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Impact of aircraft noise and language on primary school learners' reading comprehension in KwaZulu- Natal

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A research report Submitted to the Discipline of Psychology,

The School of Humanities and Community Development,

University of Witwatersrand, in Fulfilment of the Requirements For the Degree of Masters of Education in Educational Psychology

NOVEMBER 2012

Declaration

I declare that this thesis, entitled " Impact of aircraft noise and language on primary school learners' reading comprehension in KwaZulu- Natal is my own unaided work. It is submitted for the degree of Master of Education in Educational Psychology, at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination at any other university.

Signed this _____ day of _____ 2012

_____

Bahati Kasimonje

Dedication

For my mother Nomathemba Kasimonje, a single parent who made sure I completed my Masters Application forms! Your strength and unwavering support encouraged me to see this Masters through!

Acknowledgments

I am greatly indebted to the following:

God, for the gift of life and allowing me to experience this Masters year.

My family, who have stood by me and believed in me throughout this entire process, words fail to capture the depth of my appreciation for your tireless support and prayers.

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Abstract

Today's world is a fast developing world, with the transportation sector being one of the fastest developing sectors (Goldschagg, 2007). Through technologies such as an aircraft, one is able to travel across the globe in shorter periods of time. Unfortunately such progress often comes with environmental hazards; one such hazard being environmental noise (Stansfeld et al., 2005). However there has been little attention given to the effects of environmental noise, with much research focusing on aspects such as lead and air pollution on people's wellbeing (Stansfeld et al., 2005). Yet environmental noise particularly aircraft noise is increasingly becoming an inevitable part of people's world and has consequences on health, cognitive development and overall quality of life. Consequently this study investigates the impact of aircraft noise on a crucial component of learning (Reading Comprehension). Primary school learners in KwaZulu- Natal (N=834) scores on a test measuring Reading Comprehension (Suffolk Reading Scale2) were compared across a control group and an experimental group. Furthermore because Reading Comprehension involves language acquisition, in addition to investigating the impact of aircraft noise the impact of having English as an additional language on Reading Comprehension was also investigated. Learning in South Africa is predominantly facilitated in English while South Africa has eleven official languages with nine of them being indigenous languages. English for many learners may only be a second or even third language. Significant results were observed for both aircraft noise and language on reading comprehension as well as an interaction effect.

Keywords

Aircraft Noise, Language, Reading Comprehension, KwaZulu-Natal

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LIST OF ABBREVIATIONS

Abbreviation	Full Terminology
BICS	Basic Interpersonal Skills
CALP	Cognitive Academic Language Proficiency (CALP).
EAL	English Additional Language
EFL	English First Language
SA	South Africa
SRS2	Suffolk Reading Scale 2
RANCH	Road and Aircraft Noise Exposure on Children's Cognition and Health
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Today's world is one that is characterised by innovation and development. The growth of cities and transportation contribute to the socio-economic value of a society (Goldschagg, 2007). However along with development are environmental concerns. World news is filled with the adverse reality of global warming and climate change and how these are consequences of mankind's mismanagement of the environment. Environmental management has been predominantly concerned with issues around air pollution, waste disposal, sewage and the misuse of natural resources (Goldschagg, 2007). At time of writing South Africa (SA) was hosting the annual United Nations conference on addressing global issues of climate change. While these issues are considered more pervasive and apparent environmental hazards; air pollution and waste disposal are not the only adverse environmental issues that people have to contend with (Clark & Stansfeld, 2007, Stansfeld et al., 2005). On a daily basis people have to contend with environmental noise from loud neighbours, pets, motor vehicles and in certain cases aircraft (Bistrup, 2003). Environmental noise like air pollution affects city dwellers' health and quality of life (Evans & Marcynyszyn, 2004). Environmental management initiatives therefore need to place emphasis on issues such as environmental noise, in order to provide higher quality of life for city dwellers particularly children who are still at a critical developing stage in their journey of life (Seabi, Cockcroft & Goldschagg, 2010). Research such as the current study that looks into a less emphasised area regarding the impact of environmental noise particularly aircraft noise on aspects such as learners' reading comprehension is of significant value.

When thinking about reading comprehension however the significance of language cannot be ignored. Vocabulary knowledge and language competence are pivotal to attaining reading comprehension skills (Cornoldi & Oakhill, 1996, Cummins, 1991).

> "*The most significant issue for quality in education is the all pervasive and extremely powerful influence of language which is unambiguously implicated in learning … and the need for pupils to have as good a grasp of the language of teaching and learning as possible"* (Taylor, Muller & Vinjevold, 2003, p. 65).

Even if learners are proficient in their primary language, the linguistic character of South Africa is one where English is the main language of teaching and learning (Alexander, 2005, da Rocha, 2009). Despite multilingual policies such as the Language in Education policy (1997) and the promotion of language rights in the new Constitution, the education sector still does not mirror these efforts (Kamwendo, 2006). Consequently many learners find themselves having to manage the task of learning in a language they are not proficient in. As a result some English Additional Language (EAL) learners underachieve scholastically because they are taught and learn in a language that they are not competent in (da Rocha, 2009). Thus the issue of language remains a contentious issue in South Africa despite the abolishment of Apartheid, which was considered the main arbitrator of the debilitation of indigenous languages (Alexander, 2005). The current study is embedded in the language debate in the South African context where learning difficulties and language based academic problems need to be differentiated and addressed accordingly. The current study is unique in that it not only investigates the impact of language on reading comprehension but in the context of environmental noise from aircraft.

1.2 Rationale

The current challenge facing the South African education system is addressing the needs of all learners regardless of their geographical and linguistic background. Education is one of South Africa's most significant areas of concern. An Annual National Assessment conducted recently in South Africa indicates that 65 per cent of Grade 3's and 72 per cent of Grade 6's are not at the grade appropriate language level (Department of Basic Education, 2011). Given such statistics, it is widely recognised that the country's schooling system performs well below its potential and that improving basic education outcomes is a prerequisite for the country's long-term development goals. Part of improving the educational system is in identifying possible areas of concern that may impede optimal transference of knowledge and learning; even factors that are often overlooked and thought to only affect a few such as environmental noise.

It has been established that aircraft produce considerable amounts of noise (Stansfeld et al., 2005). Given this, it seems logical for airports to be situated reasonably far away from areas such as residences and schools, where noise can be a significant source of distraction and annoyance (Goldschagg, 2007, Rivlin & Weinstein, 1984). However this is not the case, there are airports situated close to learning environments; for example some schools are situated near the London Heathrow airport as well as the Los Angeles and the former Munich Airport. South Africa is not exempt and has had learning environments along aircraft runway paths in KwaZulu- Natal (Seabi et al., 2010). Schools are aimed to be learning environments that stimulate cognitive development, facilitate transferring of knowledge and children learning about the society they live in (Clark & Stansfeld, 2005). The argument brought forward is that having loud noise sources (airports) close to schools may compromise the learning process. One needs to question how environmental noise produced by aircraft activity impacts on the learning process.

Young learners are at a critical learning developmental stage. They are therefore thought to be more vulnerable to distractions in the environment such as aircraft noise (Seabi et al., 2010). Moreover children generally show less capacity than adults to anticipate and cope with stressors in general (Clark & Stansfeld, 2005). Furthermore whilst auditory effects elicited by noise such as hearing impairment and a low threshold stimulus are well established in literature there is need for more research on the less obvious non-auditory effects of noise such as motivation, annoyance and cognitive performance (Matheson, Stansfeld & Haines, 2003). Hence the focus of the current study on cognitive functioning of reading comprehension. In children the most consistent non-auditory findings on the impact of exposure to aircraft noise is cognitive impairment (Clark & Stansfeld, 2007, Matheson et al., 2003). Research indicates that tasks that involve central processing such as memory, reading comprehension and attention are the most affected by noise (Haines et al., 2001a, Stansfeld et al., 2005). The most persuasive evidence in this area pertains to impaired reading comprehension and high levels of annoyance (Clark & Stansfeld, 2005, Haines et al., 2001b, Stansfeld et al., 2005). However even in this area research is not conclusive. For instance, previous empirical studies (Cohen, Evans, Krantz & Stokols, 1980; Airport Cooperative Research Programme, 2009) did not demonstrate a delay in reading comprehension for learners located near airports. On the other hand Haines et al. (2001b) and Stansfeld et al. (2005) report significant differences between learners in high noise (close to airports) and

quiet groups on reading comprehension. Furthermore, Hygge, Evans and Bullinger (2002) found significant differences only on the most difficult items in a reading assessment. The aforementioned studies are discussed in more detail in the literature review (Chapter 2), but function to highlight here inconsistencies that suggest that this field of study has not reached a point of saturation and require further investigation. Therefore, the current study seeks to investigate similar dynamics of the impact of aircraft noise on learning in a South African context. Whilst there is increasing research from Western societies on exposure to aircraft noise and its impact on reading comprehension, there is insufficient research in this area especially within the developing countries such as South Africa where chronic exposure to aircraft noise is not an exception.

Further, South Africa has eleven official languages; this multi-lingual characteristic presents interesting dynamics to the intersection between reading comprehension and aircraft noise. Learning in South Africa is predominantly facilitated in English followed by Afrikaans even though statistics indicate that the majority of the population (74 per cent) speak an African language as their first language; therefore English for many learners is their second and even third language which they may not be proficient in (da Rocha, 2009). This presents the problem of language bias in cognitive abilities such as reading comprehension, which is pivotal for a learners' successful advancement in South Africa. This creates an area of concern regarding the dynamics of learning (Reading Comprehension) in another language for learners from other linguistic backgrounds who are also contending with environmental factors such as aircraft noise.

With the increasing levels of environmental noise from sources such as aircraft, the impact of noise on children's general well-being and education translates to more and more children being affected (Bistrup, 2003). This translates to environmental noise specifically from aircraft becoming an important health and educational problem that requires working solutions (Clark & Stansfeld, 2007). Information gained from the current study may have implications on policies that could improve the quality of life in schools and for learners. The study may potentially provide research evidence that may inform policies on the importance of the location of airports for example (Clark & Stansfeld, 2005). There is a need to create optimal environments for maximum learning to occur; investigations that explore possible hindrances to learning and curbing these hindrances would be of significance (Bistrup, 2003).

Further the current study is located in post apartheid South Africa's mission to redress past inequalities; redressing inequalities based on race, culture and language. The current study hopes to add to the language debate by highlighting the possible inadequacy of current language policies and the consequences this poses for some learners.

1.3 Research Aims

Given the problem areas articulated above, the general aim of the study was to examine the effects of exposure to chronic environmental noise by comparing the reading comprehension performance of learners exposed to aircraft noise with those not exposed to aircraft noise. Because language is inextricably tied to reading and comprehension, this study further aimed to examine the influence of language on reading comprehension. In order to gain insight into the possible factors that affect learning.

1.3.1 Objectives

1. To investigate the impact of chronic exposure to aircraft noise on reading comprehension on a sample of primary school learners in KwaZulu- Natal.
2. To investigate the impact of not speaking English as a first language on reading comprehension.
3. To investigate the interaction between aircraft noise and language spoken at home (English as an Additional language and English as a First language) on reading comprehension.

1.4 Research questions

Following the aims of the study the following questions guided the current study:

1. Does exposure to chronic aircraft noise impact negatively on primary school learners' reading comprehension?
2. Is there a significant difference between English First Language (EFL) learners and English Additional language (EAL) learners on reading comprehension?
3. Does language spoken at home play a mediating role on the impact of aircraft noise on reading comprehension?

