

UNomadashimane igama lami. Sengikhulile! Awu! Akukho okudlula lokhu. Ikhulu leminyaka akusiyo into encane. Phela ngazalwa ngempi yamaNgisi namaBhunu. Abanye babewabiza ngokuthi amaDashimane amaBhunu. Igama elithi Nomadashi lasukela lapho. Ubaba wayesebenza epulazini endaweni yase-Bulwer. Kwathi ngokusuka kwempi wathi umlungu kubaba, 'Ngiya empini. Hleze ngingabuyi, ngifele khona. Uma ngingabuyanga, ungakhathazeki. Ngiwenzile onke amalungiselelo okuthi umesisi anibheke nezingane zakho.' Umama ngaleso sikhathi wayekhulelwe. Wazibula ngamawele, umfana nentombazana. Bathi kuzelwe amakhosi. Bangiqamba igama elithi nginguNomkhosi. Kepha ngenxa yokuthi ngazalwa ngempi kwaduma elokuthi nginguNomadashi. Ngakhula-ke sihlezi epulazini. Sasilima, sisenga izinkomo, kudliwa amasi. Kwakujwayelekile ukuthi ingane ekhulele epulazini iwuqale isencane umsebenzi. Ngaqala ukusebenza ngingakalihlanganisi ishumi leminyaka. Umsebenzi wami kwakungowokuphatha izingane zomlungu. Ngaze ngakhula impela ngisebenza kuye lo mlungu.

Nyembezi, S. (1953). *Ubudoda abukhulelwa.* Pietermaritzburg. : Shuter and Shooter Ltd. p. 15.

Lapha kwaMsezane kwakwakhiwe ngempela. Kwakungumuzi ovuthiwe. Indlu yayakhiwe ngesitini esibomvu, esishisiwe. Yayinovulande ezinhlangothini ezimbili. Indlu yayinamakamelo ayisishiyagalolunye. Kwakukhona indlu yokuphola, neyokudlela, nalapho ayesebenzela khona uMsezane nalapho ayegcina khona izincwadi zakhe. Phela kwakungumfo owayekuthanda ukufunda. Kunamakamelo amathathu okulala. Bese-ke kuba yikhishi nendlu lapho kubekwa khona ukudla. Uma ungena endlini yokuhlala, wawukhangwa upiyane olukhulu, luzisho nje ukuthi olwemali. Kwakukhona futhi endlini izihlalo ezithofozelayo, ayethi umuntu uma ehlala kuzo ashone phansi avele ngezindlebe. Phakathi nendawo kukhona itafulana elincane kubekwe phezu kwalo isitsha esinezimbali. Phansi lapha amapulangwe ayembozwe ngocansi lwabeLungu. Kwakuyilolu hlobo othi uma uhamba phezu kwalo nezigi zife, umuntu athashazise okukamangobe. Ezindongeni kwakulenga izithombe ezimbalwa. Zonke izinto ezazikulo muzi zazikhuluma ngokusobala zithi kukwamnumzane lapha.

Mkhize, M.T. (1983). *Amahlaya alala insila*. Pretoria: De Jager-HAUM Publishers. p. 1

Umuzi wakubo kaChithimpi Zondi umfo kaNkalimba wawunezindlu ezimangaqhugwana amathathu wakhiwe ngaphansi kwegquma. Iminyango yezindlu yayibheke ngaseNyakatho ukugwema iziphepho ezazivamise ukuqhamuka ngaseNingizimu. NgaseMpumalanga yomuzi kwakunomhoshana okwakwehla kuwo umchachazwana wamanzi owawuze uyongenela emfuleni uMzimayi. Ntambama kwakuye kuheleze umoya obandayo owawuye ungene ngezi-khadlana zezicabha kwaZondi. Lamahelehelana ayeqala ngokuphola kamnandi kodwa agcine esebanda ngoku-mangalisayo lapho sekuphakathi kwamabili ebusuku ikakhulukazi uma kusebusika. Ngalelilanga kunguMgqibelo ntambama iwona lamahelehelana ayesiza ekupholiseni kwaZondi. Phela lapha emzini kaNkalimba ngalelilanga kwakusindwe ngobethole kutatazela omakoti kunjeyaya. Okungamakhehla nezalukazi kwakulokhu kubonakala kuphuma kuthi tshobe ngemva kwezindlu kuchitha lawomanzi ayengasadingeki emizimbeni yawo. Kulobuhholohholo bomsindo wabonakala uDuda umfowabo omncane kaNkalimba engena endlini nezimbuzi ezimbili ayezibambe ngezimpondo eyokuma ngasemsamo. Esemsamo uDuda wabatshela abasendlini ukuthi lezimbuzi kwabe kungezani.

Zama, J.M. (1967). *Ingwe idla ngamabala.* Pietermaritzburg: Shuter and Shooter. p. 1

Kwakungenye intambama lapho selibantubahle; kusentwasahlobo iminduze seyiqalile ukuqhakasa, mhla ngiqalayo ukuyizwa inguquko empilweni yami ngoba ngakhanyelwa kusukela ngaleyo ntambama ukuthi akukho lutho oluzenzekelayo nje ngokwalo. Yonke into emhlabeni inembangela nenhloso ethile kulowo nalowo muntu. Leyontambama engiyisusela kuyo lendaba yami ngayiphawula ngoba ubaba, uNqakamatshe, wafikisana kanye nathi esangweni lomuzi wakwethu, kwazise ukuthi sasingaveli ndawonye nobaba. Ubaba wayebuya embizweni eyayibizwe nguGazi iNkosi yethu thina baThembu. Thina sobathathu madodana akhe sasiqhamuka kokumba iziphunzi esikhaleni esasisivule ezinsukwini ezingaphambiyana ngokugawula izihlahla ekupheleni kwehlathi elaligudla insimu kamame omkhulu, uMaButhelezi. Umame omkhulu wayebike kubaba ukuthi isife ayesilima minyaka yonke sase sinciphile ububanzi baso ngenxa yokucinaniswa yimixhantela yezihlahlana ezazimila ezimpandeni zemithi eyayisephethelweni laleohlathi. Thina sasivela kulowo msebenzi.

CHAPTER 5

AUTOMATICITY IN THE READING OF ISIZULU

ABSTRACT

Automaticity, or instant recognition of units of language represented in combinations of letters is essential for proficient reading in any language. This study of competent adult first language readers of Zulu explored eye movement patterns in conjunction with a process of stimulated recall. It aimed to discover which words were immediately recognised, and what factors were associated with immediate recognition or its opposite, active decoding.

Almost 25% of words in the texts read were immediately recognised by most readers. Averaging 6.5 letters in length, these words tended to be shorter than average word length in the texts, and most consisted of not more than two morphemes. Recurring words were recognised immediately at some points in the text and not at others, indicating that factors such as position, collocations, context, and the construction of a mental representation of the meaning of text may be salient in word recognition.

Conversely, almost 24% of words appeared to require cognitive work to decipher. Averaging 11.1 letters, these were longer than average, and most consisted of between three and five morphemes. Findings suggest that the agglutinative structure and conjoined writing system of isiZulu may be less conducive to the development and exercise of automaticity than orthographies of disjunctive languages.

113

INTRODUCTION

Recent years have seen a surge of policy support for the use of indigenous languages in Africa (Trudell 2010), but literature searches do not yet yield much relating to reading in African languages, where many questions are still to be answered. This paper is a contribution to this field, and reports on a study of automaticity among competent readers of isiZulu, the most widely spoken indigenous South African language.

When the telegraph system was invented, operating clerks surprised observers with the speed at which they learned to decode Morse code without referring to the key (Gleick 2011). In spontaneously developing this skill, they demonstrated the keenness of human perception of patterns, and our capacity to interpret them.

The Morse code clerks' achievement might seem an estimable cognitive feat; yet the fluent, competent reading of printed text that proficient readers take for granted is even more so.

"Reading is arguably the most complex cognitive activity in which humans routinely engage" state Reichle, Warren and McConnell (2009) (2009, p. 1) and offer, in "a gross simplification", a description of the activity of reading:

> Upon moving the eyes to a new location on the printed page, visual features from the input are propagated from the eyes to portions of the visual system which extract their shapes and locations in order to generate visual representations of both individual letters and words (McCandliss, Cohen, & Dehaene, 2003). Some small portion of these features are selected through attention (McConkie & Rayner, 1975; Rayner, 1975) and then rapidly converted into non-visual representations, including the orthographic and phonological codes that correspond to a word's spelling and pronunciation, respectively, and the codes that correspond to a word's meaning and syntactic category (e.g., see Taft, 1991). At some point while this is happening, enough information will have accrued from the fixation to warrant moving the eyes to a new location; at this point, the oculomotor system uses the information about word boundaries available in peripheral vision to begin programming a saccade to move the eyes to another location. While this saccade is being programmed, the lexical information that has become available will be integrated with whatever syntactic and/or semantic information has

been extracted from previously identified words to build a representation of the sentence (Frazier, 1998) and whatever situation is being described by the larger text (Kintsch, 1988). And finally, while this integration is being completed, the systems involved in visual and lexical processing are directed towards the next unidentified word, causing both the eyes and attention to move down the line of text.

(Reichle, Warren and McConnell, 2009, p. 1)

Different models of the reading process offer varying accounts of how skills such as these cohere. Although debate continues about exactly how this happens, it is clear that when these skills become automatic and integrated into the relaxed, swift exercise that silent reading can be, readers need give little attention to the complex process of retrieving information from the code of print, and give their attention almost entirely to the information itself.

Central to any fluent interpretation of symbols to language is automaticity, or reliance on learnt associations between clusters of symbols and units of language, so that on perception of the symbols, associated pieces of language are immediately available to the reader without the need for active cognitive processing. In reading text, automaticity is instant recognition of familiar print patterns as representing particular units of language and their meanings (Penner-Wilger, 2008). With automaticity, we can, in a series of brief visual fixations from which clear perceptions of some printed symbols, and only indistinct impressions of others is gained, rapidly register the meaning of successive clusters of symbols, building our understanding of what the writer intended to communicate as we do so.

Automaticity is regarded as crucial in the competent exercise of literacy skills by Helen Abadzi whose many recent publications linking discoveries in neuroscience to reading have significantly influenced understanding of reading processes and literacy learning. Abadzi describes automaticity as a "vaccine", and an "on-off switch" for literacy (2011), meaning that without it, literacy skills cannot enable competent reading.

Literature searches reveal a prodigious amount of literature about all aspects of reading in English, and a substantial body on comparisons of literacy learning across languages, but much less on aspects of competent reading across different orthographies and languages.

In this study, eye movement records are used to explore competent readers' silent reading of authentic continuous texts in isiZulu, the most widely spoken indigenous South African

language, and in this paper, the records are analysed with particular reference to indications of automaticity.

THE ATTAINMENT OF AUTOMATICITY

When automaticity is achieved, readers can devote thinking processes to the meaning in text rather than the mechanics of deciphering code, and can engage imaginatively with the text, making inferences, links with remembered information, and judgements on what the writer has communicated. Without automaticity, it is extremely difficult for readers to gain new information from text (Verhoeven, Reitsma et al., 2011), to construct a growing interpretation of what they read as they move through text, to use context to aid comprehension (Marinelli et al., 2010) or to perform any higher order skills associated with reading (Abadzi, 2012).

Abadzi, whose work linking in neuroscience and reading has yielded new insights into automaticity claims that to read effectively, we need to move through text fluently and swiftly because human working memory can hold elements for only about 12 seconds (Abadzi, 2012). To understand messages in text, we must construct them as wholes before we start forgetting how they began, and so must read rapidly enough to get from the beginning to the end of each message within this small memory window. In English, a minimum reading rate of 45 – 60 words per minute (wpm) appears to be necessary for this to occur at a basic level (Abadzi, 2012). More complex reading tasks, such as searching for information, require speeds of about 250 wpm (Abadzi, 2010). This reading rate can be achieved only through automatic, instantaneous recognition of a significant proportion of the words in a text. In order to establish automaticity, particular clusters of letters must be perceived as wholes, or coherent words, rather than groups of characters. This is attained only through extensive exposure to text and repeated association of each particular cluster with the words or piece of language it represents. Interestingly, it appears that the brain area and function used in recognition of human faces is also used to see groups of letters as whole units (Abadzi, 2012), perhaps because it facilitates particularly acute discrimination between small variations in clusters of elements.

Automaticity is achieved by most children who observe and are included in literacy-related practices frequently from an early age, especially if they have explicit instruction in developing reading skills, and plenty of supported reading practice at school. However,

children with little exposure to literacy practices, mediocre instruction and irregular reading practice may not achieve automaticity at all, and therefore fail to become truly proficient. Automaticity is rarely achieved if learning is begun after adolescence, and adults learning to read a new script report that even though they see all the letters, they need to consciously work out what words they represent, and never reach the same ease of perception of words in scripts they learned before adolescence (Abadzi, 1996). Where adults do achieve automaticity in word recognition in a new script, it appears to be only after decoding the words approximately 3000 times (Abadzi, 2012).

AUTOMATICITY IN DIFFERENT LANGUAGES AND ORTHOGRAPHIES

Literature searches yield an overwhelming amount of information relating to reading in the English language, and much less relating to reading in other languages (Pretorius and Mampuru 2007). This tends to facilitate comparisons with English more than with other languages. However, in the context of this paper, comparisons with English might be completely appropriate since isiZulu and English are the most used languages in KwaZulu-Natal (van der Merwe & van der Merwe, 2006) and readers of isiZulu are most likely to read in these two languages. It is doubtful that findings from studies of reading in English can be assumed to apply across languages (Share, 2008), and as shown below, it is possible that readers of English and isiZulu must develop contrasting skills to cope adequately with the demands of each orthography.

The orthography of English may be particularly conducive to the development of automaticity. In comparison with other languages, English is characterised by an extremely irregular relationship between its phonemes and the letters used to represent them (Borgwaldt et al., 2004), and it is a disjunctive language, whose words are short even in comparison with other European languages: the average word length in newspaper text is 4.6 letters in English, 4.7 in Danish, 4.9 in Swedish, 5.6 in German and 7 in Finnish (Björnsson, 1983).

English has a very wide range of permissible syllables and letter combinations, making for a similarly wide range of visual word forms, and hence high visual dissimilarity amongst its words: information from Project Gutenberg, which digitalises English literature, shows that the only three letter string likely to occur more than 10 times in 400 words of English text is "the", and that no four letter string is likely to occur more than 3 times (Project Gutenberg, 2013). This indicates a great deal of variation among English syllables and consequently high heterogeneity among its word forms. This variability of form implies high distinguishability among words, and this and its high frequency of single syllable words (Pretorius and Mokhwesana, 2009), could facilitate the development and exercise of automaticity.

Studies of learning to read in different languages indicate that the degree of syllabic complexity affects the acquisition of reading skills and the development of automaticity. Unsurprisingly, automatic recognition is most easily established where simple visual patterns represent particular word sounds (Abadzi, 2011). In languages whose orthography features clusters of consonants, and graphemes consisting of more than single letters, it is more difficult to learn letter to sound decoding skills than in languages with less complex phonology (Seymour et al., 2003).

It is obviously easier to distinguish between letters and groups of letters that are visually disparate than those that are similar, and more practice is needed before readers can readily distinguish among similar patterns (Abadzi, 2011). It follows that automaticity is likely to develop more easily in languages whose orthography features strong visual dissimilarity amongst word forms, and with more difficulty in languages where printed words are not obviously dissimilar. This has particular relevance here because, as explained below, complex agglutinated isiZulu words and some combinations of their components often appear visually similar although they may have no semantic relation.

It appears to be easier to learn to read in languages with consistent orthographies, where readers can rely on direct letter – sound correspondence. Inconsistent orthographies compel readers to interpret large grain size units of text (Georgiou et al., 2008), including automatic recognition of whole words. Among European languages, the ability to read words accurately takes longest to develop in English, which has the most opaque orthography amongst them (Seymour, et al., 2003, Georgiou, Parrila et al., 2008). Children learning to read in languages with consistent, transparent orthographies (such as Italian, German, Greek, Spanish and Finnish) can read words accurately at the end of grade one (Ziegler et al., 2010). In comparison, children reading the orthographically inconsistent and less transparent languages of Portuguese, French and Danish show less accuracy in reading words. Children learning to read in English, with the least transparent and least consistent orthography in Europe, achieve only 34% accuracy at the end of grade one (Ziegler et al., 2010), and lag behind German children in accurately reading words even at age 12, suggesting that it is "the hardest European orthography to acquire" (Hutzler et al., 2004). Comparable information on learning to read in African languages is not yet available.

Children who have learnt to read in languages that are more orthographically consistent than English are better at reading pseudo words than children who have learnt to read in English (Seymour et al., 2003). Their success with reading these pronounceable non-words suggests that children learning to read in the more orthographically consistent languages develop reading strategies directly linked to grapheme–phoneme decoding, based on the use of small grain size orthographic cues (Ziegler & Goswami, 2005). This appears to suggest that they come to rely primarily not on the instant visual recognition of whole words, but rather on the rapid reconstruction of the speech sounds on the basis of letter-sound correlation. In contrast, children learning to read in English must develop reading skills associated with this letter-sound correlation as well as the use of a mental lexicon with larger grain size orthographic cues (Seymour et al., 2003). The combination of these differing strategies possibly enables readers to cope with the complex graphemes and wide range of apparently contradictory rules they face as they learn to read words as visually similar but phonologically distinct as "tough", "though", "thought" and "through".

There are wider variations in individual progress in learning to read in languages with inconsistent orthographies, with more cases of dyslexia amongst their readers (Seymour et al., 2003). This supports the suggestion that learning to read in opaque orthographies demands the development of a wider range or greater use of cognitive skills than learning to read in consistent, transparent orthographies. In addition to using large grain size cues as suggested above, readers of opaque orthographies may need to draw more on knowledge of syntax and vocabulary than readers of transparent orthographies (Share, 2008), and they may have to develop greater proficiency in using contextual cues.

However, could it be possible that all these learning demands might ultimately pay off for English readers in the form of significantly increased automaticity, with the associated benefits of extremely rapid and efficient reading in comparison with readers of languages which do not require the development of these strategies?

EYE MOVEMENT AND AUTOMATICITY

Fixations are strongly related to readers' direction of attention (Paulson 2005, Miellet et al., 2009). In the reading of continuous text in alphabetic script, eye movements are influenced by cognitive procedures to do with text comprehension and word identification, such as ease or difficulty in identifying a word (Paterson, Alcock et al. 2011). This implies that eye movement records can show which units of text are processed instantly as a reader's point of focus passes over them, (implying automatic recognition), and which are recognised only after refixations, indicating that cognitive effort is needed to work out what the words are.

EYE MOVEMENTS POINTING TO ESTABLISHED AUTOMATICITY

Rayner et al. (2007) note that word recognition does not necessarily happen exactly in parallel with eye movements. However, in eye movement records of silent reading of continuous text in an alphabetic language, a pattern that points unequivocally to a high level of automaticity is brief fixations separated by fairly wide saccades, on lines of a text that is well understood by the reader, as can be seen in Figure 1 below. Successive, fleeting, single fixations without regressions indicate that a reader has moved her point of focus steadily

along lines of text, instantly recognising and transforming textual elements into the "flow of phonetic imagery through the mind" (Coulmas 2003, p. 214) that is the hallmark and cognitive essence of fluent silent reading. Textual elements recognised could be single words, or words in a familiar or predictable string, or elements within complex single word constructions.

WORDS SKIPPED

Short, familiar, predictable words are often skipped by the point of focus of efficient readers (2003, Rayner 2009, Paterson et al., 2011). In English 25% - 30% of words are skipped by practised readers (White 2008, Rayner 2009). This suggests that readers predict words to the right of their point of focus, and if the indefinite shape perceived in the parafoveal visual area matches the reader's prediction, they take the word as read without a direct fixation (Paterson et al., 2011), and proceed directly to the next one. This process may be further facilitated by learned, expected, word collocations.

WORDS READ IN SINGLE FIXATIONS

In a process similar to competent readers' word skipping, words that are recognised on the basis of single, brief fixations are probably identified automatically on the basis of a memory of the word form, and strong association of this form with the piece of language it represents. As with skipped words, instantaneous perception may be facilitated by the partial view that readers get of the word just before it is focussed on directly (Rayner 2009, Paterson, et al., 2011), and recognition may be aided by anticipated word collocations. In English text, words of 6 - 9 letters are the most likely to be read in a single fixation (New et al., 2006).

IN READING OF CONTINUOUS TEXT

Automaticised recognition of words may be influenced by nothing other than the perception of each printed word itself in reading isolated words (Ehri, 2007). However, when reading entire passages of text, readers' recognition of words is likely to be aided (or hindered) as they anticipate much of the text on the basis of familiar collocations, prior knowledge, suppositions activated during the reading process and their construction of meaning of the text read so far, as well as information gained from text read just prior to that in focus (Rapp & van den Broek 2005). These factors will inevitably differ between readers and from one situation to another. Even within a sentence, exposure to a complex word facilitates

recognition of a semantically related word later in the sentence (Paterson et al., 2011). Thus, in reading of continuous text, a number of factors other than the perceptual stimulus of each word appear to affect automaticity.

Eye movements pointing to a lack of automaticity

In eye movement records, a high frequency of refixations and regressions implies that a reader is not experiencing the benefit of automatic recognition of many words, and thus is not experiencing much of Coulmas' (2003) mental flow of phonetic imagery.

Refixations

In English, readers take on average longer to recognise multisyllabic words than short ones. Words incorporating more than 9 letters are often read with more than one fixation, and each syllable adds on average 20 ms to recognition time in studies of lexical decision making (New et al., 2006). This is in line with Paterson's observation (2011) that visual recognition of English words composed of multiple morphemes (for example "multisyllabic") is likely to depend on breakdown into constituent morphemes.

Regressions

Regressions show that a reader is referring back to "problem areas in the text, such as syntactic or semantic complexities or word identification problems" (Paulson 2005 p. 342). In reading records of fluent readers of English text, regressions make up not more than 10% – 15% of eye movements (Rayner 2009).

Causes of regressions include awkward syntax, low frequency words, confusion, disconfirmation of an interpretation, difficulties in word identification, incomplete lexical processing, overshooting or undershooting the beginning of a line, or returning to words skipped on a first reading (Paulson 2005). Paterson et al. (2011) note readers' tendency to make inter-word regressions on the second of two related morphologically complex words in a sentence, and suggest that similarity between word forms sometimes inhibits recognition, perhaps when readers make an unwarranted supposition that the second word is a recurrence

of the first. For example, a reader reading a sentence containing both the words 'universality' and 'university' might misread whichever comes second, having expected a repetition of the first.

When making regressions, it does seem that readers maintain a sense of the spatial arrangement of words in text in relation to what they have understood of the text as they read, and are able to return their point of focus to parts of the text that might have been problematic for them (Rayner et al., 1998). This suggests that popular assumptions that regressions and re-readings result in jumbled processing of words are erroneous, and that readers maintain a sense of the structure of meaning in text they are reading even when shifting their gaze to different parts of sentences to search for information to aid their construction of meaning (Paulson, 2005). Information sought might relate to a reader's attention shifts, or their schemas and their association with elements of the text, or to particular textual elements salient for the construction of meaning (Paulson, 2005).

Since readers often redirect their point of focus to points in text that caused them difficulty, analysis of recorded eye movements is likely to reveal features in text that attract regressions most frequently.

The body of research on various aspects of how we acquire and execute different reading skills is growing, yet because of the multiplicity of contexts, languages and orthographies in which reading skills are practised, questions remain unanswered, particularly in relation to orthographies and languages other than English.

READING AND ISIZULU ORTHOGRAPHY

In terms of psycholinguistic grain size theory, since Zulu orthography is consistent and transparent, its readers are likely to reconstruct language from print by processing relatively small grain size units of text, as do readers of other orthographically consistent languages such as Italian (Ziegler and Goswami, 2005). This small grain size processing of text might be the optimal strategy for readers of isiZulu not only because of the language's regular grapheme-phoneme representation, but also because of its agglutinative nature, and conjoined writing system. Because of these features, its words are frequently long and complex,

composed of short morphemes clustered round central word stems. To illustrate, one isiZulu word is often the equivalent of four or five words in disjunctive languages such as English, as in the starting sentence of one of the texts used in this study:

"Wawunezindlu ezingamaqhugwana amathathu wakhiwe ngaphansi kwegquma,"

(He had three houses that were traditional huts built at the base of a hill)

These 6 words translate into 15 English words, but take up more space as a line of text than the English words.

Because of the ubiquity of long complex words in all texts other than those specially designed for beginner readers, word length may not may not be as salient a determining factor of reading difficulty as it is in European languages, where it is central to common measures of reading difficulty (Readability Formulas, 2013).

The effects of agglutination notwithstanding, there are high frequency short isiZulu words that appear in text in a constant form. Examples include nouns such as *umuntu* / *abantu* (person/people), adverbs such as *kahle* (well or slowly), and conjunctives such as *kodwa* (but).

Consequently, proficient readers of the language are likely to automatically read words such as these in the instant they are focused on "with little cognitive effort or attention" (Penner-Wilger, 2008), recognising a range of "multi-letter units and whole words" (Verhoeven, et al., 2011). It is possible that skilled readers of isiZulu texts learn to automatically recognise not only its limited number of stable, unvarying short word forms, but also commonly recurring parts of long agglutinated words.

RESEARCH QUESTIONS IN THIS STUDY

Based on the recordings of eye movements and recall of the reading process of a sample of proficient readers of Zulu collected as they read four natural texts in isiZulu, this study seeks to discover the patterns of automaticity demonstrated by these readers. It does this by asking:

1. What units of text were instantly recognised by the most proficient of these readers?
2. To what extent is their treatment of recurring words consistent? And

3. What light can their immediate recollection of reading experiences throw on the processes that combine in reading isiZulu text?

TEXTS USED

According to the main publisher of educational Zulu textbooks, who have published Zulu novels, poetry and textbooks since the 1930s, no official grading system exists for Zulu texts, and publishers of Zulu textbooks rely "mostly on gut feel to gauge the language level for any given grade"[11]. Therefore, to select texts for this study, three first language Zulu lecturers in education at the University of KwaZulu-Natal (UKZN) were asked to judge excerpts from novels written in (as opposed to translated into) isiZulu. They were asked to select texts representing Zulu literature well, and judge their readability (see Appendix 2). Notably, their "gut feel" judgement matched sentence length and complexity exactly. The two texts judged to be easy to read consisted of 19 sentences with an average of 1.4 clauses per sentence, and 15 sentences with an average of 1.8 clauses per sentence respectively. One of the two texts judged to be more difficult had 10 sentences with an average of 2.7 clauses per sentence, and the other only 6 sentences with an average of 4.2 clauses per sentence. Average word length differs by less than one letter across the four texts, and so is unlikely to have influenced the perceived difficulty of these texts. The easy texts were seen to reflect current urban isiZulu, while the more difficult texts included some words and expressions characteristic of "deep Zulu", spoken in remote rural areas, and formally studied at academic institutions. In the form presented to participants, the 100 word texts ranged from 14 to 17 lines, and were presented in the font, point size, and line spacing specified for the Visagraph equipment used.

EQUIPMENT

The Swedish built Visagraph eye movement recording system used in this study records each reader's fixations, regressions, reading rate, and inter-eye coordination (Compevo 2012, p. 1).

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[11] Personal email communication, Fri 2013/04/12 from Sabelo Zulu, of Shuter & Shooter Educational Publishers.

The system uses infrared differential reflectivity to detect eye movement, and samples eye position 60 x per second (Compevo 2012). This equipment is not as sensitive as some other systems which sample eye position at higher rates than this. However, competent readers in other languages make up to 5.2 fixations per second (Hutzler et al., 2008), a rate which would enable each fixation to be recorded approximately 11.5 times. The particular advantage of this system for this study is that it accommodates a simulation of natural silent reading of ordinary texts since it operates in natural light, allows free head movement, and records as readers read text printed on normal sheets of paper.

PARTICIPANTS

Measures of reading proficiency in isiZulu have yet to be explored and standardised, so selection and screening of participants was necessarily innovative. Sampling was purposive and designed to encourage competent readers of isiZulu text to self-select for this study. An invitation to proficient readers of isiZulu who might be interested in participating was electronically circulated within UKZN, inserted in an isiZulu newspaper in Pietermaritzburg, and sent to local people who were likely to read isiZulu text in the course of their everyday activities. These included lecturers of isiZulu, Zulu journalists, publishers of isiZulu texts, post graduate students and high performing learners at a local high school. Approximately 150 people responded and underwent a screening test. In this test (Appendix 1), readers were asked to read an extract comparable in number and length of lines and font size to 200 English words, which is the amount of text that moderately competent readers of English read in a minute (Rayner & Pollatsek, 1989). In the trialling process, it was found that roughly 25% of readers identifying themselves as competent readers read this text in a minute or less, and this indicated that it could be a useful tool in selecting the most proficient readers. 38 people who read this excerpt in under a minute and recalled its main points were selected as the most competent readers of Zulu text among the 150 volunteers. Their eye movements were subsequently recorded as they read four texts, and patterns of recorded eye movement explored with each participant directly after he or she read each text. Five participants were excluded because of imperfect recordings. The remaining group of 33 included:

- 15 women and 18 men

• 24 professionals (11 of whom were part time post graduate students), 5 full time university students and 4 high school students.

All were first language Zulu speakers, and their ages ranged from 16 to 61, with 25 of them between the ages of 20 and 49.

Because the focus of this paper is particularly on automaticity and the orthography of isiZulu, the analysis and discussion below is based on the 10 swiftest recordings of each text (i.e. 40 recordings). This ensured that those included were those exhibiting the most established patterns of automaticity. An analysis of the reading patterns of the whole group is discussed in another paper (Land, 2015).

DATA COLLECTION

The data collection process took approximately one hour for each participant. The mask of the Visagraph eye movement recording system was fitted to the reader's head, its receptors aligned with the pupils of their eyes, and their eye movements recorded as they silently read each of the four texts described above. Each text was printed on an A4 sheet of plain paper held by the reader at a reading distance they found comfortable. This meant that although readers wore a mask, and knew that their eye movements were being recorded, the reading experience was natural in that the text read was authentic continuous text printed on normal paper, and readers sat in ordinary chairs in a natural reading posture. Immediately after reading each text, each reader recounted what she had understood of the text in order to show the extent of their understanding of the text.

The Visagraph system allows recorded eye movements to be viewed in various forms, in one of which allows the replay of the recorded movement of the reader's point of focus represented by a moving cursor on an electronic copy of the text read. This was possible through the use of an isiZulu language package containing the selected texts, and designed particularly for this research by Reading Plus. After retelling what she had understood of the text, and with the reading experience fresh in her mind, each reader joined the researcher in following and discussing the recorded movement of her point of focus on the electronic copy of the text. Regressions, pauses, refixations and swift progress were all noted, and many readers recalled reasons for particular patterns of eye movements where they remembered

something about their thought processes at those points. For example, on noting his regression on the second word of the phrase "isitsha esinezimbali" (a dish with flowers), a reader recalled that he had first misread "esinezimbali" as "esinamazambane" (with potatoes) as he had expected a word for food to follow the word for 'dish'.

FINDINGS

Eye movement records showed a range of skill amongst the participants even though they had all demonstrated their competence. Figures below are screen shots of parts of graphs showing the movement of readers' eyes as they read. As each line progresses down the screen space, vertical sections show the time spent on each fixation, horizontal sections show movement to the left or right on a line of text, and return sweeps to the left to begin a new line.
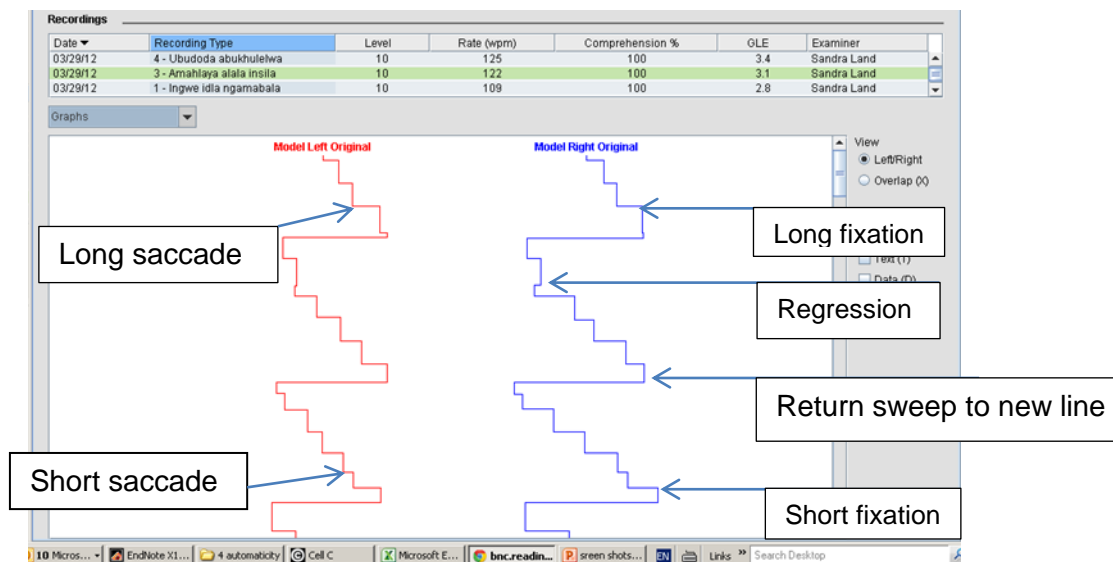
FIGURE 1: EYE MOVEMENTS OF A HIGHLY SKILLED READER

Figure 1 shows the steady progress of one of the most adept readers in this study through almost three lines of text in approximately 6.5 seconds. The brief vertical line sections show the 6 or 7 fixations he made per line, and the short horizontal line sections show his saccades as he moved his point of focus to the right through each line of text. There is only one brief regression. Observation of his recorded point of focus moving over the text (see description of this function above) confirmed that he fixated once briefly on many words, and passed over some others without fixating on them, indicating a highly degree of automaticity.
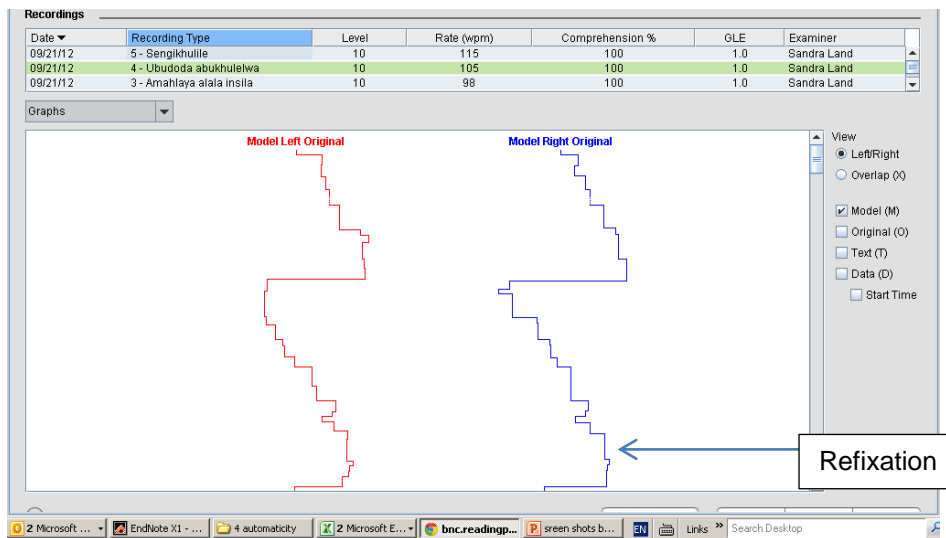
FIGURE 2: EYE MOVEMENTS OF A READER WITH MANY REFIXATIONS

Figures 2 and 3 show the slower progress of two readers with less highly developed skills than those depicted in Figure 1. The pattern in Figure 2 shows very small horizontal movements of the point of focus to the right, indicating extremely short saccades, suggesting a short span of recognition, with repeated fixations on some words.
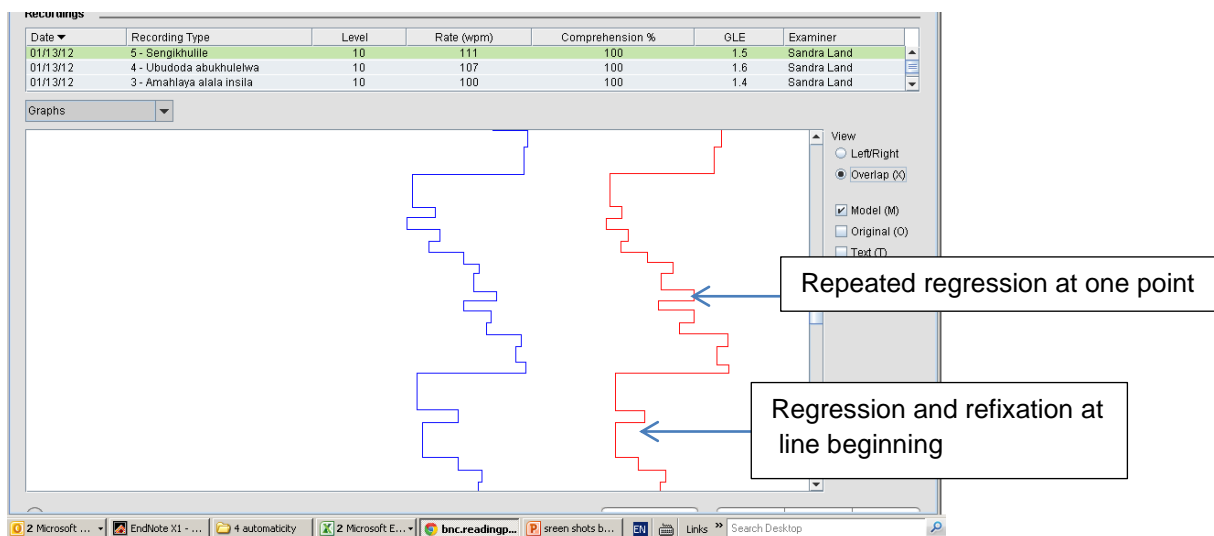
FIGURE 3: EYE MOVEMENTS OF A READER WITH REPEATED REGRESSIONS

Figure 3 represents progress at about the same rate as that shown in Figure 2, but here the track shows lengthy fixations at line beginnings and many short returns towards the left, indicating frequent regressions, as the reader 'reversed' in the text to have a second (or even third) look at words already passed. Neither Figure 2 nor 3 shows much automatic word recognition.