1.5 Hypotheses

A hypothesis is a claim of the probable occurrence of a phenomena or characteristics of a population based on prior evidence; a 'scientific guess' (Howell, 2004). The following hypotheses were developed in the current study:

1. *Impact of Aircraft Noise:* It was anticipated that statistically significant differences would be observed on reading comprehension scores. Learners exposed to limited or no aircraft noises are expected to have better reading comprehension scores on a cognitive assessment that assess reading comprehension than learners exposed to chronic aircraft noise.
2. *Role of Language:* It was expected that English First Language learners would score better on a cognitive assessment of reading comprehension than English Additional Language learners.
3. *Interaction between Noise and Language:* It was anticipated that language barriers and aircraft noise would both impact negatively on learners' reading comprehension skills. English Additional Language learners exposed to chronic aircraft noise are expected to have lower scores for reading comprehension than EFL learners exposed to limited aircraft noise.

1.6 Synopsis of the report

This research report consists of five chapters which include an introductory chapter, a literature review, research methodology, presentation of the results and in conclusion a discussion of the study's findings is presented. The structure of the report is elaborated below.

The current chapter (*Chapter 1*) functions to provide the background to the study. It introduces the rationale behind the study as well as the purpose of the study. The questions and hypothesis investigated are also highlighted with the intent of providing the reader with an overview and understanding of what this research is concerned with.

In *Chapter 2* relevant literature related to the impact of environmental noise specifically aircraft noise and language on reading comprehension is explored. The purpose of this review is to locate the current study in the context of existing knowledge and research in this field. Existing trends are also identified and related to the South African context. Literature discussed is examined and critically evaluated in the report.

Chapter 3 discusses the research methodology used to realise the study. Highlighting the context of the study with regards to its design, participants, research procedure as well as analysis employed to analyse data. The chapter concludes with the ethical considerations undertook by the researcher.

Chapter 4 on the other hand presents the findings of the study. Results are presented in tables and diagmatically according to APA guidelines. This aim of this chapter is to provide an indication of how the study's research questions occur in the real world.

Chapter 5 concludes by drawing the threads of the study together. The research findings presented in chapter 4 are located in the literature reviewed in *Chapter 2*. Highlighting areas where research findings corroborate with existing literature as well as possible new findings that may not coincide with current literature. Gaps in the field that could be the foundation of future research areas are brought to the fore. The chapter concludes with the strengths of the study and limitations, factors that may have had an impact on research findings are also acknowledged.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter serves to locate the current study in an existing body of literature. The discussion begins by exploring the concept of noise, moving into a discussion of aircraft noise specifically. The literature review also discusses literature pertaining to the cognitive ability of reading comprehension and how aircraft noise impacts on learners' reading comprehension. In addition issues pertaining to the role of language in reading comprehension in a multi-lingual country such as South Africa are also examined in the chapter. The discussion formulated in this chapter draws on previous research in the field.

2.2 Noise, what is it?

Sound is all around and emanates from some kind of source; a drum, a car horn, a voice (Federal Interagency Committee on Aircraft Noise (FICAN), 2000). The acoustic world is essential to acquiring information about the world and sound is defined as a sensory perception that stimulates auditory pathways to the brain in processing information (Berglund, Lindvall & Schwela, 1999). The question however becomes when sound becomes noise? In any study it is integral to make plain and define what the main variables in the study refer to. It is therefore essential to define and explain how noise is understood in the current study before embarking on examining the effects of aircraft noise on reading comprehension (Goldschagg, 2007). Definitions of noise include "unpleasant sounds, a loud surprising, irritating sound" (Rooney, Carney, Soukhanov, Jellis, Clarke & Yates, 1999, p. 1285), "unwanted sound" (Bistrup, 2003, p.59), "the intrusion of unwanted, uncontrollable and unpredictable sounds" (Bronzaft, 2004, p.66). What is common and explicit in all the different definitions are that noise is unwanted and a disturbing sound. Noise in the current study is therefore thought of as an intense loud sound that is undesirable that can cause disruption to daily activities and wellbeing (Berglund et al., 1999, Bistrup, 2003). Noise is measured in decibels (dB) using a sound meter (FICAN, 2000). Noise levels range from one decibel (the quietest sound) to 140 dB which can be likened to the sound produced by a military aircraft (Goldschagg, 2007).

The nature of today's developing world facilitates more and more noise being emitted and consequently more people being exposed to noisy environments (Clark & Stansfeld, 2007). Even as far back as the Roman ages and Medieval Europe regulations were placed that were aimed at reducing noise produced from wagons and carriages; the main form of transport then (Berglund et al., 1999). Essentially noise is a problem that impinges on everybody in some way and is most likely to continue to be a source of annoyance and impact on people's general wellbeing (FICAN, 2000). The impact of noise on people's wellbeing include hearing impairment, sleep and community disturbance, annoyance and distraction from tasks and causes possible reduction in task performance (Clark & Stansfeld, 2007, Haines et al., 2001a, Rivlin & Weinstein, 1984). Exposure to excessive environmental noise thus becomes an issue of concern particularly for populations who tend to exhibit a lesser ability to cope with stressors in the environment. The impact of environmental noise from loud sources such as aircraft on learners' performance in a task like reading comprehension which requires communicative instructions and the reader's attention is therefore of interest.

2.3 Aircraft noise

Aircraft are complex flying technological devices that have several advanced engines and are used to transport people and goods across destinations. Aircraft noise in the study, is the sound made by the different components of the aircraft during aircraft activity; from lift off, across the destinations and landing (FICAN, 2000). The aircraft's engine, consisting of compressors, turbines, combustor and jet exhaust produce the most noise and is especially problematic during take-off and landing (Goldschagg, 2007). Badcock (2002) cited in Goldschagg (2007) identifies four main sources of environmental noise with aircraft noise being one of them. Berglund et al. (1999) in their report also cite aircraft noise as being one of the main contributors to environmental noise. The noise produced by an aircraft is not homogeneous however; literature indicates that different aircraft emit varying levels of noise (FICAN, 2000). Older jet propelled models are much noisier than newer models for example. Nonetheless the average noise level produced by any aircraft is 60 dB and this lies on the loud side of the sound meter (Goldschagg, 2007). The World Health Organisation (WHO) stipulates that environmental noise such as that from an aircraft should not exceed 50 dB Leaq (average sound level) during the day in outdoor environments (Berglund et al., 1999). WHO guidelines further stipulate that in classes noise levels should not exceed 35 dB. Noise levels above this level are thought to interfere with the learners' processes of perceiving and

understanding verbal instructions in class (Berglund et al., 1999). This suggests that aircraft could produce noise levels almost twice over what is considered sound levels that are still conducive to learning. This is of particular interest when considering tasks such as reading comprehension that are dependent on a teacher communicating verbal instructions necessary for a learner acquiring reading skills. Further a disruption in communication is thought to impact the EAL learner who may miss the necessary basics they may only be exposed to in the school environment given that English is not the primary language spoken at home.

The noise emitted by aircraft can be heard over considerable distances consequently affecting more and more people. Previous studies that interviewed residents residing close to airports reported significant distraction from daily activities due to the noise emitted by aircraft flying past (Bronzaft et al., 1998). In the study by Bronzaft et al. (1998), about 70 per cent of residents reported being annoyed and distracted by aircraft noise. A more recent study by Haines and colleagues (2001a) also found that aircraft noise in their sample of school children was associated with annoyance. The mentioned studies can be criticised however for not reporting on the degree of distraction or annoyance felt by participants in their studies; to what extent were participants annoyed and distracted by aircraft noise. This information would be useful in assessing the extent of how problematic aircraft noise actually is (Clark & Stansfeld, 2007). The studies do however provide an indication that noise from aircraft is a source of distraction particularly for people situated close to airports. The ability of aircraft noise to distract day to day activities such as reading can thus be thought of as an underlying mechanism that may facilitate reduced performance on reading comprehension for learners situated close to an airport (Stansfeld et al., 2005). The quote below highlights how aircraft activity is thought to be a source of environmental noise and has distractive implications on people's day to day functioning. This distraction in day to day function can be extrapolated to the classroom setting

"Taking everything into consideration there is little to be lost by silencing and a great deal to be gained..... we may rest assured that the tremendous racket that is produced and associated with aeroplanes plays a considerable part in prejudicing the public against these machines" (The Aero 1911,p.1 cited in Goldschagg, 2007, p. 36).

2.5 Sources of noise in the classroom

A crucial amount of learning occurs in the classroom. In South Africa learning is predominantly facilitated by a teacher orally giving instructions while learners listen and absorb the information (Mierman et al., 2010). Classrooms therefore need to support communicative behaviour to facilitate learning. This section thus aims to highlight sources of noise in the classroom that may possibly interfere in the learning process of skills such as reading comprehension.

Noise in the classroom consists of a combination of external noise which permeates into the building together with internally generated noise (Shield & Dockrell, 2003). Internal noise mainly consists of noise generated by learners themselves as they participate in classroom activities and converse amongst themselves (Shield & Dockrell, 2003). External noise on the other hand as highlighted includes noise from transportation sources such as road traffic even aircraft noise for some schools and to a lesser degree railway noise (Shield & Dockrell, 2003). A survey conducted in London by Shield and Dockrell (2000) indicates that sources of external environmental noise includes cars which account for 86 per cent, aircraft 54 per cent, lorries 35 per cent and buses 24 per cent of noise respectively (Shield & Dockrell, 2003). Research in South Africa indicates that similar trends of environmental noise experienced by learners in the classroom are also still observed to date (Goldschagg, 2007; Seabi et al., 2010). Children, can therefore be thought of as being exposed to noise from several sources while they are learning (Seabi et al., 2010). While it is acknowledged that internal noise can interfere with the learning process, external noise is envisaged to pose as a greater distraction to learning activities. The logic being that unlike internal noise, aircraft noise for example is louder, intermittent and consequently teachers and learners have lesser control over what can be done when noise is emitted (Clark & Stansfeld, 2005). Thus it is thought that learners situated near sources of high levels of environmental noise are at a higher risk of facing academic delays than learners who are not exposed to noise levels that infringe on optimal acoustic levels in a classroom. Academic delays experienced by these learners could be in the form of impaired reading ability and poorer comprehension, which the current study seeks to investigate.

2.6 Reading Comprehension

Foucault states that knowledge is power; acquiring the ability to read facilitates knowledge that provides the learner opportunities for academic and social advancement (Ireland-Lathy, 2006). The ability to read can thus be argued to be one of the leading factors for learners' successful transitioning to higher grades of learning; with different levels requiring higher-order thinking and understanding of texts (Ireland-Lathy, 2006). It is widely recognised that language proficiency is pivotal to education attainment and success primarily because education is still largely a language based activity (Cornoldi & Oakhill, 1996., Meirman et al., 2010., Webb, 1999). Irrespective of how much today's technological advancements transforms how society obtains knowledge, people still need to read; making reading comprehension a vital skill to acquire (Cornoldi & Oakhill, 1996., Ireland-Lathy, 2006). The South African educational curriculum to a great extent requires learners to be able to extract knowledge from written texts; reading texts permeates into the different aspects of learning (Alexander, 2005). Learners from primary levels are often required to read and make sense of task instructions, to read the task material and ascertain what is being conveyed in order to complete a given task (Cornoldi & Oakhill, 1996).

This ability to read requires thought; the reader needs to actively engage with the text to extract meaning from it (Orasanu, 1986). Reading comprehension can thus be defined as the "ability to comprehend the thoughts and feelings of another mind via text" (Pumfrey, 1977:2 as cited in Ramaahlo, 2010). Orasanu (1986) reiterates this notion and also argues that the point to reading is comprehension. An interactive model of thinking about reading comprehension states that the reader is an active participant in the process in that the reader also brings to the text a number of skills in order to understand the text (Orasanu, 1986). The reader needs to decode words and letters, be aware of phonemics and the vocabulary of the language that the text is in (Cornoldi & Oakhill, 1996). Further comprehension is not simply decoding letters, words and sentences but is also about constructing meaning (Orasanu, 1986). Reading comprehension is thus an essential cognitive, developmental and socially constructed skill by which learners are able to explore and construct meaning of the world around them (Cornoldi & Oakhill, 1996).

Reading comprehension is not a neutral activity however. A reader's understanding of a text can be limited by various barriers; language being the most obvious one (Orasanu, 1986).

This is because all texts to be read are in some language; English, French, Chinese and so on. Therefore if a reader does not possess a good command of the language that the text is in, there is a high chance of a limited understanding of that text (Mierman et al., 2010). This is referred to as language bias. Bias occurs when the content in an assessment or text disadvantages a certain population and facilitates discrepancies in grasping what is being conveyed in a text (Cockcroft, 2008, Foxcroft & Roodt, 2001). Essentially there would be no equal ground for different learners in understanding and constructing meaning from a text. Issues around language bias are pertinent in multilingual countries such as SA. As already mentioned, South Africa has eleven official languages; nine of them being African. Sternberg's (1996) linguistic relativity hypothesis is of interest given the predicament of language bias. Linguistic relativity is a hypothesis that states that a person's understanding of an assessment is potentially a function of language (Sternberg, 1996 as cited in Raamahlo, 2010). Essentially the hypothesis suggests that a learner's comprehension of a text is dependent and limited to the learner's level of competency of the language. This implies that for example, a Zulu first language learner may experience difficulties with comprehending a text in English and may possibly miss crucial information. And because reading material and teaching is predominantly facilitated in English the Zulu learner is likely to struggle to effectively grasp what is being conveyed in a text (Mierman et al, 2010). The hypothesis further argues that people develop certain cognitive styles and interpretations based on the language they communicate in. One could criticize this hypothesis by stating that it underestimates people's capabilities to comprehend texts that are not in their dominant language. What the linguistic hypothesis' argument does point out is that language can play a role in creating discrepancies in learning that may place non-English first language learners at a reading disadvantage compared to English first language speakers in South Africa (de Klerk, 2002; Raamahlo, 2010).

A theory by Cummin (1991) further premises that there are two facets to language proficiency namely; Basic Interpersonal Communication Skills and Cognitive Academic Language Proficiency (CALP). Basic Interpersonal Communication Skills (BICS) are primary skills pertaining to listening and speaking (Cummin, 1991). An example of BICS is being able to hold a fluent conversation in English from day to day. Cognitive Academic Language Proficiency on the other hand is the ability to cope with the academic demands of a language such as comprehension of texts (Cummin, 1991). Therefore the theory implies that

even if one can converse fluently in English for example this does not automatically translate to the academic skill of comprehension of a text in English in school (de Klerk, 2002). Application of this theory in a South African context where the medium of teaching is predominantly English questions whether learners from different linguistic backgrounds have acquired both BICS and CALP. A South African study found that English second language speakers performed significantly lower than English first language speakers on an assessment that measures reading ability (Ireland-Lathy, 2006). The study found that differences were mainly observed on the sub-test of Auditory Vocabulary and Reading Comprehension (Ireland-Lathy, 2006). This suggests that learners, according to Cummin's theory, (1991) have not acquired Cognitive Academic Language Proficiency needed to effectively comprehend a text. The argument thus brought forward is that the linguistic character of South Africa is one where although many learners have acquired BICS, their CALP is not necessarily adequately developed and thus consequently puts them more at risk of underachieving in comparison with their English First Language counterparts. English home language speakers are argued to be at a better advantage in attaining CALP especially with reading tasks, as social interaction through their language of learning (BICS) makes possible the transfer of cognitive academic proficiency from one language to another with less effort.

2.7 Linguistic character of South Africa

As argued above language is central to reading comprehension and considering South Africa's history it would be imprudent to ignore the language question and its role in education in South Africa. The importance of the role of language within the South African context is illuminated in the quote below

"*As an instrument of ethnocultural identity, it played a central role in defining racial groups, thus supporting apartheid. As an instrument of mobilisation, it has served to establish the political power of the white Afrikaans-speaking electorate. Finally, as an instrument for gaining access to certain rights and privileges (such as job opportunities) the former language policy favoured the so-called white communities, thus serving as an instrument of discrimination"* (Webb, 1996, p.139).

Democratic South Africa through the new Constitution in a bid to redress past oppression and inequalities eloquently acknowledges SA's cultural and linguistic diversity, and accordingly recognises the need to promote a language policy that embraces multilingualism (Kamwendo,

2006). Stemming from the new Constitution and educational policy, the Department of Education adopted the Language in Education Policy in 1997. Amongst the policies' main objectives, particularly relevant to the current study, is to facilitate access to meaningful education for all South Africans. Essentially 'establishing learning environments that accommodate and encourages the optimal growth for the different learners from various multilingual backgrounds so that some learners are not at a disadvantage and counteract the mismatch between primary home languages and languages of learning and teaching' (Language in Education Policy, 1997, p. 1). The Language in Education policy thus implies that all learners despite their linguistic background should be accommodated for and that one's language should not be an impediment with regards tasks such as reading comprehension (Language in Education Policy, 1997). As mentioned in earlier sections the majority of learners in South Africa are either bi or multi-lingual but are often in learning environments that teach in a medium they may not be fluent in particularly with regards to CALP (O'Conner & Geiger, 2009). If what the Language in Education policy stipulates has been fully implemented it could be thought that language would not be considered important variable impacting on reading comprehension or possibly interacting with aircraft noise in South African schools.

Although commendable, the fact that South Africa has eleven official languages presents logistical problems which appears to facilitate a gap between 'policy on paper' and implementation. The eloquence of the new constitution with regards to multilingualism seems to get lost in translation. This argument is highlighted by authors such as Kamwendo (2006) stating that regardless of the new language policy 'birthed' in the democratic South Africa, English is still at the top of the language hierarchy and still considered the key to power. Satyo (1999) describes the language policy in SA as giving a "sneaking suspicion that actually the policy of eleven languages in fact translates into 11=1+1=2. We are back to square one... we are presented not with eleven languages but rather with a menu of eleven languages from which to choose two formerly privileged languages" (Satyo, 1999, p. 156). For instance English is still considered the main language in the government departments, private sector, commercial services and in education (Crystal, 2003; de Klerk, 2002; Kamwendo, 2006). Thus English is still language of economic, social and historical power. Phillipson (1996) refers to this as linguistic imperialism where although English is not the primary language for a majority, it is still the dominant language used. African languages

although official still have a low economic and social status compared to English and Afrikaans (Alexander, 2005; Webb, 1999). What this highlights is that many learners remain disadvantaged and marginalised in the educational sphere specifically around language based tasks which as argued in earlier sections forms the crux of one's education as language permeates into most if not all learning areas. Although a pressing issue that requires attention it is also acknowledged that SA has a plethora of challenges that necessitate addressing and language predicament seems to rank low in comparison to job creation, crime prevention and health (Kamwendo, 2006).

In addition to what appears to be partial implementation of a Language Policy, English remains the language of choice even for non English speakers (de Klerk, 2002). According to the Pan South African Language Board (PANSALB, 2000); a board that is mandated to promote multilingualism and ensure that language rights stipulated by the constitution are upheld, states that many parents place children in previous Model C schools where English is the medium of learning and teaching despite the fact that their children have had minimal exposure to English and many place them at a disadvantage. Research by de Klerk (2002) in the Eastern Cape reported that parents preferred that their children to learn in an English medium school even though English is not their primary language. What was apparent in the study was the opinion that English is thought to be associated with upward mobility. At least 124 of 194 participants believed that English offers better educational success which is thought to likely translate to more job opportunities-'English is the most used language in the workplace' and financial security (de Klerk, 2002). Parents in the study also highlighted that Xhosa medium schools seemed to offer poorer quality education (de Klerk, 2002). Whether this is true is debatable but what it does highlight however are the perceptions around language and education of key stakeholders (parents) in a child's educational experience. Apart from parental perceptions the reality is that South African National Grade 12 examination are written either in English or Afrikaans whether a child has been placed in an ex Model C school or a township school therefore it is inevitable that learners will be placed in an context where they have to contend with texts in English. Such realities and reports such as de Klerk's (2002) and from PanSALB (2000) suggest that because English is still perceived as superior, there are many English additional learners that will have to try and manage language discrepancies particularly involving comprehension of texts. Given the aforementioned linguistic context, it is not farfetched to think that the many South African

EAL learners face reading and comprehension difficulties. That learning in what can be considered a 'new language' could be anxiety provoking and impacts one's performance in the classroom.

It should be said that the relationship between language and academic performance is not a chain reaction, where being an EAL learner does not always mean that one will perform poorly or have difficulties with English language based tasks. A study by Mierman et al. (2010) for example, found that language differences in their study were mainly observed between the Grade 1s, while at a Grade 2 and 3 levels minimal differences were observed between EAL and EFL learners. In their study larger differences were observed on the more difficult items (Mierman et al., 2010). What is being conscientised however is that it would be imprudent to ignore the role and effects of language difficulties in education. The English additional language learner exposed to pervasive environmental noise is not only contending with issues around language proficiency, but the effects which chronic environmental noise elicits such as interrupting the transference of auditory vocabulary.

2.8 Aircraft Noise in the context of Reading Comprehension

The impact of aircraft noise on cognitive tasks such as reading comprehension has been researched over the past thirty years. A significant number of international studies indicate that aircraft noise impairs learners' cognitive abilities such as attention, reading comprehension and working memory (Evans & Maxwell, 1997, Haines et al., 2001b, Hygge, Evans & Bullinger, 2002). The most observed significant results regarding the impact of aircraft noise on cognitive abilities, are indications of impaired reading comprehension effect. Although the case, findings are still inconclusive with a mixture of significant and non significant results for reading impairments due to noise exposure. (Clark & Stansfeld, 2005).

A Munich study examined the effects of aircraft noise on learners' attention, memory and reading comprehension both cross-sectional and longitudinally (Hygge et al., 2002). Initially the study investigated the effects of aircraft noise on cognitive tasks by comparing children (aged 9 years old) schooling near an airport to those not situated near an airport and consequently less exposed to aircraft noise (Hygge et al., 2002). Researchers found significant reading impairments and poor comprehension for learners situated near the airport (Hygge et al., 2002). It is important to highlight that significant differences between the noise and quiet groups were observed for the most difficult section of the reading test however.

Investigating whether similar findings would be observed in a multi-lingual context such as SA; examining whether it is significantly more difficult to comprehend texts that demand more CALP skills for EAL learners is of concern.