The 40 recordings selected for this particular analysis, since they reflected established automaticity, resembled Figure 1 rather than Figures 2 or 3.

TEXTUAL FEATURES AND AUTOMATICITY

Table 1. Measures of texts and average reading scores on each.

Text	Ave reading rate wpm / letters per minute (lpm) / letters per second (lps)	Ave number of fixations *Ave length of saccades*	Ave number of regressions
1. Sengikhulile 100 words 765 letters 16 lines 19 sentences (exc 1st and last lines) Ave no words per sentence: 5.3 Ave no clauses per sentence: 1.4	159 wpm/ 1214 lpm / 20 lps	138 *4.59 letters*	14
2. Ubudoda abukhulelwa 100 words 747 letters 14 lines 15 sentences Ave no words per sentence: 6.6 Ave no clauses per sentence: 1.8	145 wpm / 1081 lpm / 18 lps	155 *4.26 letters*	14
3. Amahlaya alala insila 100 words 831 chars 17 lines 10 sentences Ave no words per sentence: 10 Ave no clauses per sentence: 2.7	117 wpm /974 lpm / 16 lps	176 *3.74 letters*	24
4. Ingwe idla ngamabala 100 words 749 letters 15 lines 6 sentences Ave no words per sentence: 16.7 Ave no clauses per sentence: 4.2	124 wpm /931 lpm / 16 lps	175 *3.67 letters*	31

As shown in Table 1, sentence length differed markedly across the texts, and reading speed decreased as sentence length increased. Computation of a Pearson Product Moment Correlation showed a moderate, yet significant negative correlation between reading speed and sentence length: $r = -.413$, n = 40, p = 0.01, showing that reading speed dropped as sentence length increased.

There was a moderate but significant positive correlation between the number of fixations readers made and sentence length, showing that the fixation rate increased with sentence length: $r = .399$, n= 40, p = 0.05.

A more significant and slightly stronger correlation was found between the number of regressions made by readers and sentence length: $r = .440$, n = 40, p = .01. Sentence length

increases across the texts, with an average of 5.3 words per sentence in Text 1, 6.6 in Text 2, 10 in Text 3, and 16.7 in Text 4, so this shows that that readers read texts 3 and 4 (that had been judged to be the more difficult of the four texts) more slowly, and with more fixations and regressions than they did texts 1 and 2. Reasons for this could relate to sentence length and a number of other less measurable differences between the texts, such as unfamiliar vocabulary or other complexities, for instance the need to make inferences.

Readers' comments as they watched the replay of the recorded movement of their points of focus reveal their perceptions of their own reading process at points where their progress slowed:

SL   *You see, you slowed down a lot here?*
NN   *Yes I remember.*
SL   *What was going on in your head?*
NN   *Ezingaphambiyana nokugawula izihlahla, I think it is the same as the other one before this one. I was trying to understand, to read it and understand it at the same time…because it is talking about amadodana and now it's izihlahla so I am trying to put all of this thing together.*

Illustrating Paulson's observation that readers regress to problem areas in the text (2005), one reader spoke of her surprise upon reading of the war between the two white groups in South Africa (the Boer War):

TM   *I was not sure about the sentence because, really I never heard anything about the impi between amaNgisi namBhunu. I only know the war between Blacks and Boers so Mmh? Okay then to me it was something new.*
SL   *So that is why you stuck there because you were thinking …*
TM   *Yes - WHAT? amaNgisi namBhunu?*
TM   *Yes … I had to re-read the sentence to make sure if I was reading the right thing.*

Similarly, another reader exemplifies the observation made by Paterson et al., (2011) that readers tend to regress on the second of related words in a sentence, perhaps because their similarity inhibits recognition (here the words are visually similar, though not related):

SL   *And you also regress there, on kwakuyiloluhlobo.*
CM   *Ok there, I am not sure if it was this … ubuhholohholo because when I see that I thought there was something familiar.*

Average word length did not differ much between the texts (Text 1: 7.65.letters, Text 2: 7.47 letters, Text 3: 8.31, Text 4: 7.49). Unsurprisingly, in view of this small difference, there was no significant correlation between word length and reading speed ($r = -.118$, n= 40)

In stark contrast to the likelihood noted above of only one particular letter string ('the) recurring more than 10 times in 400 words of English, in the 400 words of the combined Zulu texts used in this study, 62 three letter strings occur 10 times or more, and 11 four letter strings occur more than 10 times (Decrypting Text 2013).

Analysis of 5000 words of text from Isolezwe (http://www.iol.co.za/isolezwe), a popular Zulu newspaper, showed that in 400 words of text in this newspaper, 30 three letter strings would be likely to occur 10 times or more, and 4 four letter strings would occur more than 10 times (Decrypting Text 2013). In comparison, analysis of 5000 words of text from the Mercury (http://www.iol.co.za/mercury), a popular English newspaper, showed that in 400 words, 4 three letter strings (the, and, -ing and -ent) would occur 10 times or more, and no four letter strings would occur more than 10 times (Decrypting Text 2013). The difference between the frequency of letter strings between the Zulu newspaper text and the excerpts from novels used in this study is interesting, and possibly an artefact of genre? Even with this difference, and the difference between the Gutenberg corpus and the sample from a popular English newspaper the comparisons show one phenomenon clearly: Letter strings are repeated much more in Zulu than in English.

Similarity between word forms does not facilitate easy and immediate distinguishability in any language (Abadzi, 2011), and it is possible that a high recurrence of the same letter strings may hinder the development of automaticity. It could be argued that in the example referred to above where a reader regressed on "isitsha esinezimbali" (dish with flowers) (Text2), after misreading it as " isitsha esinamazambane" (dish with potatoes) the reader's mistake showed signs of automaticity since he had predicted a word referring to food, and on sight of a long word containing the prefix esina/e- followed by a stem containing 'z' and 'mba', assumed the stem to be "amazambane", a miscuing error because of the similarity between word forms. Almost immediately after this regression the reader had trouble with the same letter combination again, regressing on **ezimbalwa** (several) after misreading it as **izimbazo** (axes).

A strong, highly significant correlation ($r = .743$, n= 40, p = 0.01) was found between saccade length and reading rate. A high reading rate is strongly associated with automaticity,

and these figures clearly demonstrate that the readers whose saccade length is long are those who moved through the texts swiftly. This is clearly reflected in the graphs of readers' eye movements as shown above.

Less strong, but still significant, was the negative correlation ($r = -.348$, n= 40, p = .05) between saccade length and sentence length. In this study a contributory factor to this correlation may be difficult or unfamiliar vocabulary since readers noted that in Texts 3 and 4, which had longer sentences than texts 1 and 2, there were some words they found obscure:

SL   *… You were working hard on this one; did you feel like hard work?*
MS   *Yes it did.*
SL   *Ngezikhadlana - is that a construction that you are familiar with?*
MS   *Yes, izikhala is spaces. So izikhadlana is smaller spaces - but a lot of the language I am not used to. I do not really speak like that so …*

There was no significant correlation ($r = .053$, n= 40) between the duration of readers' fixations and sentence length, indicating that readers did not increase the duration of their gaze either when coping with longer sentences or words they found obscure. This is interesting, in that it indicates that the slower reading rates noted on texts with longer sentences and words readers found obscure was due to the higher number of fixations (including regressions) made by readers, and not longer fixations.

The graph below summarises the above information by comparing sentence length, reading rate, fixations (reduced by a factor of 10 to allow graphic comparison) and regressions across the four texts. The trend line in the graph shows how reading rate decreased as sentence length increased, and the rate of fixations and regressions increased with it.
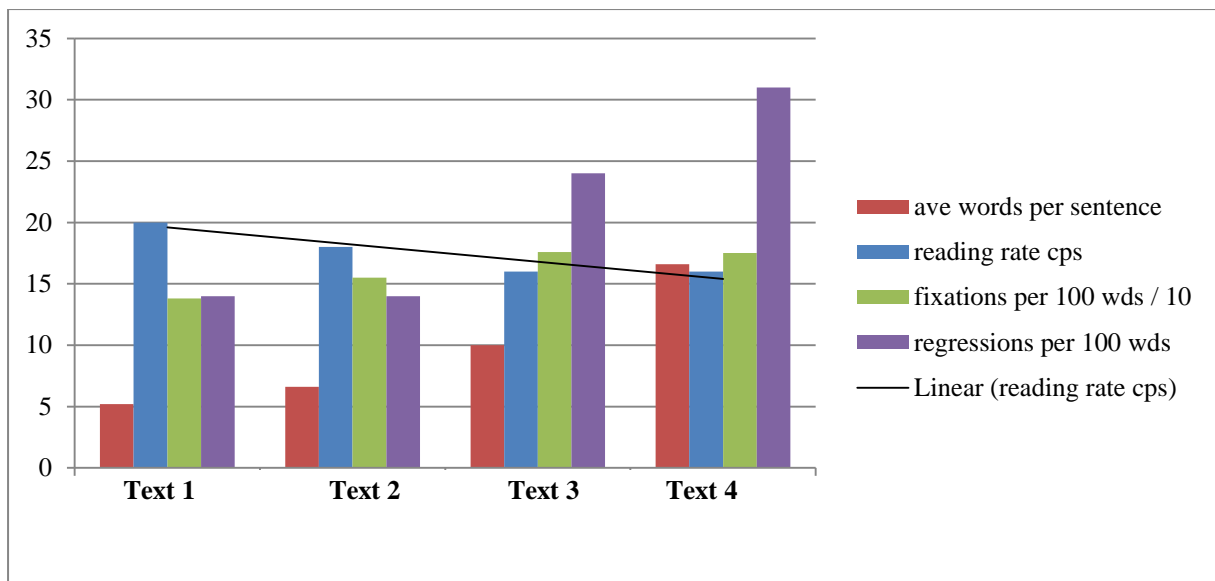
FIGURE 4: SENTENCE LENGTH OF TEXTS AND AVERAGE SCORES

WORD RECOGNITION

Although word recognition might not happen exactly in parallel as a reader's point of focus shifts from one word to the next, the number of fixations on a word and the duration of fixations are measures often used by researchers to reflect the ease with which a word is recognised (Rayner et al., 2007), and an average over different readers will serve at least as a guide to how easily it is recognised.

On this basis, recordings of each reader's eye movements were coded to create a record of each reader's processing of each word in each of the four texts according to the following key:

0 = no fixation (indicating recognition in the parafoveal view, and thus automatic recognition)

1= single brief fixation (indicating instant, automatic recognition)

M = refixations on the same word, (indicating that the reader was actively decoding the word, rather than instantly recognising it), and

R = regressions to or within a word, (indicating that the reader was returning to parts of the text for various reasons, showing that successful instant, automatic recognition had not occurred).

Once each reader's processing of all the words in each text had been coded, these records were collated by allocating a code to each word in each of the texts, representing:

- the number of readers who skipped the word,
- the number of readers who fixated once briefly on the word,
- the number of readers who fixated more than once on the word, and
- the number of readers who regressed to or within the word.

Thus, for instance, the code 2 5 2 1 allocated to the word *izihlahla* indicated that 2 readers had not fixated directly on it (possibly recognising it in parafoveal view), 5 readers had fixated once on it, 2 readers had fixated more than once on it, and 1 reader had regressed to or within this word. This information was then used to show

- which words appeared to have been instantly recognised in 80% or more of the recordings, on the basis of having been read without a direct fixation, or with only one brief fixation, and
- which words appeared to have required cognitive work to decipher, on the basis of having been read with multiple fixations or regressions in 80% or more of the recordings.

INSTANTLY RECOGNISED (AUTOMATICISED) WORDS
24.5% (98 of 400) of the words in the texts appear to have been instantly recognised in 80% or more of the recordings. These words are listed in Appendix 3, grouped according to the number of morphemes they incorporate.

The average word length across the four Zulu texts used in this study is 7.73 – significantly longer than average word length of 4.6 letters in English, 4.7 in Danish, 4.9 in Swedish, 5.6 in German and 7 in Finnish (Björnsson, 1983). The average length of instantly recognised words here is 6.5 letters, indicating that, as in other languages (Paterson et al., 2011), shorter words are more likely to be automatically recognised. While the agglutinative structure of Zulu prevents classifying words into separate categories of function and content, there are some short words that remain unagglutinated, and are purely functional, including *nje* (just),

khona (there), *futhi* (again) and *uma* (if). It is predictable that short high frequency words such as these are instantly recognised by readers, and possibly skipped. Here, only 3 of the 400 words in the four texts were **skipped** in at least half of the recordings. These were: *uma* "if" or "when" (a function word), *indlu* "house", and *yomuzi* "of the home" (content words), and were skipped at points in the text where their predictability was high. This is less than 1% - dramatically less than the 25% - 30% of the words that skipped by readers of English text (White 2008; Rayner 2009).

Most instantly recognised words consist of not more than two components and contain an element of content; only three contain more than 3 morphemes. Where these multi-morpheme words were instantly recognised, they were high frequency word forms, and/or appeared in contexts of high predictability such as *um/fo/wa/bo* in the context of *"... wabonakala uDuda umfowabo omncane kaNkalimba..."* ("…could be seen Duda, Nkalimba's little brother …"), where the capital letter of the first name and the context would have cued expectation of the word for "brother". Thus, predictably, it appears that complex words with few morphemes are recognised more easily than complex words with three or more morphemes, and it is possible that parts of agglutinated words are instantly recognised, as in this instance:

SZ-W *… I just discarded the first beginning part ezingama- part and just concentrated on*
      the   qhukwana part. [I thought] What could that be?
SL   *ok because those e-zi –nga- ma - they're all familiar parts of words*
SZ-W *yes*
SL   *and the - qhukwana part is the new part*

Many of the words that were read with one brief fixation at some points in the text were read with multiple fixations at other points. This indicates that factors such as position, collocations, context, and the process of construction of text meaning appear to be salient in recognition. Notably, no words at the start of a line of text were instantly recognised, even though some of them (*uma, lapho* and *ukuthi*) were instantly recognised elsewhere in the text. These refixations on words at the beginning of lines were in line with the observation by Rayner et al. (2007) that fixations at line beginnings often involve corrective saccades, presumably made as readers ensure that they have found the beginning of the right line. A reader's indefinite perception of this habitual process is clear in this discussion of a recorded refixation at the start of a line:

CM   I think it's - when I am starting the new line - and then I don't know if I was on the third or the second line, I'm not sure …

SL   So you're just making sure that you are at the right place?

CM   Ja, ja.

SL   So, how do you make sure that you are on the right line? Do you make sure by thinking 'does this word make sense with what I have just read?'

CM   Like if I was on the third line or fourth line?

SL   Yes. Do you know?

CM   It only just happens.

WORDS REQUIRING COGNITIVE WORK TO DECIPHER

23.5% (94 of 400) of the total words in the texts were read with two or more fixations or with at least one regression in 80% or more of the recordings, which indicates that readers break them into their constituent parts or otherwise actively decipher them. These words are listed in Appendix 4, grouped according to the number of morphemes they contain.

The average word length of these words is 11.1 letters (considerably longer than the overall average word length in these texts of 7.73 letters), and they consist of up to seven agglutinated morphemes, e.g.:

ngi/nga/ka/li/hlangan/is/i, (I had not yet gathered together)

kwa/ku/ngo/wo/ku/phatha (it was to take care of)

a/yi/si/shiya/galo/lu/nye ('that were nine', or literally 'that which leaves digit of one').

In view of the length and amount of information in these multi-morphemic words, it is unsurprising that nearly all the readers required more than one fixation to read them, and predictable that readers are likely to develop automaticised recognition of only those complex permutations that occur in text with unusually high frequency. The transcript excerpt below illustrates the strategy of one of the swiftest readers, which appears to exemplify the reconstruction of the speech sounds and small grain size processing strategy described by Ziegler and Goswami (2005) on this six morpheme word:

SL   And how do you manage to unravel this because …there is [a morpheme], there's one, two, three four, five six 'bits' in that word. How do you do it in your head?

NN   I think I read it slowly like [mimicking] kwakungowokuphatha then I understood it.

SL   Ok – so you make the reading voice that goes on in your head say the word?

NN   Yes I say the word, but silently.
SL   And you went back to check if you saw it right?
NN   Yes.
SL   And you listened to it again in your head?
NN   Yes. That's exactly what I did.

READERS' TREATMENT OF RECURRING WORDS

Appendix 5 contains a table that shows how these and five other words or word stems that recur repeatedly in the texts were read. Interestingly, some words recognised immediately by nearly all skilled readers at some points in the text were read with multiple fixations and / or regressions at other points. For example, the word *khona* (there) was instantly recognised in 100% of the recordings at three points in the text, but in only 60% of them at another point, where it refers to a pantry. Although the word *khona* is grammatically predictable at the point, the reference to a pantry might be an unexpected concept for some of these readers.

Ubaba (father) and *phela* (here, an interjection like "well") recur several times in the text, and appear in both the list of instantly recognised words and on the list of words on which readers fixated more than once or regressed to. This suggests that factors other than the distinguishability and familiarity of particular words affect the ease with which they are recognised.

Position on a line of text is salient, with a moderate but significant correlation between position in a line of text and the likelihood of being instantly recognised ($r = .399$, n= 40, p=0.01).

A survey of the textual location of the 22 instances of frequently recurring words that were recognised immediately in at least 70% of the recordings shows that 17 of these were in texts 1 and 2, which were characterised by short sentences (with less than 2 clauses per sentence on average). Only 5 of these frequently recurring words were instantly recognised in texts 3 and 4, whose sentences were longer, averaging 2.7 and 4.2 clauses respectively, and which had been judged to be more difficult to read than texts 1 and 2.

With regard to the position of words within a sentence, it appears that a relatively short high frequency word is likely to be recognised with a single fixation (but not skipped) at the beginning of a sentence, and more likely to require multiple fixations when appearing further into a sentence, since the number of readers instantly recognising a word appears to drop with increasing distance into sentence.

Yet surprisingly in view of this, and in spite of the strong correlation found between lower reading rates and longer sentences, there is no significant correlation (r = -.083, n= 40) between a word's position in a sentence and the likelihood of its being instantly recognised.

LIMITATIONS

As noted above, the enquiry in this paper is based on eye movements of the 10 swiftest readers of a sample of 33, recorded as they each read 4 texts. This narrow selection ensured that only recordings of readers who demonstrated established automaticity were used, but more confidence could be placed in a study of a larger sample. However, it is hoped that the information offered in this exploratory study will be useful as a starting point in the particular research question addressed.

The Visagraph equipment used in this study is not as sensitive as some other eye tracking equipment, and cannot be relied on to indicate readers' points of focus within long complex words as precisely as more sensitive equipment. However, an advantage that offsets this is that its features (described above) allow a close simulation of natural silent reading of continuous text, which was the particular focus of this study.

The effects of readers' awareness of being recorded as they read are unavoidable, and a limitation in all reading research involving readers' cooperation.

CONCLUSIONS

The agglutinative nature of Zulu, its conjoined writing system and comparatively long, complex words, coupled with its high rate of recurring syllables and particular strings of letters are features that are not likely to facilitate swift, easy discrimination between words. Hence, the orthography of Zulu appears to be less conducive to the development and exercise of skills associated with automaticity than orthographies of languages with short words and high heterogeneity among word forms, such as English. This has implications for teaching strategies in Zulu reading.

In this study, reading speeds of a sample of readers with demonstrated competence in reading isiZulu was highest in texts with short sentences and familiar vocabulary. On texts incorporating longer sentences and less familiar vocabulary their rate of reading decreased, and the rate of fixations and regressions increased significantly, although the duration of their fixations did not. Saccade length increased on texts with short sentences and familiar vocabulary, indicating a higher rate of automatic recognition in these texts.

Almost 25% of words were recognised instantly in 80% of the selected recordings, although less than 1% of words were skipped, which suggests that very few words were predicted on the basis of their parafoveal view. Words that recurred in the texts were recognised immediately at some points, and not in others. Position within a line of text was found to be significant in this regard, but surprisingly, given the lower rate of reading on texts with longer sentences, not position within a sentence. Words that were instantly recognised tended to be shorter than the average word in the text, suggesting that, as in other languages, short words are more likely to be automatically recognised.

23.5% of words in these texts were read with multiple fixations and /or regressions in 80% of the selected recordings. Predictably, these words were longer (comprising on average more than 11 letters) and more complex than the average words in the texts; most contained three or more morphemes.

Readers' accounts of their reading suggest that context and the construction of a mental representation of the meaning in text is a complex and powerful influence on how words are read, and that at times cognitive processing of words and even sentences lags behind perception of words in the point of visual focus.

This study is limited in terms of its sample size, the sensitivity of the equipment used, and the unavoidability of readers' awareness that their reading behaviour observed, and putting up with intrusive recording equipment. However, since the equipment at least allowed a simulation of natural reading behaviour, and since many participants stated that they enjoyed the recording process, it is hoped that the study presents a fairly authentic view of the extent of automaticity among current readers of isiZulu text.

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APPENDICES:

Appendix 1: Invitation to participate in the study, including a self test of reading rate

UYAMENYWA UKUBA UZIMBANDAKANYE NOMSEBENZI WOCWANINGO LOKUFUNDA ISIZULU

Ungakwazi ukufunda lokhu ebhokisini ngaphansi komzuzu owodwa? Zikalele ngewashi

Sidinga ukusebenza ngokushesha ukuthuthukisa izilimi zase Africa enyuvesi yethu. Ukuthuthukiswa kwezilimi zase Africa njengezilimi esiphathelene nemfundo ephakeme kubalulekile. Sonke sidinga ukuzinikela kuzona. Akusiyena uhulumeni kuphela okungafanele abone ukuthi lezilimi zase Africa zisetshenziswa endaweni efanele emphakathini wethu. Ngokweqiniso lokhu kungumsebenzi wethu sonke. Ezikhungweni eziphezulu zemfundo, abathuthukisi bezilimi, kanye nomphakathi wonkana kufanele baqiniseke ukuthi izilimi zase Africa ziqinisekiswe.

Izilimi zase Africa zibalulekile kulelizwe. Zisivezele ukuthi singobani, futhi sifuna ukuba ngobani, kanye nendlela esifisa ukwakha ngayo i South Africa.

Ukuthuthukiswa kwezilimi zase Africa kwimfundo, nakwezemfundo ephakeme, kusemthethweni sisekelo. Uthi umthethosisekelo, bhekisisani ukushabalala kwesisindo sezilimi zabantu bakithi kuleli, uhulumeni kumele athathe izinyathelo ezinqala zokuphakamisa isisindo nenqubo yokusetshenziswa kwezilimi zethu. Masingavumeli ukuthi izilimi zakulelizwe zishabalale. Kodwa masiziqinisekise.

Uma kuwuthi thina esiluncele ebeleni lolulimi asiluthuthukisi, ubani ozoluthuthukisa?

Uma ungafunda kulelibhokisi isikhathi esingaphansi komzuzu owodwa , kungenzeka uthande ukuba ingxenye yocwaningo lomsebenzi wokufunda imibhalo yesiZulu. Indlela okubhalwa ngayo isiZulu kuhluke kakhulu endleleni okubhalwa ngayo isiNgisi. Kanye namakhono okufundwa kwesiZulu awakaqondisiseki namanje.

Ngidinga abantu abakwazi ukufunda isiZulu ngokushesha futhi okululula kubona ukufunda, abangaba nothando lokuvolontiya. Ngidinga ukuqopha indlela amehlo abo anyakaza ngayo uma befunda. Inhloso yami eyokuhlola amakhono okufunda incwadi yesiZulu.

Uma uzinikezela kulomsebenzi ungsiza entuthukisweni yolimi lwesiZulu njengolimi olufundwayo. Bonke abazozinikela kululucwaningo bayothola ulwazi mayelana namakhono okufunda kwabo.

Ayikho imali ezotholakala ngokwenza lomsebenzi.

Sandra Land   Centre for Adult Education   University of KwaZulu-Natal

Texts used in this study (though obviously not in this format)

1. Memela, N. (1992). *Sengikhulile.* Durban: New Readers Publishers.

UNomadashimane igama lami. Sengikhulile! Awu! Akukho okudlula lokhu. Ikhulu leminyaka akusiyo into encane. Phela ngazalwa ngempi yamaNgisi namaBhunu. Abanye babewabiza ngokuthi amaDashimane amaBhunu. Igama elithi Nomadashi lasukela lapho. Ubaba wayesebenza epulazini endaweni yase-Bulwer. Kwathi ngokusuka kwempi wathi umlungu kubaba, "Ngiya empini. Hleze ngingabuyi, ngifele khona. Uma ngingabuyanga, ungakhathazeki. Ngiwenzile onke amalungiselelo okuthi umesisi anibheke nezingane zakho." Umama ngalesosikhathi wayekhulelwe. Wazibula ngamawele, umfana nentombazana. Bathi kuzelwe amakhosi. Bangiqamba igama elithi nginguNomkhosi. Kepha ngenxa yokuthi ngazalwa ngempi kwaduma elokuthi nginguNomadashi. Ngakhula-ke sihlezi epulazini. Sasilima, sisenga izinkomo, kudliwa amasi. Kwakujwayelekile ukuthi ingane ekhulele epulazini iwuqale isencane umsebenzi. Ngaqala ukusebenza ngingakalihlanganisi ishumi leminyaka. Umsebenzi wami kwakungowokuphatha izingane zomlungu. Ngaze ngakhula impela ngisebenza kuye lomlungu.

2. Nyembezi, S. (1953). *Ubudoda abukhulelwa.* Pietermaritzburg. : Shuter and Shooter Pty Ltd. p. 15.

Lapha kwaMsezane kwakwakhiwe ngempela. Kwakungumuzi ovuthiwe. Indlu yayakhiwe ngesitini esibomvu, esishisiwe. Yayinovulande ezinhlangothini ezimbili. Indlu yayinamakamelo ayisishiyagalolunye. Kwakukhona indlu yokuphola, neyokudlela, nalapho ayesebenzela khona uMsezane nalapho ayegcina khona izincwadi zakhe. Phela kwakungumfo owayekuthanda ukufunda. Kunamakamelo amathathu okulala. Bese-ke kuba yikhishi nendlu lapho kubekwa khona ukudla. Uma ungena endlini yokuhlala, wawukhangwa upiyane olukhulu, luzisho nje ukuthi olwemali. Kwakukhona futhi endlini izihlalo ezithofozelayo, ayethi umuntu uma ehlala kuzo ashone phansi avele ngezindlebe. Phakathi nendawo kukhona itafulana elincane kubekwe phezu kwalo isitsha esinezimbali. Phansi lapha amapulangwe ayembozwe ngocansi lwabeLungu. Kwakuyiloluhlobo othi uma uhamba phezu kwalo nezigi zife, umuntu athashazise okukamangobe. Ezindongeni kwakulenga izithombe ezimbalwa. Zonke izinto ezazikulomuzi zazikhuluma ngokusobala zithi kukwamnumzane lapha.

3. Mkhize, M. T. (1983). Amahlaya alala insila. Pretoria: De Jager-HAUM Publishers. p. 1

Umuzi wakubo kaChithimpi Zondi umfo kaNkalimba wawunezindlu ezimangaqhugwana amathathu wakhiwe ngaphansi kwegquma. Iminyango yezindlu yayibheke ngaseNyakatho ukugwema iziphepho ezazivamise ukuqhamuka ngaseNingizimu. NgaseMpumalanga yomuzi kwakunomhoshana okwakwehla kuwo umchachazwana wamanzi owawuze uyongenela emfuleni uMzimayi. Ntambama kwakuye kuheleze umoya obandayo owawuye ungene ngezi-khadlana zezicabha kwaZondi. Lamahelehelana ayeqala ngokuphola kamnandi kodwa agcine esebanda ngokumangalisayo lapho sekuphakathi kwamabili ebusuku ikakhulukazi uma kusebusika. Ngalelilanga kunguMgqibelo ntambama iwona lamahelehelana ayesiza ekupholiseni kwaZondi. Phela lapha emzini kaNkalimba ngalelilanga kwakusindwe ngobethole kutatazela omakoti kunjeyaya. Okungamakhehla nezalukazi kwakulokhu kubonakala kuphuma kuthi tshobe ngemva kwezindlu kuchitha lawomanzi ayengasadingeki emizimbeni yawo. Kulobuhholohholo bomsindo wabonakala uDuda umfowabo omncane kaNkalimba engena endlini nezimbuzi ezimbili ayezibambe ngezimpondo eyokuma ngasemsamo. Esemsamo uDuda wabatshela abasendlini ukuthi lezimbuzi kwabe kungezani.

4. Zama, J. M. (1967). Ingwe idla ngamabala. Pietermaritzburg: Shuter and Shooter. p. 1

Kwakungenye intambama lapho selibantubahle; kusentwasahlobo iminduze seyiqalile ukuqhakaza, mhla ngiqalayo ukuyizwa inguquko empilweni yami ngoba ngakhanyelwa kusukela ngaleyo ntambama ukuthi akukho lutho oluzenzekelayo nje ngokwalo. Yonke into emhlabeni inembangela nenhloso ethile kulowo nalowo muntu. Leyontambama engiyisusela kuyo lendaba yami ngayiphawula ngoba ubaba, uNqakamatshe, wafikisana kanye nathi esangweni lomuzi wakwethu, kwazise ukuthi sasingaveli ndawonye nobaba. Ubaba wayebuya embizweni eyayibizwe nguGazi iNkosi yethu thina baThembu. Thina sobathathu madodana akhe sasiqhamuka kokumba iziphunzi esikhaleni esasisivule ezinsukwini ezingaphambiyana ngokugawula izihlahla ekupheleni kwehlathi elaligudla insimu kamame omkhulu, uMaButhelezi. Umame omkhulu wayebike kubaba ukuthi isife ayesilima minyaka yonke sase sinciphile ububanzi baso ngenxa yokucinaniswa yimixhantela yezihlahlana ezazimila ezimpandeni zemithi eyayisephethelweni laleohlathi. Thina sasivela kulowo msebenzi.

APPENDIX 3

Table 2

Words that 8 of 10 swift readers recognised automatically			
1 morpheme	2 morphemes	3 morphemes	4 morphemes
mhla (day)	yami (my)	ngaleyo (from that)	wayebike (she reported)
nje (just)	ngoba (because)	ethile (certain)	umfowabo (their
lapho (when/where/there	Yonke (all)	nenhloso (with the purpo	brother)
khona (there)	yethu (our)	nalowo (and that one)	akusiyo (it is not that)
Phela (Well)	thina (us)	wakhiwe (built)	
futhi (as well/again)	akhe (his)	yezindlu (of the houses)	
Uma (if/when)	kokumba (to dig)	yomuzi (of the home)	
Kepha (yet)	izihlahla (plants)	emfuleni (in the river)	
	insimu (field)	obandayo (cold)	
	sase (until we had)	agcine (they ended up)	
	amathathu (three)	ayeqala (he began)	
	ngaphansi (below)	emzini (in the home)	
	iziphepho (breezes)	ezimbili (two)	
	kuwo (to that)	ayegcina (he kept)	
	wamanzi (of water)	Okulala(to sleep)	
	kwaZondi (of Zondi)	Elincane (that was little)	
	omakoti (brides)	kubekwe (to put away)	
	kuphuma (to exit)	epulazini (on the farm)	
	umoya(wind)	endaweni (in a place)	
	kodwa (but)	ngifele (I may die)	
	kuthi (making as if)	okuthi (so that)	
	yawo (of theirs)	nezingane (and the child	
	uDuda (boy's name)	kuzelwe (it was born	
	Indlu (house)	for)	
	zakhe (his)	elithi (that said)	
	Ukufunda(to read)	yokuthi (of the fact)	
	nendlu (and a room)	ekhulele (grew up)	
	umuntu (person)	leminyaka (of years)	
	kuzo (on it)		
	kwalo (on it)		
	isitsha (dish)		
	othi (made as if)		
	kwalo (on it)		
	encane (little)		
	Abanye (others)		
	Igama (name)		
	Ubaba (father)		
	Kwathi (it was said)		
	kwempi (of the army)		
	wathi (he said)		
	Ngiya (I am going to)		
	Umama (mother)		
	Bathi (they said)		
	ukuthi (that)		
	ingane (child)		
	amasi (curdled milk)		
	Ngaqala (I began)		
	ishumi (ten)		
	wami (my)		
	Ngaze (I did)		
	Impela (really)		

Table 3

Words that 8 of 10 swift readers fixated on more than once				
1 morpheme	2 morphemes	3 morphemes	4 morphemes	5+ morphemes
Phela (Well)	iminduze (lilies) ukuqhakaza (bloo ubaba(father) baThembu (of the Thembus) iziphunzi (tree stu kamame omkhulu the first wife) ububanzi (breadth ntambama (evenir nendawo (and a place) amapulangwe (planks) izinkomo (cattle) Iminyango (doors)	seyiqalile (it had begun) empilweni (in life) Leyontambama (that ever ngayiphawula (I told it) uNqakamatshe (person's name) wakwethu, (of ours) uMaButhelezi (Ms Buthele wayebuya (he came back) embizweni (from a meetir sobathathu (we were three madodana (sons) sasiqhamuka (we appeare ngokugawula (of chopping down) esikhaleni (in the space) umchachazwana (spring) ngokuphola (cooling) esebanda (that were cold) sekuphakathi (that was in between) kunguMgqibelo (it was Saturday) ngobethole (of heifers) ngalelilanga (on that day) kaNkalimba (of Nkalimba) nezalukazi (and old ladies kwezindlu (of the houses) Kwakukhona (there was) okukamangobe (like that wild cat) kwakulenga (there were hanging) okudlula (that passes) ngazalwa (I was born) amaDashimane (Dutchme lasukela (started from then)	Ngakhanyelwa (I realised) wafikisana (he go there at the same time) esasisivule (that we had open elaligudla (that surrounded) ngaseNyakatho (to the north) ngaseNingizimu (from the south). NgaseMpumalang (to the east) owawuye (that used to) ngezikhadlana (in the gaps) kusebusika (in winter) lamahelehelana (these breezes) kwakusindwe (that was smeared Yayinovulande (it had a veranda) ezinhlangothini (on its sides) esishisiwe (that were fired) yayinamakamelo (it had rooms) ayesebenzela (where he worked kwakungumfo (he was a man) owayekuthanda (who liked) Kunamakamelo (there were rooms wawukhangwa (was displayed) Nentombazana (and a girl) Ngingabuyanga (I had not come back)	oluzenzekelayo (that had been done for) engiyisusela (from where I took this) ezingaphambiyana (that we in front of) yokucinaniswa (because of being crowded) ezingamaqhugwana (that were traditional huts) ezazivamise (that used to) kwakunomhoshana (there a ravine) ngokumangalisayo (that wa surprising) Okungamakhehla (those wl were old men) Ayengasadingeki (that was not still needed) Kulobuhholohholo (in that commotion) ayisishiyagalolunye (that we nine) ezithofozelayo (that were s esinezimbali (that had flowe Kwakuyiloluhlobo (it was th kind) ezazikulomuzi (that were of that home) ungakhathazeki (do not wo wayekhulelwe (she was pregnant) nginguNomkhosi (I was Nomkhosi) nginguNomadashi (I am Nomadashi) Kwakujwayelekile (it was usual) ngingakalihlanganisi (I had not yet gathered together) kwakungowokuphatha (it was to take care of)