Results in the initial Munich study were subsequently corroborated by findings in a longitudinal study (Hygge et al., 2002). Three hundred and fifty children who were part of the initial Munich study were followed after the closing of the old airport and were part of the experimental group for the initial study. Two experimental groups (old airport and new airport) of learners exposed to aircraft noise were compared to two control groups (old and new airport) who were not exposed to aircraft noise. Findings from the study revealed improved reading comprehension scores as well as memory for learners previously exposed to noise at the old airport. On the other hand within the same space of two years learners situated near the new airport exhibited impairments in cognitive abilities such as reading comprehension. Strength of this particular study is that the researchers in their analysis accounted for the effects of developmental change that potentially could have facilitated the improved scores on cognitive tests (Hygge et al., 2002). This 'switch' of effects that highlights the effect of aircraft noise as the common variable in both studies highlights the adverse impact of aircraft noise on learners (Clark & Stansfeld, 2005). The study also shows that the effects of aircraft noise over time can be reversible. A possible limitation of results from the Munich study however would be whether results were an effect of the sample size (Matheson et al., 2003). The current study however utilises a larger sample in a bid to counteract problems encountered by small sample sizes.

A more recent cross-sectional study conducted in schools situated near the Heathrow airport also found effects on reading comprehension. Twenty schools participated in the study, 10 high noise schools (N=236) and 10 low noise schools (N=215) (Haines et al., 2001b). Participants in the study were matched as far as possible for age, sex and socio-economic status although the noise group was most likely comprised of non-white and English additional learners (Haines et al., 2001b). Strength of the Heathrow study is that the study's analysis utilized multi-level modelling statistical techniques that account for the possible effects of confounding variables.

The Heathrow study found a 6 month reading delay for learners attending school near the airport compared to those situated away from the airport (Haines et al., 2001b). The study

also found that scores of the Suffolk Reading test taken as a whole showed no significant differences between learners in the noise and quiet groups. As with the Munich study differences were only observed when the 15 most difficult test items were analysed separately. These differences remained after adjusting analyses for age, language spoken and level of economic standing (Haines et al., 2001b). This is particularly important because it suggests that language may not necessarily facilitate differences in reading comprehension skills. It is imperative to infer results obtained from any study with caution however; it could be that such results in the Heathrow study may have been context specific. The study was conducted in London where learners from different cultural backgrounds are arguably more similarly exposed to English as compared to South Africa for example where English may be the official language but not as equally exposed to all people. In addition it should be noted that the study utilised reading test results obtained under mellow calm sound conditions (Clark & Stansfeld, 2005). This methodological concern may have impacted on results obtained. Finally the Heathrow study does not give an indication of the long-term effects of aircraft noise on reading comprehension since the study was not longitudinal (Matheson et al., 2003). A South African pilot study that investigated the impact of aircraft noise on reading, attention and memory only found significant results for reading comprehension. Impaired reading was observed for learners exposed to noise even after controlling for intellectual functioning (Seabi et al., 2010). The South African study showed similar trends with that of international studies where significant results are predominantly observed in reading performance (Clark & Stansfeld, 2005).

Not all studies investigating the effects of aircraft noise on cognitive performance find significant results however (Boman, Hygge & Enmarker, 2005). Possible explanations for non-significant results are that children adapt over time to the noise produced by aircraft and are still able to perform cognitive tasks such as reading comprehension just as well. Children for example may be able to filter out noise and selectively attend to what they need to process at the time (Boman et al., 2005). A repeated measure field study by Cohen et al. (1980), the first of its kind investigated the impact of aircraft noise on school learners near the Los Angeles flight path. Learners' performance in four schools exposed to high levels of noise (N=142) were compared to learners from 3 low noise schools (N=120). In order to counter-act the possibility of confounding variables co-varying with noise exposure researchers matched participants as far as possible according to scholastic performance, race, ethnicity

and socio-economic status. Where matching was only partly successful, there were significant differences in ethnicity and length of time spent in schools; with learners in the quiet school sample having attended longer in their present schools a regression analysis was conducted to redress these differences (Matheson, Stansfeld & Haines, 2003). Each participant was tested individually in two 45 minute testing sessions in a noise insulated trailer. For reading comprehension however archival reading scores in the form of school reports were use. A follow up was also conducted a year later to examine whether the effects observed in the initial collection of data persisted or even aggravated or whether learners had managed to adapt to their environment (Matheson et al., 2003). Amongst the other variables in the study no effect was found for reading comprehension (Cohen et al., 1980). Researchers arguing that observed results could be attributed to the nature of the experimental design where reading was not actually tested during the study instead school previous school reports were used. An important criticism to highlight about the study with regards to non-effect for reading performance could be the use of archival reading records facilitated confounding chronic and acute noise exposure unlike other variables (Attention, Motivation & helplessness and Physiological response i.e. increased blood pressure) in the study that were actually tested in the time of study where significant results were observed (Matheson et al., 2003).

Although literature gives an idea of the impact of aircraft noise on cognitive tasks such as reading comprehension, conclusive evidence cannot be drawn. Furthermore there is a lack of literature on the underlying mechanisms that may explain how exactly aircraft noise impacts on cognitive abilities such as reading comprehension. This highlights how there is still room for more research in this area and how the current study can contribute to literature in the field.

2.8 Gaps in Literature

Most studies that investigate the impact of noise on learners' cognitive development as highlighted report some form of impairment in reading ability (Clark & Stansfeld, 2005, FICAN, 2000). However the underlying mechanisms or a framework linking noise and reading comprehension remain uncertain and is an important area for future research in order to establish an understanding relationship between aircraft noise exposure and reading

comprehension (FICAN, 2000). Possible explanations for the effect of noise on reading comprehension are therefore attempted and hypothesised in the context of the current study.

It has been proposed that the effects of noise on reading may partly be due to noise-induced delays in language and speech perception development (Evans & Maxwell, 1997). A limited number of studies indicate that noisy environments interfere with verbal communication which is central to acquiring language (Shield & Dockrell, 2008). In a study by Evans and Maxwell (1997), children exposed to aircraft noise scored lower on a reading test and on a speech perception test where the identification of words in a noisy environment was required. The reasoning behind the hypothesis as highlighted in earlier sections is that language is one of the most crucial building blocks of reading (Cornoldi & Oakhill, 1996; FICAN, 2000). Speech interference is likely in noisy environments such as aircraft flight paths such that language acquisition in such situations becomes difficult and it becomes possible a learners' reading foundation and performance is delayed (FICAN, 2000). This hypothesis is thought to be particularly valuable when thinking of vulnerable groups such as EAL learners in the current study who in addition to facing a possible language barrier whilst contending with trying to acquire language in a noisy environment. It is not unreasonable to speculate that children who face language bias are even more vulnerable when learning occurs in a noisy environment. This current study could potentially provide knowledge on factors that interact with noise that facilitate delays in cognitive tasks such as reading.

In addition to speech perception disturbance, phonological short-term memory might be thought of as a mediator between noise and reading. Phonological short-term memory is a component of working memory responsible for coding, storage, and manipulation of speech-based representations (Baddeley, 2003). The ability to hold verbal items in short-term memory is a predictor of a child's vocabulary range leading to language development and reading comprehension (Baddeley, 2003). Under adverse listening conditions, more cognitive resources are required to decode the speech signal, thereby reducing the resources available for storage and processing of the information (Klatte et al., 2009). Furthermore children are more easily distracted by irrelevant sounds than adults and thus less able to focus attention on the task in the presence of background noise (Edwards, Fox & Rogers, 2002).

Noise studies extensively report an association between exposure to noise and resulting noise annoyance (Clark & Stansfeld, 2005). Thus an additional mediator particularly in children

that is thought to mediate the impact of noise on cognitive activities such as reading comprehension is annoyance (Babisch et al., 2009, Miedema, 2007). Annoyance is broadly defined as negative feelings such as irritation, discontentment and a frustrated response to what is perceived as a stressor (Babisch et al., 2009). Environmental noise, which interferes with behaviour for example communication and concentrated activity, can be considered as a possible cause of annoyance for individuals (Miedema, 2007). The effects of environmental noise depend on acoustical characteristics of the noise for instance the loudness, time patter whether noise is predictable or not; will it get better or not. Being able to cope with daily background stressors is important for human well-being and health and as highlighted because aircraft is loud and unpredictable it poses as a source of annoyance (Miedema, 2007). Current studies on the impact of aircraft noise on cognitive development in children highlight participants reporting high levels of annoyance. A review of studies of aircraft noise on cognitive abilities by Clark and Stansfeld (2007) indicates that the majority of participants including teachers reported being annoyed by noise experienced. Thus learners may have decreased attention to tasks at hand such as reading comprehension (Clark & Stansfeld, 2007).

Miedema (2007) reports that a meta-analysis indicates that, at a similar noise exposure average, aircraft noise is reported more annoying than road traffic and railway noise. A recent study Hypertension and Exposure to Noise near Airports (HYENA) interviewed 4861 aged between 45-70 who had been living near an airport for at least 5 year. The researchers purposeful excluded people living near other areas exposed to significant noise such as railways (Babisch et al., 2009). The study found that although noise levels remained the same since 2002 when the study was first initiated, participants reported being more annoyed by noise indicating that noise annoyance was increasing. This suggests that even though exposure to noise may be constant, people may not actually get used to the noise but instead may become increasingly annoyed by noise. In relation to learners chronically exposed to intense noise such as aircraft noise they may not be able to ‘tune out’ the noise, but also experience an increased frustration with noise which in turn affects their performance in classroom tasks such as reading. It should be highlighted however that noise annoyance is also dependent on individual characteristics; some learners may be able to tolerate noise better than others and consequently their performance not as impacted. Although not the main focus of the study questions regarding annoyance were included in the child questionnaire

participants needed to complete in the current study. The current study may as an aside may shed light into the possible interaction of noise and annoyance by looking at whether reported high levels of annoyance are associated with lower reading comprehension scores.

2.9 Summary of the Literature Review

The chapter focused on theoretical understandings of the cognitive ability of reading comprehension. Reading comprehension is identified as an integral skill, one needs to acquire for academic advancement. However, as explicated in the chapter, the skill of reading comprehension in English may be influenced by environmental noise and language. Research regarding the impact of aircraft noise has not been conclusive particularly in the South African context. Furthermore, the multilingual context of South Africa is such that the question that the role language plays in the education system cannot be ignored. Chapter 3 therefore serves to highlight steps in which the research undertook to empirically investigate the theoretical understandings and debates regarding the role of aircraft noise and language on reading comprehension presented in this chapter.

CHAPTER THREE

METHODOLOGY

3.1 Context of the study

The current study is part of a larger South African based study namely, the Road and Aircraft Noise Exposure on Children's Cognition and Health (RANCH-SA). RANCH-SA investigated the impact environmental noise specifically aircraft noise has on primary school learners' memory, attention and reading comprehension abilities in the province of KwaZulu-Natal. The RANCH-SA study implemented a quantitative quasi-experimental research design in its investigation and is currently still ongoing; embarking on a longitudinal study

The RANCH-SA study administered five instruments. These were, the Suffolk Reading Scale Level 2 (SRS2) to assess reading comprehension, Toulouse Pieron test that assesses attention, the Child Memory Scale, the Search and Memory task, and the Figure Analogies subtest of the Quantitative battery for Cognitive Abilities Test that assesses IQ levels. The cognitive assessments mentioned above were administered in a group setting between 8am and 10 am in the morning. No hearing tests were done to screen for hearing impairments, however parents were asked if their children had any known hearing difficulty (Seabi et al., 2010).

The current study unlike the broader RANCH-SA study focuses only on the cognitive ability of reading comprehension and aimed to investigate the added effect of language on reading comprehension within a noisy environment. Furthermore the current study unlike the RANCH-SA study was cross-sectional in that it only utilises data collected by the RANCH-SA study for the year 2009 when the Durban International Airport was still situated close to some schools. Archival studies such as the current study make use of previously collected data for new analyses; the researcher is essentially utilising relevant data collected in the past to answer current research questions (Whitley, 2002).