Appendix 5

Word stem	Appearing in text as:	Read instantly in x /10 recordings	Text	Line position	Sentence position In phrase x	Level of predict-ability	Frequency	Pt of speech
-baba	Ubaba (father)	**10/10 1 9 0 0**	1	3rd wd line 5	1st wd phr 1	low	high	noun
	Ubaba	**6/10 0 6 2 3**	4	last wd line 8	1st wd phr 1	low	high	noun
	ubaba	**3/10 0 3 4 4**	4	1st wd line 7	mid-sntce phr 3	low	high	noun
	nobaba (with father)	**7/10 0 7 2 1**	4	2nd last wd line 8	last wd phr 5	fair	high	noun phrase
	kubaba (to father)	**4/10 readers 0 4 4 4**	4	1st wd line 14	4th wd phr 1	fair	high	noun phrase
	kubaba	**4/10 readers 0 4 3 4**	1	2nd last wd line 6	in phr 2 directly before direct speech	fair	high	noun phrase
phela	Phela	**8/10 readers 1 7 0 2**	2	3rd wd line 6	1st wd	low	High	interjection
	Phela	**7/10 readers 0 7 3 0**	1	last wd line 2	1st wd	low	high	Interjection
	Phela	**5/10 readers 0 5 4 5**	3	1st wd line 13	1st wd	low	high	Interjection
-ndlu	Indlu (house)	**9/10 readers 5 4 0 1**	2	2nd wd line 2	1st wd	high	high	Noun
	Indlu	**8/10 readers 3 5 0 2**	2	2nd last wd line 3	1st wd	high	high	noun
	nendlu (and a house)	**8/10 readers 0 8 1 1**	2	last wd line 7	4th word begin phr 2	high	high	noun phrase
	yezindlu (of the houses)	**8/10 readers 1 7 1 1**	3	2nd wd line 3	2nd wd phr 1	fair	high	noun phrase
	indlu	**8/10 readers 5 3 0 2**	2	mid line 4	2nd wd phr 1	high	high	noun
	Kwezindlu (of the houses)	**2/10 readers 0 2 7 4**	3	1st wd line 16	phr 4	fair	high	noun phrase
khona	khona (there)	**10/10 readers 0 10 0 0**	1	mid line 7	3rd wd phr 2	high	high	Adverb

	khona (there)	**10/10 readers 3 7 0 0**	2	mid line 5	Mid-sntce phr 3	high	high	Adverb
	khona (there)	**10/10 readers 0 10 0 0**	2	end line 5	Mid-sntce phr 4	high	high	Adverb
	khona (there)	**6/10 readers 3 3 3 1**	2	3rd wd line 8	Mid-sntce in phr 2	high	high	Adverb
	kukhona (there is)	**4/10 readers 0 4 1 5**	2	2nd wd line 12	3rd wd phr 1	high	high	Clause
	Kwakukhona (there were)	**4/10 readers 1 3 6 4**	2	2nd wd line 4	1st wd	high	high	Clause
	Kwakukhona (there were)	**2/10 readers 0 2 7 3**	2	1st wd line 10	1st wd	high	high	Clause
kuthi	okuthi (so that)	**9/10 readers 2 7 0 1**	1	2nd last wd line8	Mid sntce beg phr 2	fair	high	conjunct
	kuthi (making as if)	**8/10 readers 6 2 2 1**	3	mid line 15	Mid sntce introducing ideophone	low	high	link
	ukuthi (that)	**8/10 readers 1 7 1 1**	1	mid line 14	2nd wd in sntce Begin phr 2	fair	high	conjunct
	ukuthi (that)	**6/10 readers 1 5 1 2**	2	2nd last wd line 9	In phr 3	fair	high	Conjunct
	ukuthi (that)	**6/10 readers 0 6 3 1**	4	1st wd line 4	In long sntce Intro phr 9	fair	high	conjunct
	ukuthi (that)	**5/10 readers 1 4 3 3**	4	mid line 8	In long sntce begins phr 5	fair	high	conjunct
	ukuthi (that)	**4/10 readers 1 3 2 4**	4	2nd wd line 14	Mid sntce begins phr 25	high	high	conjunct
	yokuthi (of the fact that)	**8/10 readers 0 8 1 1**	1	2nd wd line 12	Mid short sntce Begins phr 2	low	high	conjunct
	ngokuthi (by saying)	**6/10 readers 0 6 2 3**	1	1st wd line 3	Mid sntce beg phr 2	low	high	conjunct
	elokuthi (which was to say that)	**6/10 readers 0 6 3 1**	1	last wd line 12	Mid sntce begin phr 3	low	low	conjunct
Uma	Uma (If)	**10/10 readers 8 2 0 0**	1	2nd last wd line 7	1st wd	fair	high	conjunct
	Uma (If)	**10/10 readers**	3	mid line 11	Mid sntce begin phr	fair	high	conjunct

149

		7 3 0 0			4			
	Uma (If)	**8/10 readers 3 5 0 1**	2	mid line 8	1st wd	low	high	conjunct
	Uma (If)	**7/10 readers 0 7 0 3**	2	1st wd line 11	Mid sntce in phr 3	fair	High	conjunct
	Uma (If)	**9/10 readers 2 7 0 2**	2	mid line 14	Mid sntce begin phr 2	high	high	conjunct
lapho	lapho (when)	**8/10 readers 3 5 1 3**	3	mid line 10	Mid sntce begin phr 3	low	high	Conjunct
	lapho (where)	**5/10 readers 0 5 1 4**	2	1st wd line 8	Mid sntce Begin phr 2	low	high	Conjunct
	lapho (there)	**6/10 readers 0 6 0 3**	1	2nd wd line 5	Last wd short sntce	low	high	Conjunct
	nalapho (and where)	**6/10 readers 0 6 3 1**	2	1st wd line 5	Mid sntce Begin phr 3	high	fair	Conjunct
	nalapho (and where)	**6/10 readers 1 5 0 4**	2	mid line 5	Same sntce as above, begin phr 4	high	Fair	conjunct

CHAPTER 6

PROCESSES AND STRATEGIES USED BY COMPETENT READERS OF ISIZULU

ABSTRACT

Research on reading in African languages is particularly pertinent in South Africa now, in view of the poor reading performance in many South African schools. This paper is based on a study of competent adult readers of isiZulu that analysed what its orthography (the way it is written) requires of readers. As an agglutinative language with a conjoined writing system, isiZulu carries meaning not only in separate words, but also in morphemes that cluster together, forming long complex words. Eye tracking data shows that competent readers of isiZulu move their eyes across text in saccades (shifts of the point of focus) that are short in comparison with the saccades that characterise efficient reading of English. It also shows that readers of isiZulu fixate on points of text for longer periods than do readers of English.

The study links quantitative eye movement data to qualitative data gained from a stimulated recall process, to discover strategies consciously used by competent readers of isiZulu. Some of these strategies, such as visualisation, are common to efficient readers of all languages, while others might be peculiar to agglutinating and/or tonal languages. These strategies inform suggestions for the development of effective reading skills in isiZulu.

INTRODUCTION

Many South African children do not develop adequate reading skills in their home language.

In KwaZulu-Natal (KZN), where nearly 77% of the province's 10.2 million people are first language Zulu speakers (Statistics South Africa, 2011), conditions conducive to the development of effective reading skills in the language most familiar to them appear to exist for few children.

Currently children learn to read in their home language in the first three school years, and their average scores in Annual National Assessment (ANA) tests of 2011, 2012 and 2013 have tended to be below 40% (Department of Basic Education, 2012 and 2013). The situation seems even worse in grades 4, 5 and 6: in 2012 ANA tests, average marks for home language literacy were in the 20s and low 30s, rising about 10% in the ANA tests of 2013 (Department of Basic Education, 2013). The percentage of children attaining at least 50% in grades 4, 5 and 6 improved dramatically from only 31% in 2012 to nearly 50% in 2013 (Department of Basic Education, 2013), representing a surprising shift towards the modest goal set by the Minister of Basic Education of 60% of children achieving more than 50% in languages in these grades (Department of Basic Education, 2012). However, in grade 9 the situation remains calamitously short of even this unambitious target, with children's average mark for home language literacy at 38% in 2012, and 39% in 2013, and only 28% and 31% of children achieving at least 50% in 2012 and 2013 respectively. Thus the aim of the draft policy entitled Incremental Introduction of African Languages (Department of Basic Education, 2013) of strengthening "the use of African languages at Home Language level" must be applauded. However it is difficult to see how this policy's suggestion of the addition of another language to the curriculum will facilitate this, especially when learners are clearly struggling with reading in their own home languages.

Our education system is beset by a range of debilitating historical, political and practical factors, which frequently combine to impede learning. Where these factors coincide with limited preschool exposure to reading (Pretorius & Mampuru, 2007) and teachers' orientation towards reading as an oral performance rather than comprehension, noted by Trudell and Schroder (2007), the situation reflected in the ANA scores should surprise no-one. However, a crucial and overlooked weakness in the system is that South African teachers tend to be inadequately trained in the teaching of reading (Pretorius & Mokhwesana,

2009; National Education Development Unit, 2013). Perhaps because there is little research on reading in African languages (Land, 2015), and an abundance on reading in English, available pre- and in-service training in teaching reading is shaped by methods favoured for teaching reading in English, whose structure and orthography differs markedly from that of indigenous African languages.

A useful body of research on children's reading in indigenous South African languages is growing (e.g. Pretorius & Mampuru, 2007; Verbeek, 2010; Van Rooy & Pretorius, 2013; Pretorius, 2014). The study reported on here offers a complementary angle, focusing on the well-developed reading skills of mature readers, noting adults' eye movement patterns, and describing strategies they use to read isiZulu rapidly and efficiently. It is hoped that identification of these strategies could contribute to the development of pedagogical principles pertinent to the teaching of reading.

READING PROCESSES THAT EDUCATORS SHOULD UNDERSTAND

Researchers recognise reading as "arguably the most complex cognitive activity in which humans routinely engage" (Reichle et al., 2009), yet educationalists tend to underestimate the complexity of the processes that beginners need to master: decoding visual symbols into language while simultaneously constructing a coherent conceptual representation of meanings contained in text.

To decode alphabetic script, readers shift their focus systematically along successive lines of text, registering sufficient features in the text to identify combinations of letters representing successive words or other units of language. To do this, readers match visual patterns in the text with their existing orthographic, phonological and semantic concepts of language (Reichle et al., 2008). So recognition of a word involves responding to its representation in print by thinking of how the letters represent its sounds (its phonics) and what it means (its semantics).

To read with understanding, readers must also accumulate information from the text in short term memory. This process is described by Rapp and van den Broek (2005, p. 277) as:

... developing concepts [that] fluctuate in activation as a function of four sources:

(a) text input in the current cycle,

(b) residual information from the preceding cycle,

(c) the memory representation constructed for the text read so far, and

(d) the reader's prior knowledge.

These fluctuations result in a "landscape" of activations, with concepts waxing and waning in activation during reading.

This waxing and waning of concepts relates to readers' developing mental representations of the meaning of text as they extract information from print, and as they anticipate the next words, continually confirming or disconfirming predictions as they progress. This was first described by Kenneth Goodman in his famous definition of reading as "a psycholinguistic guessing game" (Goodman, 1967). As this view of reading became widely accepted, it inspired changes in the ways reading was taught, since it focused attention squarely on readers' constructing mental representations of meanings in texts. An unfortunate consequence was that in many reading programmes, teaching of mechanical decoding skills was abandoned instead of being supplemented by strategies aimed to enhance the construction of meaning.

It is likely that higher order cognitive meaning-making processes are similar for readers of all languages. However, at the more mechanical level of decoding print to words, it is apparent that readers respond differently to different orthographies. Particularly pertinent to this paper are differences between orthographies where letters consistently and reliably represent the same speech sounds, and orthographies where the relationship between letters and speech sounds is inconsistent. Research shows that readers of languages with transparent and consistent orthographies such as Greek, Finnish, and Italian decode text by matching graphemes (letters, or letter combinations) to phonemes (speech sounds) (Georgiou et al., 2008). In contrast, readers of opaque, inconsistent orthographies such as English develop other strategies because letters do not always represent the same sounds (Georgiou et al., 2008). Linked to this is the psycholinguistic grain size theory proposed by Ziegler and Goswami (2005). This suggests that the letter groupings relied on by readers of opaque, inconsistent orthographies to reconstruct language are significantly larger than the letter

groupings relied on by readers of transparent consistent orthographies. The reason for this is that speech sounds are represented more consistently by large grain size units of text in opaque orthographies than small grain size units. In other words, while single letters can represent a range of speech sounds, groups of letters forming syllables tend to represent speech sounds more reliably; for example, none of the letters in the words "range" or "speech" can be counted on to represent particular speech sounds in English, so recognition of whole words such as "range", "and "anger", and "speech" and "psyche" is necessary.

Orthographies make up a continuum with consistent, transparent orthographies (where spelling predicts pronunciation) at one extreme, and opaque, inconsistent orthographies (where spelling does not reliably predict pronunciation), at the other. The orthographies of isiZulu and English, in which most people in KwaZulu-Natal must develop reading skills fall at opposite ends of this continuum. This has significant implications for acquiring and exercising reading skills, which should be taken into account in the teaching of reading and the training of reading teachers.

If they learn to read in their first language, readers' existing vocabulary, phonemic knowledge, and understanding of the structure and functioning of the language should aid their prediction and recognition of words. Also, their established confidence in using their mother tongue to give and receive information should facilitate their construction of a conceptual representation of a text's meaning. Yet van Rooy and Pretorius (2013) found that grade 4 children whose first language is isiZulu read English faster than isiZulu, even when they needed the English instructions translated into isiZulu in order to understand them. This is in stark contrast to findings relating to European languages with transparent orthographies in which children achieve reading competence far more quickly than English children (Georgiou et al., 2008; Seymour et al., 2003). Reasons for this are unknown but may relate to the textual features described below, and/or to teaching methods and attitudes toward reading, such as the common sub-Saharan African perception that reading is primarily an oral performance (Trudell & Schroeder, 2007). This may prevent many teachers from emphasising reading for meaning and using silent reading exercises in class. In observed reading lessons in local schools in 2013, the only activity noted was reading aloud (Mather, 2013; Sivnarain, 2014). It would ease the task of teachers to know that short exercises in silent reading, where learners practised the skills of predicting, deducing and concluding, and received immediate feedback, would be a powerful strategy to encourage readers to read for meaning.

READING AND THE ORTHOGRAPHY OF ISIZULU

FACTORS THAT FACILITATE READING

With near perfect correlation between letters and sounds[12] isiZulu orthography is transparent and consistent.

Initial acquisition of reading skills is aided by the regular, dependable relationship between letters and speech sounds in shallow orthographies (Trudell & Schroeder, 2007). Children learning to read the transparent, consistent orthographies of Greek, Spanish, Finnish, and Italian, can read unfamiliar words aloud correctly at the end of grade 1 (Ziegler et al., 2010).

In contrast, "deep" orthographies, like that of English, are characterised by irregular relationships between letters and speech sounds where single letters can represent a range of speech sounds or be unvoiced. Unsurprisingly, children learning to read in English take three times as long to competently recognise words as children learning to read in transparent, consistent orthographies (Seymour et al., 2003).

Research has not yet established how long it takes, or should take, for beginner readers of isiZulu to recognise unfamiliar words, and no benchmarks exist for the development of reading skills in isiZulu (van Rooy and Pretorius, 2013). What is expected of learners at the end of grade 1 ranges widely, from recognition of letters and some single words, to reading whole simple stories (Verbeek, 2010). In stark contrast to the plodding pace of reading development in many South African schools, a startling Reading to Learn[13] DVD shot in September 2014 (Reading to Learn, 2014) shows enthusiastic Grade 1 township children successfully reading a whole story and writing the sentence "*Ugogo uyasixoxela inganekwane*" (Granny tells us a folk tale) directly from dictation. This indicates that progress could be rapid if teaching strategies focused on decoding and meaning, proceeded at

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[12] The letters 'n', 'd', 'h', 's', and 'l' are exceptions and can represent two phonemes just as 'n' does in the English words "can" and "ink".

[13] Reading to Learn is an organisation that promotes a reading teaching method focusing particularly on understanding how parts of sentences and paragraphs relate to each other to create meaning.

a stimulating pace, and took advantage of the benefits of a transparent, consistent orthography.

Factors that may impede reading development

The orthography of isiZulu poses several challenges for readers.

Firstly, its agglutinative structure and conjoined writing system give it unusually long and complex words. The Lix readability formula (Readability Formulas, 2014) illustrates this. Designed to gauge readability across languages, the formula is based on word length and sentence length, and rates easy to read text at a score of 20, average text at 40, and difficult text at 60. Text from newspapers in ten European languages scored between 47 and 65 (Björnsson, 1983), but if the formula is applied to text from the isiZulu newspaper *Isolezwe*, the Lix score is 97[14].

The complex words of isiZulu are composed of word stems and affixes, and readers must register the meaning of the stem and note its modification by each affix. The logic of psycholinguistic grain size theory (Ziegler & Goswami, 2005) suggests that readers of isiZulu are likely to process small grain size units of text as a sure, quick route to reconstructing language because readers must distinguish between morphemes of usually one to three letters. For example, in the word "*asimthandazele*" (let us pray from him/her) readers must recognise the five morphemes (*a/si/m/thandaz/ele*) – a stem preceded by three affixes and succeeded by another. A change of one letter in one affix changes the meaning, (e.g. *animthandazele* = you (plural) should pray for him/her). This small grain parsing could contribute to the high number of fixations, long fixation duration, and frequent regressions noted among proficient readers of isiZulu (Land, 2015).

Secondly, although tone modifies meaning in spoken isiZulu, there are no tone markers in written isiZulu. For example, *-nga-* can have a negating effect in a low tone, but indicate potential in a high tone. So "*Lomntwana angajovwa*" if *nga-* is low toned means "This child

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[14] The comparison is illustrative only of word length, since the validity of the Lix formula for African languages has not been established.

must not be vaccinated", but, if *nga-* is high toned means "This child may be vaccinated". Therefore readers must either hold alternate meanings in mind where there is ambiguity until they can confirm meaning from contextual cues, or reread phrases to decide on their meaning. This could contribute to the high rate of regressions noted among competent readers of isiZulu (Land, 2015).

Finally, especially in comparison with English, the orthography of isiZulu has a low number of permissible letter combinations. Short letter strings such as *zi, ku, ka,* or *nga*, recur frequently, either as distinct morphemes or parts of larger morphemes with different meanings in different contexts. For example in *izinto* (things), *zi* is part of a very common prefix indicating plurality, but in "*izinyo*" it is part of the root word for "tooth". In a comparison of texts of approximately 25 000 characters each from English and isiZulu newspapers (*Isolezwe* and *The Mercury*) 18 three letter strings recurred more than 100 times, and 3 four letter strings recurred more than 100 times in the isiZulu text. In comparison, only 5 three letter strings (*the, ing, and, ent* and *her*) and no four letter strings recurred more than 100 times in the English text. The effect of this is that words are not as visually distinct from one another in isiZulu as they are in English. Since new readers need more time to learn to distinguish between visually similar words than obviously dissimilar ones, (Abadzi, 2011), this feature could have implications for the progress of learner readers, and possibly requires the relatively short saccades and long duration of fixations noted among proficient readers of isiZulu (Land, 2015).

INDICATIONS FROM PRELIMINARY EYE MOVEMENT DATA ABOUT READERS' RESPONSES TO THIS ORTHOGRAPHY

Eye movement records of reading alphabetic text are measures of:

- fixations: points in the visual field focused on, and clearly seen; competent readers demonstrate a pattern of consecutive fixations along each line of text. Fixations are measured in terms of frequency, position and duration;
- saccades: the movement of the point of focus between fixations; in reading, saccades are measured in terms of letters between fixations;
- refixations: repeated fixations on a particular point in the text;

- regressions: registered if a reader looks backward in the text, shifting the point of focus to the left; regressions are measured in terms of frequency and length.

Linguistic and cognitive processes affect eye movements (Reichle et al., 2008; White, 2008), and studies in different languages show that saccade length and the duration of fixations vary across orthographies (Osaka, 1992; Reichle et al., 2003; Liversedge & Findlay, 2000). Since fixations are linked to attention (Paulson, 2005; Miellet et al., 2009) eye movement patterns in reading can yield information about how readers respond to particular features of text, and the strategies they use as they read.

Eye movement data on competent readers of isiZulu is discussed in detail in another paper (Land, 2015). Data suggest that when reading isiZulu text, they:

- skip 1% of words, apparently recognising them in parafoveal vision since they register their meaning; these words tend to be frequently used, short non-agglutinated words (e.g. uma, nje).
- read 25% of words in a single fixation, thus apparently immediately recognising them; these words are mainly short non-agglutinated words or high frequency words with not more than two morphemes (e.g. kodwa, zakhe, umuntu) (Land, 2015).
- require a relatively long period to process the text perceived in each fixation compared with readers of other alphabetic languages for which data is available; the average duration of fixations of readers in this study was .3 seconds.
- appear to process small grain size units of text as they read, since their average saccade length was 4.05 characters.
- make regressions as frequently as readers of other alphabetic languages in terms of time, making 1 regression every 1.89 seconds, and with 16% of fixations being regressions; however, in terms of regressions over spans of text they regress more, at 1 regression every 24 characters;
- isiZulu orthography is relatively time consuming to read in comparison with other alphabetic languages for which data is available; reading rates of participants in this study, all of whom demonstrated high competency, ranged from 621 – 1283 characters per minute (cpm). The average speed of the fastest ten in the sample was 1021cpm.

These figures suggest that adept readers of isiZulu use decoding strategies that differ from those of their counterparts in English, since in efficient reading of English:

- the majority of words are instantly recognised during reading of continuous text, with 25% - 30% skipped (White, 2008; Rayner, 2009) and others recognised in one quick fixation;
- words of up to 9 letters (i.e. the majority of English words (Norvig, 2009) are read in a single fixation, suggesting automatic recognition (New et al., 2006);
- fixations are short, usually .2 - .25 seconds (Reichle et al., 2003 p. 446; Rayner, 2009; Hutzler et al., 2004); this suggests that readers can glean the information they need from the text perceived in each fixation more quickly than is possible in isiZulu;
- saccades tend to be 7 - 9 characters, but can be up to 20 characters (Rayner, 2009; New et al., 2006; Miellet et al., 2009), indicating that competent readers of English process large grain size units of text;
- roughly 10 – 15% of fixations are regressions, made about once in two seconds Reichle et al., 2003, p. 348; Rayner, 2009; Liversedge & Findlay, 2000), and approximately once every 50 characters;
- at 300 wpm, competent English readers are reading about 1380 characters per minute.

These figures suggest that although English and isiZulu both use the alphabet, there are important differences in what readers must do.

The most salient of these differences appears to be that English is most efficiently read by seeking cues for word recognition in considerably larger letter groupings than is optimal for efficient reading of isiZulu. This is in line with the logic of psycholinguistic grain size theory noted above.

A corollary of this might be that while automatic recognition of words occurs in efficient reading of both languages, isiZulu orthography militates against it while English orthography facilitates it.

Do competent readers of isiZulu effectively use particular decoding processes and reading strategies?

This paper seeks to answer this question by relating details in eye movement records mapped onto text to what readers remembered of those particular moments as they read.

Sample

Since there are as yet no standardised measures of reading proficiency for isiZulu (van Rooy & Pretorius, 2013), an invitation to readers who saw themselves as proficient, and were interested in participating in research was circulated in Pietermaritzburg, and sent to people who regularly read isiZulu text in their work, including publishers of isiZulu texts, journalists, and lecturers of isiZulu. Approximately 150 respondents underwent a timed silent reading test (Appendix 1). On the basis of their speed and accuracy, the most efficient 25% of respondents (38 of them) were selected, and their eye movements recorded as they silently read four texts described below.

The recordings of 5 participants were technically flawed, and excluded. The remaining 33 included:

- 15 women and 18 men
- 24 professionals (11 of whom were part time post graduate students), 5 full time university students and 4 high school students.

The group ranged in age from 16 to 61, with 4 under 20, and 4 over 50, and 25 between 20 and 50.

Instruments

Instruments used were texts and the Swedish-built Visagraph eye movement recording system, with Reading Plus software. The Reading Plus organisation in the United States created an isiZulu language package for this piece of research, using the texts selected for it. The package enabled participants' eye movements to be mapped directly onto electronic versions of the texts.

The four 100 word texts (Appendix 2) were extracted from novels written in isiZulu. Since there is no authorised grading system for isiZulu texts (personal email communication 2013/04/12 from Sabelo Zulu, Shuter & Shooter Educational Publishers, SA's largest publishers of isiZulu texts), a focus group was run to select texts for this study. Three lecturers in Education at UKZN, all first language isiZulu speakers, participated, and judged a number of texts. They found the four texts used to be representative of isiZulu literature, with two texts considered easy to read, and two considered difficult to read. Although these lecturers relied on "gut feel", their assessment matched measures of textual complexity. The "easy to read" texts, had 19 sentences (averaging 1.4 clauses per sentence), and 15 sentences (averaging 1.8 clauses per sentence) respectively. The "difficult to read" texts, had 10 sentences (averaging 2.7 clauses per sentence), and 6 sentences (averaging 4.2 clauses per sentence) respectively.

They judged the vocabulary of the easier texts to match isiZulu spoken in urban areas, and noted that the more difficult texts contained terms and idioms from "deep" isiZulu, spoken in rural areas, and used in formal academic isiZulu studies.

Word length is a key factor in readability formulae for text in European languages, (e.g. SMOG index, Flesch–Kincaid formula, Gunning Fog index, LIX), but average word length differed by less than 1 letter across these four texts, at 7.65, 7.47, 8.31, 7.49 letters in Texts 1, 2, 3, and 4 respectively[15].

The texts were adapted in font type, point size, and line spacing to suit the requirements of the Visagraph equipment. This equipment uses infrared differential reflectivity and has a sampling speed of 60 Hz (Compevo, 2013). Recording systems with higher sampling speeds are available, but the Visagraph system was appropriate for this study because it records eye movement during natural silent reading of continuous texts, since:

- a flexible 2.4m cable connects the mask to a computer, allowing readers free head movement and natural reading positions not possible in systems where readers rest their faces in a frame;

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[15] This is comparable to text in the isiZulu newspaper Isolezwe, calculated to be 7.17 in a corpus of 5055 words from articles published in November 2013 from http://www.iol.co.za/isolezwe

- the system works in natural light;
- eye movement detectors are in the mask, allowing texts to be read from paper, and not computer screens.

DATA COLLECTION

Readers' eye movements were recorded as they silently read the four texts referred to above. The Reading Plus package allows the replay of the recorded movement of a reader's point of focus (represented by a moving cursor) mapped onto an electronic copy of the text. Thus eye movements such as fixations, saccades, refixations and regressions can be examined in relation to the points in the text where they occurred.

Immediately after reading each text, with the reading experience fresh in mind, each reader recounted what they remembered of the text in order to check their comprehension, and then participated with the researcher in examining the reading experience through a process of stimulated recall. This involved following the recorded eye movements and linking features within it to what they remembered of particular moments in their reading experience. Information about strategies they used was gleaned from their recollections.

FINDINGS

STRATEGIES COMMONLY USED BY PROFICIENT READERS

Underlying all the readers' descriptions of their strategies was that they found these strategies helpful in their primary aim of discovering what texts were saying.

AUTOMATIC RECOGNITION OF HIGH FREQUENCY WORDS

Predictably, readers are far more conscious of what they do when they do not automatically recognise a word than when they do so. Eye movement data showed that 80% of the swiftest readers recognised approximately 25% of the words instantly, and that there was a significant correlation ($r = .743$ n= 40, p = 0.01) between faster reading rates and longer saccade lengths. This indicates that although it appears that readers of isiZulu rely on small grain size units of text, swifter, more competent readers have a high rate of automatic recognition of

combinations of small units of text. This enables readers to focus their attention on the information in text rather than on the process of reconstructing language from print, thus enabling them to read more effectively than readers with a low automatic recognition rate.

RECONSTRUCTION OF SPEECH SOUNDS AS A SMALL GRAIN SIZE PROCESSING STRATEGY FOR COMPLEX WORDS

An extract from the transcripts of the stimulated recall process illustrates this process:

SL   *And how do you manage ...here [referring to the word kwakungowokuphatha] there are one, two, three, four, five, six morphemes in that word. How do you do it in your head?*

NN   *I think I read it slowly like kwa-ku-ngo-wo-ku-phatha - then I wanted to understand it.*

SL   *You made the reading voice that goes on in your head...*

NN   *Yes I say the word.*

SL   *... and went back to check if you saw it right?*

NN   *Yes.*

SL   *And you listen to it again in your head?*

NN   *Yes. Exactly. That's what I did.*

It is noteworthy that this research participant, a journalist on an isiZulu newspaper and one of the swiftest and most accurate readers in the group, is conscious of using this strategy to read this unusual construction. Her use of it suggests that it is the optimal strategy for decoding the multiple morphemes of complex agglutinated words – and indeed it is difficult to imagine what another strategy could be.

LOOKING FOR MORPHEMES THAT MODIFY MEANING

Closely linked to the decoding strategy described above is attentiveness to features at morpheme level that modify meaning:

SL   *Then you said wazibula ngamawele? [gave birth to twins]*

TM   *Oh yes that ...when I read the word zibula I was a bit hesitant. I was not sure whether she or he killed himself, and then I saw that they mean wazibula ...*

SL   *Oh - so you thought of 'wazibulala' [she killed herself] and –bulala is a more common word.*

In this instance the eye movement record shows that the reader regressed to the word *wazibula* when her initial assumption of what the stem was (the much more commonly

encountered stem -*bulala*) seemed odd to her. As miscues indicate incorrect prediction in reading aloud, regressions can point to incorrect prediction in silent reading.

PAUSING AND TRYING OUT DIFFERENT TONAL OPTIONS

Pauses reflected in eye movement records show exactly where the reader has paused her point of focus in the text, resulting in a particularly long fixation, but cannot indicate reasons for the pause. In the instance below the reader paused to consider alternate tonal options, for which the print carries no cue.

MG   *When I see the unga- and I'm reading it but I'm not hearing – I must think "Am I saying unga- (high tone) or am I saying unga- (low tone)?" so I go back and make sure that it's unga- (low tone)*

The difference in tone that this reader is engaged with here is vital in her construction of the meaning in the text. She is referring to the word *ungakhathazeki* (you should not worry) where the morpheme –*nga*- would be spoken in a low tone. Spoken in a high tone in the same position in an agglutinated word it indicates positive potential. Here the reader clearly used contextual cues to decide which tonal variant of '*nga-*' is intended.

PAUSING TO INTEGRATE ELEMENTS OF DECODED MEANING

Among these readers a common reason for pausing was taking a moment to consciously integrate elements of text they had decoded into a construction of the meaning of the text read so far. One said he "landed in a safe place to think". In another instance:

SL   *But you stopped there for quite a long time on this common word kumnandi (it is pleasant) ...*
NN   *I was thinking about this whole article ... I think I did not understand it very well. While I was reading I was trying to understand the meaning so I found myself stopping somewhere*

This suggests a relatively high degree of ambiguities that readers must resolve in isiZulu orthography, and/or that its features compel readers to engage in a relatively long integrative process as they reconstruct the meaning in the text.

REREADING TO MAKE SENSE OF TEXT

In contrast to pausing, with the point of focus still for a moment, readers often shift their focus to the left in the text and reread some text. In this study, the most commonly expressed reason for rereading was to confirm or disconfirm the accuracy of an initial impression, or to resolve confusion. Instances were:

SL   *… then you went back to indaba yami (my story) and again you went twice to yami. Can you remember why?*

KZ   *I think I was trying to figure out the meaning.*

…

SL   *… then you went back to okuvuthiwe. Do you remember that?*

NN   *I was trying to understand the word.*

SL   *Because it's not normal to talk about umuzi ovuthiwe? (a baked or ripe house)*

NN   *Yes … I was confused, and the word was long.*

VISUALISATION OF IMAGES

Readers' sustained focus on the meaning of text was evident from their descriptions of building mental representations of the meaning in the texts as they read. Without prompting, the strongest readers talked about details of clear visual images that came to mind as they read, for instance:

SL   *And which schools were those?*

ML   *It was a Cola Primary School, Khalipha Primary School, Isipingo Primary School, Umbelebele High School … all my schools … In Durban, all of them are built of red bricks. So if I read something of red bricks, it brings back the long block with a veranda. If you say two verandas, it will be a veranda this side and other side - that how I got this idea.*

…

ML   *Yes. The picture that was in my mind is this rural place, it is some rondavels painted white at the top and the bottom mud with top soil or black mud - udaka. And there are cattle, perhaps a few goats and few chickens all in a small place because I think this place belongs to a farmer. And usually farmers allocate some place to their workers … where they can live and plant a few vegetables and then they can keep some animals. So that was going on in my mind as I was reading this.*

SL   *So you were constructing the picture as you read?*

ML   *Yes*

The source of information used by readers in the process of constructing meaning is obviously their own experience, or what they have learned from others, or from reading or media. Where the information gained from text is consistent with background knowledge, readers can progress steadily through text, but where it is not, readers tend to pause, and/or reread the text. This was evident in this study at points where eye movement records showed readers stopping momentarily, or rereading words or pieces of text, sometimes even three times. Excerpts from transcripts reveal their thinking as they did this:

TM   *I was not sure about the sentence because, really I never heard anything about the impi (war) between amaNgisi namaBhunu (the English and the Afrikaners). I only know the war between Blacks and Boers so I said to myself Mmh? Okay then, to me it is a something new.*

...

TM   *... Then I went back again on Duda because I was not sure umfowabo (their brother) uDuda or uDudu so, I was asking myself if this is a male how do they call him uDudu because that is a female name.*

SL   *Oh you thought of Dudu because it is a common name?*

TM   *Yes, but I never heard the name of Duda.*

SL   *So you were making sure?*

TM   *Yes.*

SL   *But it is very clear that is a male?*

TM   *Yes because immediately they said umfowabo*

...

SL   *So all that previous knowledge of red bricks about the school, it brings it right back so that it actually shapes your understanding of the text. Isn't that an amazing example?*

ML   *Yes it is, and it makes me keep jumping like this, forward and you want to back a little bit just to confirm - what you are thinking is true or not.*

IMPLICATIONS FOR EDUCATORS

Some of the strategies described by these readers are known to be effective in reading across languages; in fact they exemplify some of the reading activities recommended by the Department of Education in its National Curriculum Statement: Curriculum and Assessment Policy Statement (Department of Education, 2011). These include:

- pausing to check comprehension,
- comparing content to expectations,
- visualising what is being read,
- relating what is read to background knowledge, and
- reflecting on what is read.

Decoding processes used by the readers in this study that might apply particularly to orthographies such as that of isiZulu are:

- consciously reconstructing speech sounds as a small grain size processing strategy for complex words, in a process that could be seen as a high speed internal version of "sounding out",
- being alert to morphemes that modify meaning in agglutinated words, and
- using contextual cues to select the most appropriate among different tonal options of words read.

Analysis of the orthography of isiZulu leads to further considerations that might be helpful to educators.

One is that while the common use of the alphabet by isiZulu and English allows for transfer of learning in reading these languages, there are complications in this common usage. Because of the opacity of English orthography, and the transparency of isiZulu orthography, many letters perform differently in these languages. It would save new readers of English and isiZulu a great deal of bewilderment if teachers were trained to make the differences between use of letters in English and isiZulu explicitly clear. This is mentioned in a handbook for teachers (Department of Education, 2008), but usually it is simply assumed that the differences will be automatically understood by new readers.

Another basic consideration relates to automatic word recognition. Eye movement records in this study show that 25% of words in the texts used in this study were instantly recognised by 80% of readers, and that there is a strong correlation ($r = .743$, , n= 40, p = 0.01) between saccade length and reading rate. This implies that the rate of automatic recognition rises with reading proficiency. Sustained practice in recognising high frequency non-agglutinated short words, and high frequency word forms with only two or three morphemes would help learners to gain automatic recognition of high frequency words. Practice could be through the use of flash cards, or scanning newspaper text for target words such as "*uma*" (if/when) or common morpheme combinations such as "*abaka-*" (they have not yet). Linked to this could be exercises in spotting shifts in meaning encoded in shifts in morphemes, perhaps by pairing constructions with subtle differences and encouraging learners to spot one with a particular meaning as quickly as possible. An example of this might be:

owayekuthanda vs *owayengathanda*   (who used to like you/it) vs (who did not like to…)

ungakhathazeki vs ungakhathazi   (don't worry) vs (don't cause trouble)

Another useful strategy for readers of isiZulu to learn would be to cope with homographs and lack of tonal markers by looking for contextual cues.