3.2 Research Design

A quantitative research design was adopted by the present study. Whilst qualitative research has merits of its own, for this particular research, motivation for adopting a quantitative approach is due to paradigm's congruence with the aims and the nature of the study's research questions. Quantitative research is concerned with explaining a phenomenon by means of numerical data and statistical methods (Howell, 2004). The current study generated numerical data in the form of reading comprehension scores, which were used to examine the effects of noise and language between sample groups. Furthermore, because of the large sample size inherent in the study, statistical methods were valuable in condensing results and presenting them in a more manageable form. A quantitative approach also facilitates the testing of hypotheses which is valuable to the current study that sought to assess whether hypotheses of the impact of noise and/or language held 'true' and could be generalised to a larger population (Whitley, 2002).

Additionally as mentioned earlier the present study was archival in nature. It analysed previously collected data from the RANCH-SA study, specifically data regarding reading comprehension. Archival studies have both advantages and disadvantages to the current study that utilises its data. The current study inherits the experimental vigour, reliability and validity of the RANCH-SA study; yet will also inherit any methodological problems such as missing data values experienced in the RANCH-SA study.

3.3 Research Sample

The sample was drawn from the larger RANCH-SA study. In total 834 (N=834) learners across 5 public schools in the KwaZulu- Natal province participated in the study. Participants were primary school learners in the age range of 9-11 years old. The mean age being 11 years 8 months. The sample consisted of 322 (39%) males and 331 (40%) females (n=331). For 181 (21%) learners gender was unknown.

Table 1

Gender Distribution of Participants

Gender	N	%
Male	322	38
Female	331	40
Unidentified Data	181	21

As indicated in Table 2 below slightly more participants out of the 834 learners reported English as their primary language 410 (49 %) were EFL learners while 374 (45%) were EAL (Zulu, Xhosa and Sotho) learners. For 50 (6%) learners the primary language was unknown.

Table 2

Language Distribution of Participants

Language	N	%
English First Language Learners (EFL)	410	49
English Additional Language Learners (EAL)	374	45
Unidentified Data	50	6

The two schools situated under the flight path formed the experimental group and consisted of 437 (52%) participants, while the three schools situated far from the airport formed the control groups and comprised 337 (48%) participants.

Socio-economic status in the RANCH-SA study was measured by whether or not learners requested provision for free meals from the school. Three hundred and seventy one learners

(44%) reported that they received free meals at school while 338 learners (40%) did not receive meals and 125 (16%) of learners indicated they were unsure.

The RANCH-SA study utilised a non-probability purposive sampling frame. In non-probability sampling, participants are not randomly selected; consequently not everyone in the population has an equal chance of participating in the study (Barbie & Mouton1998). The disadvantage of such a sampling frame to the current study is the risk of obtaining a biased sample from the RANCH-SA study. A biased sample may provide results that are a function of the chosen sample and not an actual 'true' reflection of the rest of the population (Howell, 2004). Whilst this disadvantage is noted non-probability purposive sampling is at the same time advantageous because it enables the researcher to obtain information that is relevant to what the study is investigating (Bryman, 1993). The focus of the study is context specific, not everyone is chronically exposed to aircraft noise. Therefore the study obtained data from learners within close proximity to an airport and compared them to learners who have limited or no exposure to aircraft noise. This use of purposive sampling enabled the study to investigate how aircraft noise affects a particular group of people who experience this phenomenon instead of simply obtaining a generalised view of the impact of aircraft noise.

3.4 Instruments

Although the RANCH-SA study utilised a number of instruments for the various variables, the current study focuses on reading comprehension therefore detailed information will be given for the instrument concerned with reading comprehension – the Suffolk Reading Scale Level 2. Information on the biographical questionnaire, the noise measurement instrument and intellectual ability will also be provided as this information affects the current study.

3.4.1 Biographical Questionnaire

Information pertaining to participants' gender, age, race and languages was obtained from biographical questionnaires administered in the RANCH-SA study in the form of a child and parent questionnaire. The child questionnaire was administered in print form and completed before the assessment. The parent questionnaire was sent before hand to participants' parents of and collected from each learner on the day of the experiment. Information from the questionnaires aided in establishing the demographic profile of the sample. Moreover the

questionnaires enabled the researcher to extract the language profile of participants which was a central variable in the study.

3.4.2 Intellectual Ability

Intelligence was assessed using the Figure Analogies subset of the Quantitative battery for Cognitive Abilities Test (Lohman & Hagen, 2002). The Figure Analogy test used is also known as the Matching Mate and presents figural analogies of the type 'A?B:C?__'. The Figural Analogies test assesses both visualization and inductive reasoning. Reported reliability coefficient in literature for the test is Kuder-Richeson 0.91 (Lohman & Hagen, 2002). This Intelligence Quotient test has been utilised on a South African population in a RANCH-SA study (Seabi et al., 2010). The measurement of intellectual ability was of significance, because if not accounted for, participants' intellectual ability could be a confounding variable accounting for the possible differences found between the control and experimental groups on reading comprehension (Seabi et al., 2010).

3.4.3 Suffolk Reading Scale Level 2

There are a variety of ways to assess reading comprehension. Reading comprehension in the RANCH-SA study was assessed using the Suffolk Reading Scale Level 2 (SRS2). The SRS2 assessment is a scale which originated and was standardised in the United Kingdom (UK). The SRS2 assesses the reading comprehension of 6 year 4 months to 13 year 11 months children (Hagley, 2002). The SRS2 has different levels for different age groups and given that the RANCH-SA utilised participants in the age range of 9-11 years; level 2 was used to assess reading comprehension (Hagley, 2002). The test comprises 86 unsystematic multiple choice sentence completion questions, each containing five potential answers (Hagley, 2002). The SRS2 can be administered in either group or individual settings and takes approximately at most 50 minutes to administer (Hagley, 2002). The SRS2 is designed to fit as naturally as possible with school activities; in that the assessment is structured in a way that is similar to written and reading assignments given in school (Hagley, 2002). Test taking naturally tends to be anxiety provoking and the advantage of such a similarity is in the assessment not generating unwarranted anxiety in participants. Anxiety can potentially function as an extraneous variable that skews findings; consequently minimising test anxiety in any way is beneficial for any study (Hagley, 2002).

The SRS2 has a test-retest coefficient of (0.88), indicating that the test will yield similar results even when administered at different times (Hagley, 2002). Regarding validity the SRS2 has a high correlation of (0.85) with teacher's estimates of children's reading ability (Hagley, 2002). The SRS2 has not been standardised for the South African context however, and this may present issues around language and cultural test biases (Cockcroft, 2008). Bias occurs when the content in an assessment disadvantages a certain population and facilitates discrepancies in grasping what is being conveyed in an assessment (Cockcroft, 2008, Foxcroft & Roodt, 2001). A South African study found that although the SRS2 has not been standardised in the South African context, it has a Cronbach's alpha of 0.93 (Ramaahlo, 2010). This indicates a more than satisfactory alpha, which in turn translates to the SRS2 being considered predominantly reliable even within a different context such as SA (Ramaahlo, 2010). The use of the SRS2 can thus be justified to some extent in assessing reading comprehension in South Africa where there exists limited reading comprehension tests adapted for the South African context (Ramaahlo, 2010).

3.4.4 Noise Measurements

Noise in the larger study was measured using the SVAN 955 Type 1 sound level meter (Seabi et al., 2010). As a precautionary measure to check the instrument calibration before and after the measurements were completed, a Rion acoustic calibrator was used (Seabi et al., 2010). Noise levels were recorded for the duration of when the cognitive tests were administered (8am to 10am). In the experimental group average sound level (LAeq) recorded was 69 with a maximum of 95dBa, and in the control group 55 with a maximum of 74dBA (Seabi et al., 2010).

3.5 Procedure

In the RANCH-SA study, before the experiment was embarked, permission was obtained from educational authorities and parents of the learners to participate in the study as ethically required. In addition informed assent was obtained from the participants themselves. Only when assent was obtained from learners and consent letters had been completed and handed in to researchers was a learner allowed to participate (Seabi et al., 2010). Experimental schools were selected on the basis of exposure to aircraft noise. The two experimental schools selected were directly situated under airport flight paths whilst control schools, were selected based on their distance away from airports. The three control schools largely differed

from the experimental schools in their exposure to aircraft noise, however they were similar in terms of socio-economic demographics. All cognitive assessments were group administered between 8am and 10 am for both the control and experimental groups. RANCH-SA assessment administrators were trained in advance on standard assessment protocol and how to administer the actual cognitive tests (van de Merwe, 2009). On the day of testing the assessment administrators introduced themselves according to the RANCH-SA script which avoided the word 'noise' so as not to influence participants' perceptions of the experiment. The SRS2 was one of the latter assessments to be administered according to the RANCH-SA protocol (Ramaahlo, 2010). Each testing procedure began with practice items to ensure that participants understood what was required in the assessment. Completed tests were placed in a coded envelop straight after the assessment was completed. Each participant had a coded envelope with an identity number. Noise levels reported in the previous heading for both the control and experimental groups were recorded for the duration of the assessments (Seabi et al., 2010).

The researcher in the current study initially obtained internal ethical clearance from the University (see Appendix A). The researcher further obtained permission to access and conduct research using archived data pertaining to reading comprehension, from researchers in the University involved in the Ranch-SA study,

3.6 Data analysis

Based on the research problem articulated in Chapter one, the general purpose of the study was to examine the effect of two independent variables: Aircraft Noise and Language on Reading Comprehension. Analysis of data in the study was run using the Statistical Package for Social Science (SPSS). Variables in the study were normally distributed and the conditions of homogeneity of variance were met therefore parametric analyses were conducted.

The data set being quantitative in nature was analysed using descriptive statistics (means and standard deviations), and a Univariate General Linear Model. A Univariate General Linear Model is a technique used to conduct an Analysis of Variance for studies with two or more factors on one dependent variable (Bryman & Cramer, 1999). Although the study focuses on two fixed effects, the model simultaneously allowed the study to assess random effects (gender and socio-economic status) as well as control for intellectual ability, a covariate in

the study. Participants' gender, socio-economic status and intellectual ability can be thought of as natural confounds that can influence differences in reading comprehension performance. It was deemed important to control for these confounding variables in order to eliminate plausible explanations and gain a more robust picture of the impact of noise and language on reading comprehension. Nullifying the confounding variables functioned to increase the internal validity of the study (Whitley, 2002). Although age was not directly controlled for in the study; it is believed that age is encompassed within intellectual ability. It is thought that intellectual ability controlled for in the study is a better indicator of reading comprehension performance given that age level does not necessarily equate to superior performance in tasks. Finally, the Univariate General linear Model made it possible to establish whether there is an interaction between aircraft noise and language on reading comprehension (Howell, 2004).

3.7 Hypotheses of the study

The specific hypotheses tested in the study are provided below:

(Ho1): There is no noise effect on primary learners' reading comprehension performance.

(Ha1): There is a noise effect on primary learners' reading comprehension performance.

(Ho2): There is no difference in performance between EFL and EAL primary learners on reading comprehension.

(Ha2): There is a difference in performance between EFL and EAL primary learners on reading comprehension.

(Ho3): There is no noise and language interaction on primary learners' reading comprehension performance.

(Ha3): There is some interaction between noise and language on primary learners' reading comprehension.

3.8 Ethical considerations

Research is an intrusion of people's lives; it is therefore important for the researcher to ensure participants wellbeing throughout the research process (Barbie & Mouton, 1998). The current

study falls within the ethical clearance of the larger RANCH-SA study; because the researcher was not engaging with participants directly but rather records of data.

The RANCH-SA study followed the following ethical procedures. For informed consent, an information letter was sent to school authorities and the parents of possible participants. This letter outlined information on the nature of the study and what participation would entail (Babbie & Mouton, 1998). This information letter also informed parents of who would be able to access data; including the possibility of other researchers affiliated with the RANCH-SA accessing data. The right to withdraw at any point in study, as well as how feedback from the study could be obtained was also highlighted. Researchers also informed potential participants of the lack of direct benefit for participating in the study (Bryman, 1993). A parent signing a consent form was considered as informed consent; furthermore assent from the children themselves was also obtained. Only after educational authority and parental consent was obtained, were children grafted into the study (Seabi et al., 2010).

Given the public nature of assessments administered in a group setting, anonymity could not be ensured. However participants were ensured that information would be kept safe and confidential. Further no identifying information was incorporated in the write up of any reports. Finally details pertaining to free counselling services were provided in the event that any of the participants would need to use these services. Given the nature of the study no foreseen harm was expected however (Seabi et al., 2010).

In the present study internal ethics was obtained from the University (see Appendix A). Information accessed from the RANCH-SA archives was only used for the purposes of this research. Participant names were unknown to the researcher given that code numbers instead of names were used when data was captured in the RANCH-SA study. Furthermore collection of data was done under the supervision of a registered psychologist involved in the RANCH-SA study and no identifying information was incorporated in the write up of this study.

CHAPTER FOUR

RESULTS

4.1 Overview of Data Analysis

This chapter presents an overview of the statistical analysis conducted in the study and the results thereof. Two levels of analysis were conducted in order to present a comprehensive set of results. The first level, descriptive statistics allow for the description and analysis of a sample without drawing any inferences about a larger group. The goal therefore of descriptive statistics, is to summarise data into useful information in order to determine the general trend of the data that may have otherwise remained obscured (Bryman & Cramer, 1999). In this study descriptive statistics were employed to describe the sample in terms of the control and experimental groups, language, gender and indication of socio-economic status. The second level, inferential statistics allow for the testing of hypotheses and reaching conclusions about the sample that can be generalized to a larger population (Bryman & Cramer, 1999). Inferential statistics were valuable in testing hypotheses of the present study in order to gain an understanding of the effects of noise and language proficiency in reading comprehension performance. Descriptive statistics are presented first in the chapter followed by inferential statistics.

4.2 Descriptive Statistics

Descriptive statistics for the SRS2, which measured reading comprehension, are presented in Table 3. Of note is that out of the total 834, 141 (17%) participants did not complete the reading comprehension assessment therefore in total only 693 (83%) of the scores were available for analysis. The reading comprehension mean for this South African sample is significantly lower (mean = 31.25) than that reported in a similar study (mean = 98.2) conducted in the UK. The Haines et al. (2001b) study that also utilised the SRS2 as a measure of reading comprehension reported a mean of 99.29 after adjusting for ethnicity, main language and age. The sample in Haines et al. (2001b) may have been at a better advantage given that the SRS2 is adapted for a UK population and also had eight schools unlike the 5 in the current study. However the large difference in means generally highlights a lower level of reading comprehension performance of South African learners compared to UK learners.

Table 3

Descriptive statistics for reading comprehension

	Mean	**SD**	**Minimum**	**Maximum**	**N of Items**
Reading Comprehension	31.25	15.68	0	70	86

Table 4 below shows mean scores of reading comprehension for both the control and experimental groups, as well as for EFL and EAL learners. Regarding exposure to aircraft noise those not exposed to aircraft noise (control), as anticipated showed higher reading comprehension performance (M=32.44, SD=16.71) compared to the experimental group exposed to aircraft noise (M=29.81, SD=14.23). While learners not exposed to aircraft noise showed relatively higher reading comprehension performance, there was more variability of scores in this group meaning that there were inconsistencies in how well EFL learners performed on the SRS2.

A comparison of the language groups shows that EFL learners performed better (M=36.19, SD=14.91) in reading comprehension than their EAL counterparts (M=28.60, SD=13.51), as presented in Table 4. This difference in performance was anticipated given that the SRS2 is an English assessment. Moreover the mean score of EFL learners is above the study's population average on the SRS2 (M=31.25). This highlights that the overall reading comprehension performance for English first language speaking learners generally surpasses the reading comprehension performance of the study's sample as a whole. Meanwhile EAL learners not only performed lower than their EFL counterparts but as a group they performed below average than the population's reading comprehension performance on the SRS2.

Table 4

Reading Comprehension scores of Aircraft noise and Language groups

Grouping	N	Mean	SD
Experimental	313	29.81	14.23
Control	380	32.44	16.71
EFL	342	36.19	14.91
EAL	318	28.60	13.51

The study was also interested in the interaction between aircraft noise and main language spoken on reading comprehension. The interaction means presented in Table 5 show similar trends of the main effects where EFL learners not exposed to noise showed superior reading comprehension performance (M=40.9, SD=14.06) than all the other groups in the study. As can be observed from the table the largest difference in mean scores was between EFL learners in the control (M=40.9) and EFL learners in the experimental group (M=30.16). This suggests the presence of an interaction between aircraft noise and language which is elaborated in the later section of this chapter. For EAL groups on the other hand, whether they were exposed to chronic aircraft noise or not mean scores for reading comprehension were lowered. This indicates that the effect of noise on EAL learners' reading comprehension performance is generally negligible.

Table 5

Reading Comprehension scores of interaction between Aircraft Noise and Language

Grouping	Language	N	Mean	SD
Experimental	**EFL**	151	30.16	13.76
	EAL	162	29.48	14.69
Control	**EFL**	191	40.95	14.06
	EAL	156	27.69	12.14

4.3 Inferential Statistics

As highlighted in the method chapter a Univariate General Linear Model was used to test the effect of aircraft noise and language on reading comprehension. In addition the model controlled for the possible impact of intellectual ability, gender and socio-economic status on results. Intellectual ability was controlled for as a covariate in the model and no statistically significant differences were observed for either gender groups ($F(1,653) = 1.81$, $p = .179$), or level of socio-economic status ($F=(3,709)=2.10$, $p = .100$) on reading comprehension ($\alpha = 0.05$). Therefore it can be thought that neither of the aforementioned confounds accounted for the variance in reading comprehension.

In addition to null hypothesis significant testing, effect sizes are provided in the study. Effect sizes function to estimate the magnitude of influence the main effects have on a dependent variable (Whitley, 2002). It would not be of use to simply conclude from the null hypothesis significant testing results that noise influences reading comprehension. This could lead to incorrect conclusions and sweeping generalisations. Therefore in the current study effect sizes gave indication of how much variance in reading comprehension is influenced by aircraft noise and/or language. Furthermore, effect sizes enabled the researcher to establish which main effect had the greatest influence on reading comprehension performance for the different groups in the study. Although SPSS software used to analyse data in the study a supplies partial eta squared effect sizes output, Cohen's d effect sizes were calculated instead. This is because Cohen's d is resistant to sample size influence unlike the partial eta squared

which can affected by a large sample size such as that inherent in the current study (Rosnow & Rosenthal, 2008). Moreover partial eta squared values do not sum to one making interpretations of the effect size problematic (Rosnow & Rosenthal, 2008).

4.3.1 The effect of aircraft noise on reading comprehension

Regarding the first research question which sought to examine the impact aircraft noise has on reading comprehension. Results indicated, statistically significant differences between the experimental and control groups on reading comprehension in favour of the control group who were not exposed to aircraft noise ($F= (1,347)=8.42$, $p<.004$). This implies that learners exposed to chronic aircraft noise had lower scores for reading comprehension than learners not exposed to the same intensity of noise; confirming hypothesis one. However a small effect size $d= 0.17$ was determined. Thus indicating that although exposure to aircraft noise negatively impacts on reading comprehension the impact is very minimal. Table 6 presents a summary of the main effects and interaction effects on reading comprehension.

Table 6

ANOVA Table

Variable	DF	F	Sig
Aircraft Noise	1	8.42	.004*
Language	1	21.21	.000*
Aircraft Noise & Language	1	25.62	.000*

*indicates significance at the 0.05 level ($p<.05$)

4.3.2 The effects of language spoken on reading comprehension

Question two was concerned with the difference between EFL learners and EAL learners. It was postulated that EFL learners would perform significantly better than EAL learners on a reading comprehension test given that the SRS2 is an English based assessment. As

illustrated in Table 6, a statistical significant difference was observed in favour of EFL learners (F=(1;660), p=.000). This suggests that learners' primary language influences reading comprehension performance particularly if the assessment is not in their main spoken language (home language). A moderate effect size d=0.52 for language on reading comprehension was determined. This is a larger effect than that of aircraft noise and serves to highlight the larger influence language has on reading comprehension performance.

4.3.3 Aircraft noise and Language on reading comprehension

The study was additionally interested in investigating whether noise and language interact to influence learners' performance on reading comprehension. It was hypothesised that learners who were both exposed to aircraft noise and non-English first language speakers would perform poorly on reading comprehension assessment. Results as presented in Table 6 showed statistically significant differences in favour of English learners not exposed to aircraft noise (F(1,660)=25.621, p=.000). These results suggest a combined effect of noise and language on reading comprehension. The effect of this interaction is small (d=0.33) however. Only 33 per cent of the samples' reading comprehension performance is accounted for by the combined effect of noise and language.

The nature of the interaction of noise and the primary language spoken as illustrated by Figure 1 below is an antagonistic type interaction. An antagonistic interaction occurs when two variables each work in a certain way when examined separately, but when combined an opposite effect occurs (Howell, 2004). In the present study the effect of language reversed when the two independent variables were examined simultaneously. As highlighted in earlier sections of the chapter, the largest differences in means were observed between EFL exposed to chronic noise and EFL learners in the control. Results suggest that although EFL learners consistently performed better than EAL learners in the study, when EFL learners were exposed to noise their mean score on reading comprehension was significantly lower than their counterparts not exposed to noise; as illustrated by graph one. Moreover, a large effect size, d=.76 was established when EFL learners were examined separately. This condition exhibited the largest effect in the study. Thus it can be thought that reading comprehension performance of EFL learners is most affected by environmental noise and not language. This is expected given that the reading comprehension assessment was in a language learners are considered to be more proficient in. EAL learners on the other hand generally showed poorer

reading comprehension performance and showed minimal reading comprehension differences between learners in noise or minimal noise setting. Interestingly, EAL learners exposed to aircraft noise performed better than their counterparts who were not exposed to a similar level of noise. These results suggest that for EAL learners' language and not aircraft noise makes the most difference in reading comprehension performance.