For example

Lezi zincwadi zingatshelekwa emtapweni wolwazi. (Depending on the tonal pattern: These books can be borrowed from the library OR: These books must not be borrowed from the library).

This necessitates attending to the meaning in surrounding text, and looking for contextual cues, which few teachers appear to be trained to enable their learners to do; observations in local schools and adult classes indicate that while teachers do attempt to ensure that their readers understand the meanings of individual words, they tend not to direct the attention of their learners to the meaning of whole paragraphs, or the overall meaning of a text (Mather, 2013; Sivnarain, 2014). They are by no means alone in the assumption that once readers decode words, their understanding of text will automatically follow; a draft reading development course developed by an internationally recognised reading researcher stops at word recognition (Abadzi, 2014).

Where teachers do attend to the overall meaning, they can take advantage of children's proficiency in their mother tongue, and their familiarity with language features such as concords in identifying referents and inferring information in text.

Finally, it might be logical to suggest that synthetic methods of teaching reading such as the syllabic method, which works well with isiZulu, possibly encourage readers to process small grain size units of text and that processing small grain size units of text may be inevitably slower than processing larger grain size units of text. An implication of this may possibly be that reading in orthographies that lead readers to rely on large grain size processing, such as English and French, is potentially faster than reading in orthographies where large grain size processing is not necessary. Further research will be required to investigate this possibility. It must be stressed however, that whether some orthographies enable swifter reading or not, the advantages of acquiring reading skills in the mother tongue will remain, and should always be given precedence.

CONCLUSION

Data from this study indicates that competent readers of isiZulu do consciously and effectively use particular decoding strategies. These strategies could be incorporated into reading programmes and brought to the awareness of reading teachers.

However, an unintended consequence of describing useful reading strategies such as those defined above is that diligent educators may forget or not understand that their use is not as ends in themselves, but in reaching the central objective of reading, which is to access the meaning of texts. All the readers who contributed to the compilation of the strategies listed above were very clear that they used these strategies not as ends in themselves but because they had found that their use increased their ability to effectively access the meaning of texts.

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APPENDICES:

Appendix 1: Invitation to participate in the study, including a self test of reading rate

UYAMENYWA UKUBA UZIMBANDAKANYE NOMSEBENZI WOCWANINGO LOKUFUNDA ISIZULU.

Ungakwazi ukufunda lokhu ebhokisini ngaphansi komzuzu owodwa? Zikalele ngewashi:

Sidinga ukusebenza ngokushesha ukuthuthukisa izilimi zase Africa enyuvesi yethu. Ukuthuthukiswa kwezilimi zase Africa njengezilimi esiphathelene nemfundo ephakeme kubalulekile. Sonke sidinga ukuzinikela kuzona. Akusiyena uhulumeni kuphela okungafanele abone ukuthi lezilimi zase Africa zisetshenziswa endaweni efanele emphakathini wethu. Ngokweqiniso lokhu kungumsebenzi wethu sonke. Ezikhungweni eziphezulu zemfundo, abathuthukisi bezilimi, kanye nomphakathi wonkana kufanele baqiniseke ukuthi izilimi zase Africa ziqinisekiswe.

Izilimi zase Africa zibalulekile kulelizwe. Zisivezele ukuthi singobani, futhi sifuna ukuba ngobani, kanye nendlela esifisa ukwakha ngayo i South Africa.

Ukuthuthukiswa kwezilimi zase Africa kwimfundo, nakwezemfundo ephakeme, kusemthethweni sisekelo. Uthi umthethosisekelo, bhekisisani ukushabalala kwesisindo sezilimi zabantu bakithi kuleli, uhulumeni kumele athathe izinyathelo ezinqala zokuphakamisa isisindo nenqubo yokusetshenziswa kwezilimi zethu. Masingavumeli ukuthi izilimi zakulelizwe zishabalale. Kodwa masiziqinisekise.

Uma kuwuthi thina esiluncele ebeleni lolulimi asiluthuthukisi, ubani ozoluthuthukisa?

Uma ungafunda kulelibhokisi isikhathi esingaphansi komzuzu owodwa , kungenzeka uthande ukuba ingxenye yocwaningo lomsebenzi wokufunda imibhalo yesiZulu. Indlela okubhalwa ngayo isiZulu kuhluke kakhulu endleleni okubhalwa ngayo isiNgisi. Kanye namakhono okufundwa kwesiZulu awakaqondisiseki namanje.

Ngidinga abantu abakwazi ukufunda isiZulu ngokushesha futhi okulula kubona ukufunda, abangaba nothando lokuvolontiya. Ngidinga ukuqopha indlela amehlo abo anyakaza ngayo uma befunda. Inhloso yami eyokuhlola amakhono okufunda incwadi yesiZulu.

Uma uzinikezela kulomsebenzi ungsiza entuthukisweni yolimi lwesiZulu njengolimi olufundwayo. Bonke abazozinikela kulolucwaningo bayothola ulwazi mayelana namakhono okufunda kwabo.

Ayikho imali ezotholakala ngokwenza lomsebenzi.

Sandra Land   Centre for Adult Education   University of KwaZulu-Natal

Text 1 Memela, N. (1992). *Sengikhulile*. Durban: New Readers Publishers.

UNomadashimane igama lami. Sengikhulile! Awu! Akukho okudlula lokhu. Ikhulu leminyaka akusiyo into encane. Phela ngazalwa ngempi yamaNgisi namaBhunu. Abanye babewabiza ngokuthi amaDashimane amaBhunu. Igama elithi Nomadashi lasukela lapho. Ubaba wayesebenza epulazini endaweni yase-Bulwer. Kwathi ngokusuka kwempi wathi umlungu kubaba, "Ngiya empini. Hleze ngingabuyi, ngifele khona. Uma ngingabuyanga, ungakhathazeki. Ngiwenzile onke amalungiselelo okuthi umesisi anibheke nezingane zakho." Umama ngalesosikhathi wayekhulelwe. Wazibula ngamawele, umfana nentombazana. Bathi kuzelwe amakhosi. Bangiqamba igama elithi nginguNomkhosi. Kepha ngenxa yokuthi ngazalwa ngempi kwaduma elokuthi nginguNomadashi. Ngakhula-ke sihlezi epulazini. Sasilima, sisenga izinkomo, kudliwa amasi. Kwakujwayelekile ukuthi ingane ekhulele epulazini iwuqale isencane umsebenzi. Ngaqala ukusebenza ngingakalihlanganisi ishumi leminyaka. Umsebenzi wami kwakungowokuphatha izingane zomlungu. Ngaze ngakhula impela ngisebenza kuye lomlungu.

Text 2 Nyembezi, S. (1953). *Ubudoda abukhulelwa.* Pietermaritzburg. : Shuter & Shooter Pty Ltd. p. 15.

Lapha kwaMsezane kwakwakhiwe ngempela. Kwakungumuzi ovuthiwe. Indlu yayakhiwe ngesitini esibomvu, esishisiwe. Yayinovulande ezinhlangothini ezimbili. Indlu yayinamakamelo ayisishiyagalolunye. Kwakukhona indlu yokuphola, neyokudlela, nalapho ayesebenzela khona uMsezane nalapho ayegcina khona izincwadi zakhe. Phela kwakungumfo owayekuthanda ukufunda. Kunamakamelo amathathu okulala. Bese-ke kuba yikhishi nendlu lapho kubekwa khona ukudla. Uma ungena endlini yokuhlala, wawukhangwa upiyane olukhulu, luzisho nje ukuthi olwemali. Kwakukhona futhi endlini izihlalo ezithofozelayo, ayethi umuntu uma ehlala kuzo ashone phansi avele ngezindlebe. Phakathi nendawo kukhona itafulana elincane kubekwe phezu kwalo isitsha esinezimbali. Phansi lapha amapulangwe ayembozwe ngocansi lwabeLungu. Kwakuyiloluhlobo othi uma uhamba phezu kwalo nezigi zife, umuntu athashazise okukamangobe. Ezindongeni kwakulenga izithombe ezimbalwa. Zonke izinto ezazikulomuzi zazikhuluma ngokusobala zithi kukwamnumzane lapha.

Text 3   Mkhize, M. T. (1983). *Amahlaya alala insila.* Pretoria: De Jager-HAUM Publishers. p. 1

Umuzi wakubo kaChithimpi Zondi umfo kaNkalimba wawunezindlu ezimangaqhugwana amathathu wakhiwe ngaphansi kwegquma. Iminyango yezindlu yayibheke ngaseNyakatho ukugwema iziphepho ezazivamise ukuqhamuka ngaseNingizimu. NgaseMpumalanga yomuzi kwakunomhoshana okwakwehla kuwo umchachazwana wamanzi owawuze uyongenela emfuleni uMzimayi. Ntambama kwakuye kuheleze umoya obandayo owawuye ungene ngezi-khadlana zezicabha kwaZondi. Lamahelehelana ayeqala ngokuphola kamnandi kodwa agcine esebanda ngoku-mangalisayo lapho sekuphakathi kwamabili ebusuku ikakhulukazi uma kusebusika. Ngalelilanga kunguMgqibelo ntambama iwona lamahelehelana ayesiza ekupholiseni kwaZondi. Phela lapha emzini kaNkalimba ngalelilanga kwakusindwe ngobethole kutatazela omakoti kunjeyaya. Okungamakhehla nezalukazi kwakulokhu kubonakala kuphuma kuthi tshobe ngemva kwezindlu kuchitha lawomanzi ayengasadingeki emizimbeni yawo. Kulobuhholohholo bomsindo wabonakala uDuda umfowabo omncane kaNkalimba engena endlini nezimbuzi ezimbili ayezibambe ngezimpondo eyokuma ngasemsamo. Esemsamo uDuda wabatshela abasendlini ukuthi lezimbuzi kwabe kungezani.

Text 4   Zama, J. M. (1967). *Ingwe idla ngamabala.* Pietermaritzburg: Shuter and Shooter.   p. 1

Kwakungenye intambama lapho selibantubahle; kusentwasahlobo iminduze seyiqalile ukuqhakasa, mhla ngiqalayo ukuyizwa inguquko empilweni yami ngoba ngakhanyelwa kusukela ngaleyo ntambama ukuthi akukho lutho oluzenzekelayo nje ngokwalo. Yonke into emhlabeni inembangela nenhloso ethile kulowo nalowo muntu.

        Leyontambama engiyisusela kuyo lendaba yami ngayiphawula ngoba ubaba, uNqakamatshe, wafikisana kanye nathi esangweni lomuzi wakwethu, kwazise ukuthi sasingaveli ndawonye nobaba. Ubaba wayebuya embizweni eyayibizwe nguGazi iNkosi yethu thina baThembu. Thina sobathathu madodana akhe sasiqhamuka kokumba iziphunzi esikhaleni esasisivule ezinsukwini ezingaphambiyana ngokugawula izihlahla ekupheleni kwehlathi elaligudla insimu kamame omkhulu, uMaButhelezi. Umame omkhulu wayebike kubaba ukuthi isife ayesilima minyaka yonke sase sinciphile ububanzi baso ngenxa yokucinaniswa yimixhantela yezihlahlana ezazimila ezimpandeni zemithi eyayisephethelweni laleلohlathi. Thina sasivela kulowo msebenzi

1. Readers' experience of reading Zulu text, and their perceptions of how they recognise words or components of words and other parts of text.

2. Readers' perceptions of any aspect of their own reading performance on English or Zulu text that might be relevant to the study.

3. Readers' beliefs about isiZulu as a language of academic reading and learning.

4. Readers' beliefs about the way the use of isiZulu will change in this century (in view of the prediction that Africa will lose all but 200 of the 2193 languages currently spoken on the continent (Batibo, 2005)

(Numbers 3 and 4 are not directly relevant to the information sought in relation to the analysis of reading skills that is the subject of this study, but will provide useful contextual information, particularly in view of the possible effect of readers' understanding of and attitudes towards their own reading behaviour.)

CHAPTER 7

OVERALL SUMMARY OF FINDINGS AND CONCLUSIONS

This study set out to explore issues relating to skilled reading in isiZulu. The main data gathering exercise addressed the question of whether proficient readers of isiZulu develop and use reading strategies and processes that differ from those developed by proficient readers of English.

Particular research questions subsumed in this overarching goal were:

- In what context do readers of isiZulu develop and practice their reading skills?

- What can eye movement records tell us about reading in an agglutinative, orthographically consistent African language?

- How do reading patterns shown by competent readers of isiZulu compare with reading patterns shown by readers of other languages?

- How does automaticity function in competent reading of isiZulu as an orthographically transparent agglutinative language?

- Are there particular textual features of the orthography of isiZulu that facilitate the development and application of reading skills, or that make particular demands on readers?

- How do readers of isiZulu text cope with the absence of signals of tonality in its orthography, and how do they resolve uncertainty?

- Are there specific strategies that teachers could use to develop effective reading skills among adults or children learning to read in isiZulu?

IN WHAT CONTEXT DO READERS OF ISIZULU DEVELOP AND PRACTICE THEIR READING SKILLS?

This first question was addressed in a paper entitled *English language as siren song: Hope and hazard in post apartheid South Africa,* published by Multilingual Matters as chapter 11 (pp. 191 – 207) in the edited book: *English as Hydra: Its Impacts on Non-English Language Cultures*, and included here as Chapter 2 above.

Particularly pertinent to the context in which learners develop reading and language skills in isiZulu is the unequal status of English and isiZulu in the province of KwaZulu-Natal, and the implications of the power dynamics inherent in this imbalance.

In spite of extensive language policy development designed to promote the use of indigenous languages, many first language speakers of isiZulu (and other indigenous South African languages) use their own languages in domestic and community contexts, but do not regard indigenous languages as appropriate for contexts of learning and power. The surrender of speakers of indigenous languages to the hegemony of English has had the effect of retarding the development of isiZulu as a language of learning and reading.

Parents who were restricted to the infamous Bantu Education provided by the apartheid government are willing to devote substantial resources to sending their children to schools that were, until the end of apartheid, reserved for other population groups. At these schools, the standard of education tends to be reasonably high, but the medium of instruction is English (or, at a few schools Afrikaans or German), and isiZulu may not even be offered as an optional subject; however, parents who send their children to these schools tend to accept as inevitable their children's consequent inability to read in isiZulu.

At schools that were reserved under the apartheid government for Black African children in KwaZulu-Natal, the medium of instruction is officially English, but there is frequent code switching in class, and isiZulu is taught as a subject. There has been substantial investment in education since the end of apartheid, yet improvement in the quality of educational has not been even, and at these schools literacy scores in the recently adminstered Annual National Assessment tests tend to be abysmally low (Department of Basic Education, 2013). Since the majority of teachers and officials running these schools are themselves products of Bantu Education, the injustices of apartheid seem to be sealed into the schooling system: teachers in

the lower grades continue to be burdened with enormous classes, many schools suffer from poor organisation, inadequately trained and demotivated teachers, and a careless work ethic. Distressingly, even teachers who earnestly believe they are teaching well often fall far short of teaching core skills such as reading well. Thus poor literacy scores should come as no surprise.

In the sphere of publishing, the lack of available reading matter in indigenous languages is commonly lamented. On the other hand, publishers complain about the poor response of the buying public to the few books that are published in indigenous languages, where sales seldom cover the costs of publishing. However, the last few years have seen a particularly good response to a recently introduced isiZulu newspaper, *Isolezwe*: while readership of most newspapers in all languages has fallen, this paper has increased its readership dramatically, both online and of hard copies of the paper. This might signal the spark of a new generation of readers of isiZulu who will support publications. Thus the future of reading in isiZulu hangs in the balance. With a well supported publishing industry, and better understanding and practice of teaching reading in isiZulu, the language could survive and develop alongside English. If these factors do not materialise it is likely that isiZulu will shrivel and possibly even disappear within two or three generations.

WHAT CAN EYE MOVEMENT RECORDS TELL US ABOUT READING IN AN AGGLUTINATIVE, ORTHOGRAPHICALLY CONSISTENT AFRICAN LANGUAGE?

Difficulties in addressing the second of the questions listed above are discussed in Chapter 3 of this thesis, in a paper entitled *Open to the flaw: comparing reading skills demanded by English and Zulu*. It was published in 2011 in *Language Matters, 42*(1), pages 50 - 68.

Eye movement data relates to positions of focus or fixations on texts, duration of fixations, refixations and regressions, saccades, and span of recognition. This information can be used to measure a reader's reading rate, and gain insight into factors such as automatic recognition of words, ease or difficulty of word decoding, and resolving of ambiguities.

There are similarities in the reading behaviour of competent readers across languages that use the Roman alphabet, but uncertainty remains in relation to how the varied processes that readers automatically combine when reading differ with different orthographies.

In this regard, Ziegler and Goswami's psycholinguistic grain size theory (2005) appears to be particularly relevant to reading in isiZulu. This theory extends Frost's orthographic depth hypothesis (2007), which suggests that the optimal strategy for reading languages with orthographies where pronunciation of words is predictable from their spelling is for readers to reconstruct speech sounds directly from orthographic cues. Ziegler and Goswami suggest that readers who read in this way are likely to take into account and process small grain size units of text which may possibly be as short as single syllables. This contrasts with processing large grain size units of text which is the basis of whole word recognition, and apparently the most effective strategy for reading languages with an inconsistent orthography. The logic of psycholinguistic grain size theory suggests that as an agglutinative language represented by a transparent and regular orthography, isiZulu requires a different combination of sub-skills of readers than English text, as an orthographically opaque representation of a non-agglutinative language.

The paper referred to above reports on a pilot study that aimed to compare eye movement patterns of readers of isiZulu with benchmark eye movement patterns established for English readers, and to explore any differences that emerged in the comparison. Findings from this pilot study were inconclusive. The paper describes problems in a research design that had initially seemed workable, but eventually proved to be unfeasible because of the difficulties encountered. Since these are the kind of difficulties that could compromise or limit the validity of other cross lingual studies of reading, they are worth noting.

These problems included

- complexities involved in comparing the relative degree of reading difficulty of texts in profoundly different languages, difficulties in translating cultural content of each text, and of finding a culture free text;
- the effect of observation on the reading behaviour of research participants in studies of reading, and the impossibility of discovering how closely recorded scores reflect unobserved reading under natural conditions;

- the limitations in comparing an individual's reading in different languages to draw conclusions about the demands of contrasting languages or orthographies, since one cannot control for differing levels of linguistic competence between first and additional languages, or for carry-over effects of reading habits learned in response to one orthography;
- the fact that established measures of reading competence tend to relate to English and therefore to reading behaviour that one would expect of competent readers processing large grain size chunks of text;
- the inapplicability of readability indexes developed for English to other languages, and the need for measurements that accommodate cross-lingual comparisons.