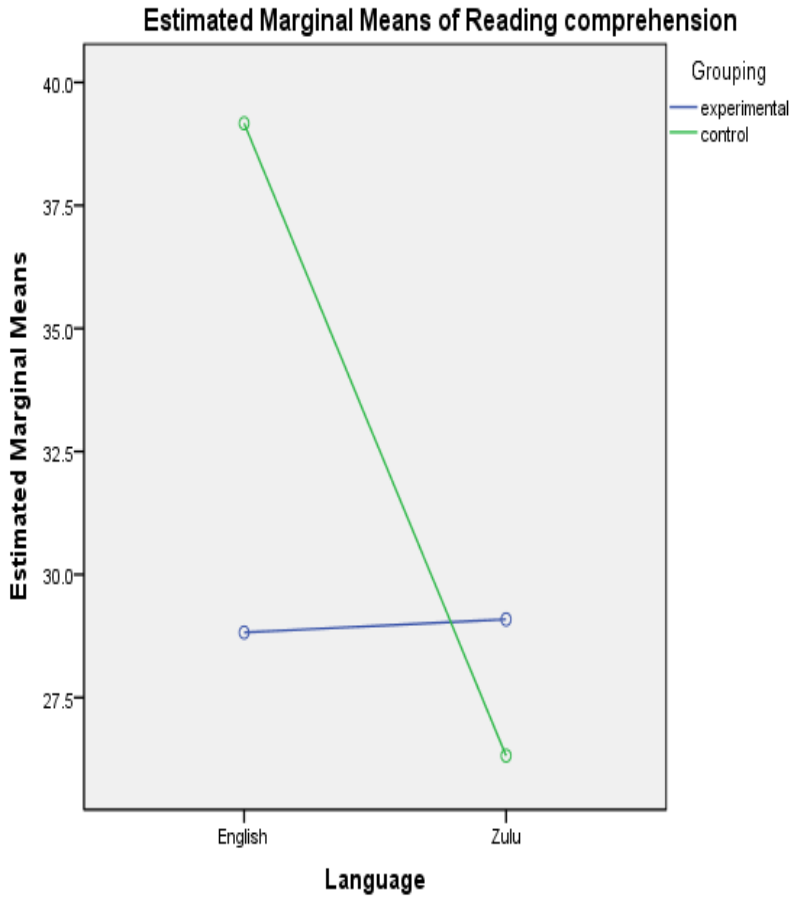


Figure 1: Aircraft noise and language interaction plots for reading comprehension

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 Overview of chapter

The study was concerned with a comparison of reading comprehension scores between two sample groups-learners exposed to chronic aircraft noise and those not exposed to aircraft noise, and learners' whose primary language is English and English Additional Language (EAL) learners. The aim of the study was thus to explore the impact of aircraft noise exposure and in addition the influence of language on the cognitive ability of reading comprehension in a multilingual country such as South Africa.

The results of the study, as delineated in the previous chapter are interpreted and discussed in context of literature reviewed in Chapter Two. The first section of the chapter is divided into three sections: the effect of aircraft noise, the effect of language and the combined effect of aircraft noise and language on reading comprehension. The last section of the chapter discusses implications of the study's results, how the results of the study apply to the 'real world' and identifies areas in the field that can further be investigated to attain a more holistic understanding of the impact of aircraft noise and language on reading comprehension. The strength and limitations of the study are also discussed in the chapter.

5.2 The effect of aircraft noise on reading comprehension

As already mentioned, the Suffolk Reading Scale 2 was used as a measure of reading comprehension. The findings of the study demonstrated a statistical difference between learners exposed to aircraft noise and those in quieter area. These results corroborate earlier empirical studies. For example, Hygge et al. (2002) reported significant reading comprehension impairments for learners situated near the previous Durban International Airport vicinity. Additionally the Heathrow study by Haines et al. (2001) showed similar results of delayed reading ability for learners in the high noise group. These findings offer some evidence for the vulnerability of language acquisition and processing in a noisy

environment. As highlighted in the literature review, according to the WHO guidelines aircraft noise is twice over what is considered acceptable noise levels still conducive to learning (Berglund et al., 1999). The current study however, unlike previous studies that also found significant noise effects on reading comprehension additionally provided an indication of the extent that noise impacts on reading comprehension performance. The small effect size in the study suggests that although aircraft noise may act as a risk factor that impairs reading comprehension performance the risk is small.

5.3 Effect of language on reading comprehension

Hypothesis two in the study proposed that EFL learners would perform better than EAL learners on a reading comprehension assessment. This prediction was based on Sternberg's theory (1996) that suggests that low proficiency of the language of a text is likely to result in a limited understanding of that text. In an assessment situation this is likely to translate into lowered performance. The results in the current study corroborated the latter; a significant difference in performance was observed between EAL and EFL learners in favour of the EFL learners. These findings support those found in the previous study (Ireland-Lathy, 2006), which revealed that EAL learners are at a greater disadvantage with regards to literacy tasks such as the SRS 2 which is in English.

Further, EAL learners performed consistently lower than their EFL counterparts regardless of their environmental noise condition. It would seem that language is a more pertinent factor for EAL learners with regards to English literacy and the optimal comprehension of English texts. Such results are not unfathomable in light of premises put forward by authors such as Cummins (1991). Cummins' (1991) BIC versus CALP argument provides meaning for the lowered performance of EAL learners. The EAL learners as Cummins (1991) suggests, have possibly acquired basic communication fluency in English but are lagging in terms of the academic proficiency needed to effectively comprehend the task one is reading. English Additional Language learners unlike their EFL counterparts are more likely to have the added effort of translating the text from English into their primary language and back to English again. Further, they are more likely to have a lowered vocabulary range, which places them at a disadvantage in identifying words and extracting meaning from texts needed in the skill of reading comprehension (Cornoldi & Oakhill, 1996). Moreover learning in what can be considered a 'new or foreign language' is argued, to be frustrating and anxiety provoking

which consequently may permeate into the EAL learners' performance (Mierim et al., 2010). All these factors can be considered as elements of language barriers that interfere with EAL learners' performance in English language based tasks. It is arguable that EAL learners would have higher scores if an assessment such as the SRS2 was in a language they are more comfortable with and proficient in. The issue of language bias in assessment and education is not new in South Africa and often results in what authors such as Foxcroft and Roodt (2001) and Mierman et al. (2010) highlight as a misdiagnosis of language barriers into learning disorders.

Furthermore, overall academic progress can also be compromised, as articulated in literature the reading of English texts evades into most if not all learning areas (Cornoldi & Oakhill, 1996). Even in mathematics one has to read and process language in order to gain what is being asked and a solution to the problem. The lowered performance of EAL learners in the study is thought to be symptomatic of the tendency of EAL learners to underachieve in English language based tasks in South Africa. As highlighted by linguistic and social experts such as Alexander (2005) English remains the language of command in today's society even in multilingual societies such as South Africa. As a result this hierarchy of the English language extends to social institutions such as schools. The issue of language thus creates unequal playing fields in education in countries such as South Africa and possibly other countries that share similar linguistic characteristics that also experience gaps in resource input in promoting optimal learning for all learners. It is useful to highlight here that it is not being suggested that English as a language is inherently immoral. Rather, it is that language creates discrepancies in learning. Authors such as Kamwendo (2006) and Webb (1999) articulate that a large number of learners experience a mismatch between the language of teaching and learning and the learner's primary language. Despite transformative policies in democratic SA, findings in the study highlight a disjuncture in what is desired by policy and how it is translated in reality. It seems that alignment between theory and practice has not yet been fully achieved.

However the conundrum that South Africa faces is that despite research findings of language bias in a learning area, limited resources in the form of teachers and capital to educate in all languages constrain the transformative objectives of the Language in Educational Policy (1997). Moreover despite findings the question of which language out of the 11 official

languages which can be found in any classroom becomes the mode of learning and teaching remains problematic (Ramaahlo, 2010). Language remains a contentious discussion in South Africa and findings from earlier studies and the current study highlight how it is palpably clear that language plays a significant role on reading comprehension, however how to rectify the obvious is not so apparent.

5.4 Effects of aircraft noise and language on reading comprehension

The greatest difference in reading comprehension performance when the effect of noise and language were analysed concurrently was observed in the EFL learners' group. As highlighted in the previous chapter EFL learners not exposed to aircraft noise had the highest performance in an English reading comprehension assessment. Such findings are expected; from the literature reviewed, there are higher chances of processing and understanding a text or assessment when it is in one's primary language (Cain & Oakhill, 2006; Stenberg, 1996). Furthermore, although exposed to some noise EFL learners in the non- aircraft noise condition were in a more conducive environment where they were less likely not to be distracted by noise and to focus on the reading comprehension task (Edwards et al., 2002).

However, for EFL learners situated near an airport although they performed better than both EAL sample groups, their reading comprehension performance noticeably plummeted in comparison to their EFL learners counterparts. These results suggest that while important, the issue of language is not always the most pertinent factor impacting reading comprehension performance. Environmental stressors such as aircraft noise are able to compromise tasks such as reading for learners who are expected not to struggle with an assessment in their primary language. The physical environment for those already proficient in the language, English being the case in point is crucial for optimal performance in classroom activities that involve the comprehension of texts. Given that the study controlled for gender, socio-economic status and intellectual ability it is not unreasonable to suggest that aircraft noise hinders reading comprehension performance for some learners. Research (Berglund et al., 1999; Hygge, 2002) supports the notion that environmental noise and associated factors such as annoyance can undermine processes of learning and teaching.

To the author's knowledge at time of writing there were no other studies that have looked at the interaction of noise and language on reading comprehension. Findings of the study contribute somewhat to filling gaps in literature pointed out in chapter two. If language for

the English learner is not the most relatable mediator, it could be thought that other factors such as annoyance and decreased attention underlie the impact of aircraft noise. Although not the focus in the study, learner's annoyance to aircraft noise was included in the child questionnaire. Most Learners reported being annoyed by aircraft noise at some points (n=525) while fewer learners (n=177) indicated that they were never annoyed by aircraft noise.

Miedema (2007) conducted a meta-analysis of people's reaction to noise. The analysis highlighted that constant exposure to noise, does not necessarily mean one will become accustomed to noise and is no longer distracted by it (Miedema, 2007). In the context of the current study; even though learners in the study were constantly exposed to noise, its negative impact can be thought to have remained and influenced reading comprehension performance.

Interestingly on the other hand, EAL learners exposed to chronic aircraft noise performed better than EAL learners not exposed to noise in the assessment. These findings were not anticipated. One would expect that having to grapple with processing 'another language' in unfavourable conditions would pose as the most influential threat to impair reading comprehension performance. It should be noted here however that the difference in performance between these two groups was minimal. Findings of the study do however persuade rethinking of what is decisive for achievement in certain learning areas for different learners. For EAL learners, exposure to chronic noise or not, the language mismatch appears to be the most decisive factor to reading comprehension performance. Taylor et al. (2003) also stress the unambiguous influential role of language in learning and its ability to either foster optimal or difficulties in learning. This is not to say that the physical environment is always completely negligible, in this case environmental conditions appear to be secondary to language for EAL learners when faced with an English assessment.

5.5 Strengths and value of the current study

The findings of the study provide some insight into the possible effects of environmental noise and socio-cultural factors such as language pose on the cognitive ability of reading comprehension. The study as far as possible controlled for influential confounding variables (gender, socio-economic status and intellectual ability) and thus to a large extent was robust in highlighting the impact of aircraft noise and/or language on reading comprehension. Knowing the influence of aircraft noise and language have on an important learning aspect

such as reading comprehension is helpful in overcoming barriers to learning and promotes optimal development for diverse learners. Thus the study is in line with the objectives of South Africa's overarching constitution and specifically the Language in Education policy (1997). The study also highlights the significance of using assessments normed on the population they are being used on as well as learners being assessed in their primary language. Further, the importance of airports being located away from schools is also highlighted in the study.