These problems have implications mainly for studies that aim to make direct comparisons of reading across languages. If these problems can be avoided, a study of eye movements can afford researchers a window onto the micro processes that readers combine as they progress through text. This is especially crucial since eye movements are the only behaviour that can be observed during silent reading of continuous text. Because of this, and because of the strong link between attention and fixations, a study of eye movement records is a key route to gaining insight into the sub-skills that are combined in silent reading. However, a limitation is that observed patterns do not reveal cognitive activity, and similar observed eye movement pattern might represent more than one cognitive process. For instance a pause or regression may be linked to resolution of tonal ambiguity, or be associated with decoding an unfamiliar word, or be linked to a reader's integration of elements of meaning derived from decoding activity immediately preceding the pause. Thus inference and extrapolation are inevitably involved in attempting to discover the causes and cognitive outcomes of particular elements in eye movement patterns.

How do reading patterns shown by competent readers of isiZulu compare with reading patterns shown by readers of other languages?

The data collection exercise that followed the pilot study referred to above, and is reported on in this thesis was designed specifically to avoid the problems identified above, and was facilitated by the completion of the development of software that allowed mapping of readers' fixations onto the isiZulu text they were reading. Thus the consequent eye movement records reflected a more accurate record of eye movement that had been possible in the pilot study. Quantitative data collected provides the basis for the paper presented as Chapter 4 of this thesis, entitled *Reading and the orthography of isiZulu*. This paper looks at the question of how reading patterns shown by competent readers of isiZulu compare with reading patterns shown by readers of other languages. It was accepted for publication in the South African Journal of African Languages, and will be published in this journal in 2015. The paper analyses the quantitative data on eye movements collected in this study, and presents a tentative profile of competent readers of isiZulu, which could be used at least as an opening basis for comparison with benchmarks provided by research on reading in other languages.

Data collected show that readers who participated in this study exhibited a significant inverse relationship between reading speed and frequency of fixations ($r = -712$, $p < .01$). This pattern is similar to that noted amongst readers of other alphabetic languages, and indicates that the swifter readers made fewer fixations than the slower readers. This suggests that more adept readers have a higher rate of instant or automatic recognition of more words or text units than the slower readers do. The more frequent fixations of slower readers point to less automatic recognition and consequently more cognitive effort on their part in decoding words.

The tentatively suggested profile of eye movement patterns that currently characterise proficient readers of isiZulu is:

- A reading rate of 815 – 1283 characters per minute (cpm); this suggests that isiZulu is read relatively slowly in comparison with other alphabetic languages;
- An average of 3.63 fixations per second, with fixations lasting on average for.3 seconds. This suggests that compared with readers of other alphabetic languages for

which data is available, readers of isiZulu require a longer period to process text perceived in each fixation;

- An average saccade length of 4.05 characters, which indicates that readers' span of recognition is relatively narrow, and that readers appear to be relying on small grain size units of text to reconstruct language as they read;

- A regression rate similar to that of readers of other languages as a percentage of fixations (16%), and in terms of time (1 regression every 1.89 seconds), but at 1 regression for every 24 characters, relatively high in terms of regressions over spans of text. This indicates that readers find a second glance at many parts of the text necessary.

HOW DOES AUTOMATICITY FUNCTION IN COMPETENT READING OF ISIZULU AS AN ORTHOGRAPHICALLY TRANSPARENT AGGLUTINATIVE LANGUAGE?

This question was addressed in a paper entitled *Tracking down automaticity in eye movement records of reading in isiZulu*. Although it was submitted to the *South African Journal of Applied Language Studies*, in November 2013, the only communication received from the editor since then is an assurance that the review process is underway. It is presented as Chapter 5 of this thesis.

Without automaticity (the immediate recognition of words or other units of text), swift and efficient reading is impossible.

IsiZulu, with its five vowel sounds, regular Consonant-Vowel syllable structure, and agglutinative word structure, would probably have been more economically and elegantly represented by a syllabary than by the Roman alphabet. As it is, with its comparatively long, complex words, as well as its frequently recurring syllables, the orthography of isiZulu appears to be less conducive to the development and exercise of skills associated with automaticity than orthographies of languages with short words and high visual heterogeneity among word forms, such as English. This is because discrimination between visual stimuli is easier and more immediate if the stimuli are short and obviously different.

Data analysed in regard to automaticity was drawn from the 10 swiftest recordings of each text (i.e. 40 recordings), to ensure that the analysis was based on records reflecting a high degree of automaticity.

Analysis showed that unsurprisingly, reading speeds were highest on texts in which sentences were short, and the vocabulary familiar. Reading rate dropped on texts featuring longer sentences and less familiar vocabulary. On these texts, the rate of fixations and regressions increased significantly. Saccades tended to be longer on texts with short sentences and familiar vocabulary, indicating a higher rate of automatic recognition in these texts.

Also, although in these recordings less than 1% of words were skipped, which suggests that readers predicted very few words on the basis of their parafoveal view, approximately 25% of words were recognised instantly, since they were read in a single fixation. These easily recognisable words were short non-agglutinated words or high frequency words with not more than two morphemes. Some words were recognised instantly at some points in the text, but not where they recurred at other points in the text. In this regard, position within a line of text was found to be significant, but surprisingly, since reading speeds were lower on texts with longer sentences, position within a sentence was not significant. Words that were shorter than the average word length in a text were more often read in a single fixation, indicating that, as in other languages, short words are more likely to be automatically recognised.

The data also showed that swift readers refixated on or regressed to 23.5% of words in these texts. Predictably, these words tended to be longer, on average comprising more than 11 letters, and were more complex than the average words in the texts; most contained three or more morphemes.

Thus the findings indicate that differences between eye movement patterns and reading strategies associated with well developed reading skills in isiZulu and those of efficient reading in English are even greater than comparable differences between eye movement patterns and strategies of readers of English and other European languages, as revealed in studies by Ellis et al., (2004), Georgiou et al., (2008), Ziegler & Goswami, (2005), and Manolitsis et al., (2009).

ARE THERE PARTICULAR TEXTUAL FEATURES OF THE ORTHOGRAPHY OF ISIZULU THAT FACILITATE THE DEVELOPMENT AND APPLICATION OF READING SKILLS, OR THAT MAKE PARTICULAR DEMANDS ON READERS?

This question was referred to across the papers that make up this collection, but more specifically in those presented as Chapters 4, 5 and 6. The paper presented as chapter 6 is entitled *Skilled reading in isiZulu: what can we learn from it?* It has been accepted for publication in the Journal of Education in 2015.

The transparency and consistency of the orthography of isiZulu is likely to facilitate the acquisition and exercise of reading skills, since learner readers can depend on the invariable association of letters with particular speech sounds.

However, there are several features of the orthography of isiZulu which may hinder the development of reading skills among learners, as well as the reading speed of skilled readers.

The first of these are isiZulu's characteristically long and complex words, which are a consequence of its agglutinative structure and conjoined writing system. Readers must recognise the boundaries between the stems and affixes that make up each word, registering the meaning of the stem and noting its modification by each affix. Since it is not unusual for words to comprise six components, this demand requires particular decoding skills.

Secondly, there are no tone markers in written isiZulu although tone is a significant modifier of meaning in spoken isiZulu. In cases of ambiguity, readers must rely on contextual clues to determine meaning.

A third feature is the restricted range of permissible letter combinations in isiZulu. Some letter strings such as *zi, ku, ka,* or *nga*, recur frequently in the orthography, and can be distinct morphemes in their own right or they can be parts of larger morphemes. As a consequence, words that bear no relation to one another can be visually similar, and distinguishing among them may require close attention, and be time consuming for readers.

HOW DO READERS OF ISIZULU TEXT COPE WITH THE ABSENCE OF SIGNALS OF TONALITY IN ITS ORTHOGRAPHY, AND HOW DO THEY RESOLVE UNCERTAINTY?

Data discussed in the papers presented as Chapters 4, 5 and 6 show that the average duration of fixations of readers in this study was .3 seconds, which suggests that readers of isiZulu have a longer average duration of fixation than readers of European languages for which comparable data is available. This suggests that taking slightly more time than readers of other languages do to process the text perceived in each fixation may be a decoding process that enables readers to deal with ambiguity as they construct their conceptualisation of the meaning in the text.

Another component of the profile of eye movement patterns that might be a strategy for resolving uncertainties relates to regressions. Although the pattern of regressions recorded in this study was similar to that of readers of English (which most of the available data relate to) in terms of regressions over time and as a proportion of fixations, in terms of frequency over spans of text, the average in data collected for this study was 1 regression per 24 characters. This is almost double the rate of regressions noted in eye movement studies of English readers, and it is possible that it indicates that readers of isiZulu must frequently reread words or short parts of text in order to accurately reconstruct the language represented in the text.

Both of the above observed features might reflect the process of using contextual cues to compensate for the lack of tonal markers, or they might show a reader's checking on having registered all the morphemes, and having taken into account all the implications they have for the meaning of a section of text.

ARE THERE SPECIFIC STRATEGIES FOR TEACHING READING THAT TEACHERS COULD USE TO DEVELOP EFFECTIVE READING SKILLS AMONG ADULTS OR CHILDREN LEARNING TO READ IN ISIZULU?

This question was referred to and addressed mainly in the paper presented as Chapter 6, entitled *Skilled reading in isiZulu: what can we learn from it?*

Children and adults who learn to read in isiZulu and English must cope with two extreme orthographies. As has been shown above:

- isiZulu orthography is transparent and consistent, so that words can be pronounced exactly according to their printed form. In blunt contrast, English has the deepest and least consistent orthography of all European languages. A large proportion of its words cannot be pronounced according to their printed forms, and remembering them as wholes is possibly the best strategy for its readers;

- the agglutinative structure and conjoined writing system of isiZulu give it extremely long, complex words which shift in form with changing semantics. English is a disjunctive language with short words which feature relatively few changes of form since semantic changes are represented in separate words;

- isiZulu text features an extremely high recurrence of particular strings of three and four letters, which appear to make visual distinction between words relatively difficult and time consuming. In contrast, English has a low recurrence of letter strings, which has the effect of making words visually dissimilar and relatively easy to distinguish between;

- Neither English nore isiZulu uses tonal markers. The lack of these results in ambiguity in Zulu text, but not in English text.

Given these differences, beginning readers developing reading skills in both languages must feel stuck between a solid orthographical rock and an equally hard place.

Yet findings from this study suggest that there are processes and strategies that skilled readers use to facilitate reading in isiZulu. Some of these are common to competent reading in all languages using the Roman alphabet, and some might be peculiar to the orthography of isiZulu.

Strategies described by readers who participated in this study that may be applicable to effective reading across alphabetic languages include:

- pausing to check comprehension,

- comparing content to expectations,

- visualising what is being read,

- relating what is read to background knowledge, and

- reflecting on what is read.

On the other hand, decoding processes and strategies that might be particularly applicable to the orthography of languages that share characteristics with isiZulu might be:

- consciously reconstructing speech sounds as a small grain size processing strategy for complex words, in a process that could be seen as a high speed internal version of "sounding out",

- being alert to morphemes that modify meaning in agglutinated words, and

- using contextual cues to select the most appropriate among different tonal options of words read.

Taking into account the features of the orthography of isiZulu described in answer to the preceding research questions, there are several considerations that might be helpful to teachers working to develop their learners' reading skills.

One is simply ensuring that readers who are developing reading skills in both English and isiZulu have a full understanding of the differences in the ways that letters of the alphabet are used in the two languages. For example, it would benefit learner readers to know that 'a' represents just one speech sound in in isiZulu, but can stand for several different vowel sounds in English, that 'p' signifies both an aspirated or unaspirated consonant in English (a feature generally below the awareness level of first language English speakers[16]), but must be followed by an 'h' to represent the aspirated consonant in isiZulu, that 'th' represents completely different sounds in English and isiZulu, and that 'c' can be involved in at least

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[16] But one that can be tested simply by putting the fingertips in front of the mouth while saying the words "poor" and "spoor", and noting the difference in breath expulsion in these words.

four different speech sounds in English, none of which is remotely similar to the click consonant it represents in isiZulu.

Another consideration relates particularly to reading in isiZulu, and to automatic word recognition. 25% of words in the texts used in this study were instantly recognised by 80% of the most adept readers, and this exemplifies the strong correlation between automaticity and reading proficiency. This means that learner readers would benefit from exercises designed to develop their ability to recognise high frequency non-agglutinated short words and high frequency word forms with only two or three morphemes in the instant that they are seen.

Equally useful would be exercises that stimulated and strengthened learner readers' development of skills in heightening their awareness of shifts in arrangements of morphemes, and the concomitant shifts in meaning.

Coaching readers to look for contextual cues would undoubtedly be another strategy for the development of reading skills in isiZulu. This would aid readers in coping with homographs such as the word *"inyanga"* (which can represent the moon, a month, or a herbalist), as well as with the lack of tonal markers which modify meaning in speech.

The information gained in data collected for this piece of research indicates that proficient readers of isiZulu do develop and use reading processes and strategies that differ from those developed by proficient readers of languages that differ in structure and orthography from isiZulu, such as English. The eye movement recorded in this study suggests that eye movement patterns of competent readers of isiZulu differ markedly from the patterns exhibited by proficient readers of English; in addition, data on the cognitive activities of readers as they read, collected during a process of stimulated recall, suggests that some of the strategies used by competent readers are shaped by the orthography of isiZulu and exemplify effective responses on the part of readers to that orthography.

LIMITATIONS

The sample of readers whose eye movements were recorded in this study comprised 33 of the most adept readers among 150 volunteers who regarded themselves as proficient readers of isiZulu, and therefore was of a sufficient size to reach statistical significance. Data from the recordings can therefore be reasonably regarded as valid for the reading patterns of skilled

readers of isiZulu. However, future studies based on larger samples may be more dependable, and it is possible that as reading practices change, possibly incorporating more sustained practice for example, the profile of eye movement patterns will change with them.

Another limitation in the study was that the only texts used were exerpts from novels. However, as explained in Chapter 1, it was impossible to find newspaper texts without a high proportion of English names and phrases in them, and this would have compromised the reading exercise. At the time of searching for usable texts, I found no non-fiction texts in isiZulu in the UKZN library, but a sufficient number of novels to yield a range of usable texts from which I could make a selection. Since the librarians moved to extend their collection of books in isiZulu when I pointed out how small the collection was, a positive spin off of this study was to better equip the library with books isiZulu books. However a limitation of this study is that it refers only to the genre of the isiZulu novel.

Then, while features of the Visagraph equipment used in this piece of research enabled a nearer simulation of natural silent reading of authentic texts than forms of eye movement recording equipment that require reading from screens, or immobilisation of a reader's head, it is possible that equipment that samples the position of the point of focus more accurately, and more than 60 times per second might yield a more finely detailed record of eye movement.

Finally, an unavoidable limitation in all research involving reading and recorded eye movement are the effects of readers' awareness of being observed while reading. This study is completely susceptible to the effects of this.

CLOSING REFLECTIONS

Writing a PhD by publication seemed like an extremely good idea at the beginning of 2012. The rules stated that five papers would be sufficient if three had been accepted for publication, and the remaining two submitted to academic journals. With two articles already published, what could possibly be easier? I was completely confident I would have the remaining three written and published in just about no time at all. With hindsight, this was naïve.

First the months ticked by as I waited for the development of the software that would enable direct mapping of eye movement onto isiZulu text. When this was done and data collected, more months fled as I tried to tailor articles to the expectations and demands of reviewers of overseas journals. They found value in the articles I submitted, and made insightful and constructive comments, but were reluctant to accept the articles for various reasons. These included "findings from a single sample reading a single set of isiZulu texts do not allow any firm conclusions to be drawn" (but can that not serve as a beginning to building up a body of data?), that reference should be made to "the Zulu corpus – surely there is one?" (there is currently only a prototype at the University of Witwatersrand, that is not open to researchers from other institutions), and that comparisons to reading in other languages such as English were spurious unless I included scores from a matched control group reading matched texts (but with the unequal status of the two languages, discrepancy in availability of texts and the legacies of apartheid education I could not see how valid matching would be possible). I soon realised that I had chosen a difficult path and that in effect I had elected to submit my thesis to flocks of examiners, all with their own firmly held and sometimes contrasting views.

However, the subject area itself was fascinating, and the reflecting and rewriting that I did as a result of the rejections I received was extremely useful, and led to insights and realisations that I would not have reached if the articles had been immediately accepted.

The interest my participants showed in exploring their own reading with me was equally helpful, as well as encouraging and enlightening. I had felt diffident about my position as a white second language speaker researching an aspect of isiZulu, and fully expected some negative responses from first language speakers who might at least question the extent of my ability to do so. But my participants engaged keenly with the tasks I presented them with, from the screening test onwards, and cheerfully put up with wearing the mask containiing the sensors, false starts in the recording process, and the length of time taken to read the four texts and to explore eye movement records in detail. They found the process interesting, gave unstinting explanations where I asked for them, and were very relaxed about expressing their frustrations with some aspects of the more difficult texts, and their enjoyment of some aspects of the texts. They willingly shared their insights into their own reading, features of the structure, semantics and orthography of isiZulu, and the current position and status of isiZulu as a South African language. I was grateful for their ready acceptance of me as a researcher of their home language, and I believe that their enthusiasm for the process, as well as the sharp disappointment of many of those who were excluded by the screening process

augurs well for the possibility of the development of a strengthened reading culture in isiZulu.

Such a reading culture would be aided by enhanced understanding of reading and how overall reading skill could be improved by the fostering of particular reading processes. In this regard I hope that this work will be a useful souce of some preliminary information, particularly in view of the well documented advantages of developing reading skills in mother tongue.

Possibilities for future rearch questions that arise from this study include

- Do eye movement patterns and reading processes and strategies differ between reading in agglutinating languages that do not have a conjoined writing system (such as Sepedi) and reading in isiZulu and other Nguni languages?
- What are the outcomes of different teaching methods used to teach reading in isiZulu to children and adults?
- Is there an optimal teaching method, or some vital aspects of instruction or practice that should be included in all programmes designed to develop reading skills in isiZulu?
- Does acquisition of reading skills and sustained reading practice in one language result in learned reading processes (e.g. large grain size processing of text) that are transferred to reading in other languages with differing orthographies?
- To what extent do different languages and different orthographies facilitate or mitigate against automaticity and hence the rate of reading?

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