In addition to null hypothesis significant testing, standardised effect sizes were provided in the study. Sweeping generalizations were avoided and findings in the study are comparable to previous empirical studies. Furthermore, effect sizes such as the Cohen's d given in the study are resistant to sample size influence unlike null hypothesis testing (Howell, 2004). The study had a reasonable sized sample and this could have influenced the observed significant differences. However the provision of effect sizes balances this effect out. The aim of research is to provide as accurate as can be information about the world we live in (Wallace & Wray, 2006). In the bigger picture a more accurate representation of how noise and/or language impacts reading comprehension was attained. The research findings also serve to motivate for future research in the field especially given the backdrop of the need for transformation in the educational sphere being echoed in South Africa.

5.6 Limitations of the study

Results in the study should be read in the context of the following limitations. Like most studies on aircraft noise, the study was cross-sectional. A problem with cross-sectional studies is that conclusions are correlational, causal inferences are highly unlikely (Rosnow & Rosenthal, 2008). Therefore it cannot be said that chronic exposure to aircraft noise for instance causes impaired reading comprehension. However true experiments that allow for casual inferences are not always practical and may function to compromise ecological validity by making the study less naturalistic (Whitley, 2002). Moreover while causal inferences cannot be made, information gained from correlational research is still able to contribute valuable knowledge to a field of study (Bryman, 1993).

An influential limitation to the study was the archival nature of the study. Problems in the capturing of data were out of the researcher's control and will consequently have bearing on results of the current study. The study was affected by missing data for all variables in the

study. In particular the largest amounts of missing data were reading comprehension scores. Reading comprehension was an important variable to have all if not most scores known, in that it was used to measure if aircraft noise and/or language influenced learning. Thus missing data for some learners' scores creates some level of uncertainty if observed results in the study would have remained if data was not missing.

Because the SRS2 was a multiple choice assessment there is a chance that learners may have guessed correctly in the assessment. Therefore scores may not be a 'true' reflection of reading comprehension performance. Furthermore according to RANCH-SA protocol the SRS2 was one of the latter assessments to be administered. As a result participants may have experienced fatigue and/or boredom during testing. This may account for the incomplete answer scripts which are marked negatively and translate to low scores of reading comprehension. Participants' reading comprehension performance may thus be a reflection of fatigue than actual reading comprehension performance. However cloze assessments such as the SRS2 tend to get progressively harder, unanswered scripts may thus be a reflection of an inability to answer questions (Cain & Oakhill, 2006).

Although the SRS2 was found to be reliable with a South African sample (Ramaahlo, 2010), it can still be argued that the reading scale not only measures reading comprehension but contains context bound questions. Analysis of some items in the scale shows that scale is liable to cultural bias. For example of item 21 July comes in summer, item 37 February comes in the winter. July falls in summer and winter in February which is contrary to South African seasonal patterns (Ramaahlo, 2010). These questions require knowledge of seasons in the United Kingdom where the assessment originated. Therefore the construct validity of reading comprehension can be thought to be compromised. However it should be noted that of the 86 questions in the SRS2 only five of these questions are context bound items, therefore these items may not heavily bias the validity of reading comprehension scores observed.

Although language is central to learning aspects such as reading comprehension, it cannot be said that it is the sole factor that facilitates differences between English First language learners and English Additional Language learners. Other variables such as learner motivation or access to learning resources within the school may be confounding with the language variable in the study and contributing to differences observed. Aspects such as

learner motivation, or an educators teaching style were not controlled for in the study and are beyond the scope of this study but are important areas for future research. It is also noted that parent's education and occupation was not controlled for in the study. Parental level of education and occupation impact on a child's language exposure and consequently reading comprehension skills.

Finally although the sample was reasonably large the sample mainly comprised English and Zulu learners, other language groups were minute. Therefore the representivity and consequently generalisability of the study is limited.

5.7 Suggestions for Future Research

Given that world and events that occur within it are not one dimensional, no singular study on its own can fully capture all the aspects of a topic of interest. This study sought to contribute knowledge on the impact of environmental noise (aircraft noise) and language on cognitive ability of reading comprehension. However an ecosystemic analysis of the situation would prove useful in obtaining a more holistic picture. If a child does not exist in isolation and learning does not occur in a vacuum, research accordingly needs to delve into the entire learning environment (Edwards et al., 2002). Research needs to look into the effects of noise on educators for instance, how noise affects their ability to teach. Further, the effects of noise exposure for example in the home environment need also to be explored. As highlighted, the current study was cross-sectional and only looked at the phenomena in one location at a particular time. There is need to explore the effects of noise for example across different contexts. This would prove useful in gaining insight into the influence of environmental noise in the different contexts where the learner is situated in. In addition there is need for research that investigates potential protective effects of sound insulation of school environments. Evaluating whether sound mitigation interventions of school environments are effective or not (Edwards et al., 2002).

The issue of language is pertinent in South Africa, the current study was mainly limited to English and Zulu speakers, and it would be useful for research to investigate the dynamics that occur with other South African languages. Further, the SRS2 is a multiple choice cloze type measure of reading comprehension, future studies could utilise a different form of assessment such as one that involves the thematic understanding of a text that does not provide potential answers.

5.8 Conclusion

The study aimed to examine the impact of both aircraft noise and language on the cognitive ability of reading comprehension in a sample of learners in the KwaZulu-Natal area. The Suffolk Reading Scale2 was used as a measure of reading comprehension in differential contexts of exposure to aircraft noise and linguistic backgrounds.

The results in the study corroborated the study's initial hypotheses. Findings in the study suggest that marginalisation can take on various dimensions, socially, culturally and even geographically. It is not being suggested that because one is exposed to chronic aircraft noise or that having English as a third language equates to lower levels of reading comprehension skills. Rather findings here should be interpreted as that those who are exposed to chronic aircraft noise or who are not primary English learners are more likely than those who are not in a similar position to have difficulties and exhibit lower reading comprehension skills. Findings in the study further reiterate the notion that learners cannot be fit into one mould; different learners have varying priority needs for optimal educational development. For EFL learners noisy environments have the most bearing on reading comprehension performance while language for EAL learners is a more likely influential predictor of reading comprehension performance.

As highlighted, the ability to read and comprehend text infiltrates into most if not all areas of learning and is thus crucial for progression in the educational sphere and today's world. Thus while exposure to environmental noise such as that from aircraft and issues of language are not the only factors that affect the important skill of reading comprehension. The significance of examining these factors is being intentional in remedying identified areas that affect education. The importance of fostering the most favourable educational experience is patent.

> *"Education is the great engine of personal development. It is through education that the daughter of a peasant can become a doctor, that a son of a mineworker can become the head of the mine, that a child of farm workers can become the president of a great nation."(Nelson Mandela)*

Any effort that enhances the educational experience of all learners in a country such as South Africa is indispensable.

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APPENDIX A: Ethics Clearance Form

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (SCHOOL OF HUMAN & COMMUNITY DEVELOPMENT

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: MED/11/0061H**
PROJECT TITLE:	Impact of aircraft noise and language on primary school learners' reading comprehension in Kwazulu-Natal
INVESTIGATORS **DEPARTMENT**	Kasimonje Bahati Psychology
DATE CONSIDERED	22/03/11
DECISION OF COMMITTEE*	Approved

This ethical clearance is valid for 2 years and may be renewed upon application

DATE: 30 June 2011

CHAIRPERSON
(Professor M. Lucas)

cc Supervisor: Mr. Joseph Seabi
Psychology

DECLARATION OF INVESTIGATOR (S)

To be completed in duplicate and **one copy** returned to the Secretary, Room 100015, 10th floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure be contemplated from the research procedure, as approved, I/we undertake to submit a revised protocol to the Committee.

This ethical clearance will expire on 31 December 2013

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

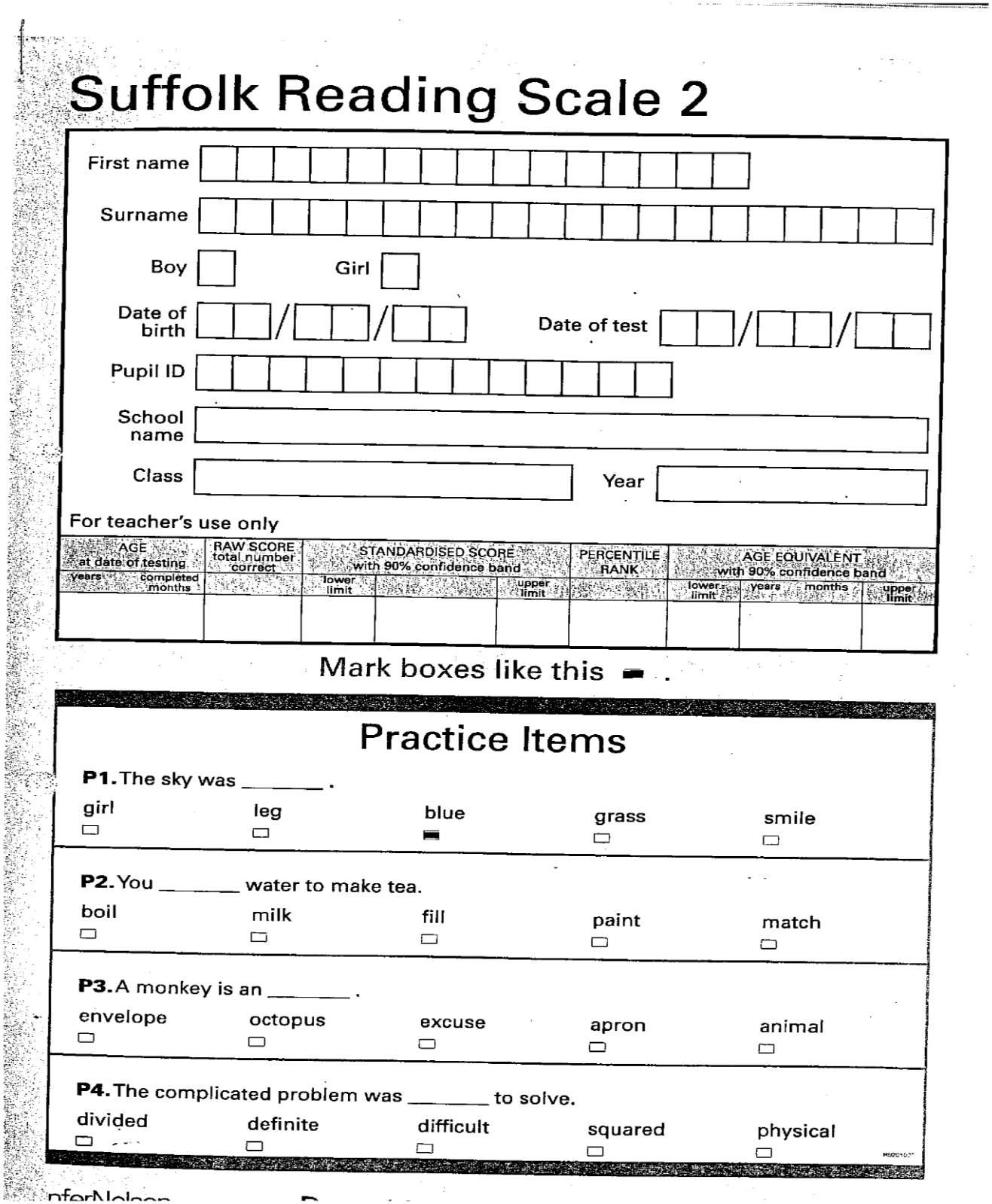
Appendix B: Child Questionnaire
Example of Question

3. What is the **main language spoken** in your **home**?
*tick **ONE** language*

❑ 1 English ❑ 2 Bengali ❑ 3 Hindi ❑ 4 Urdu

❑ 5 Gujerati ❑ 6 Punjabi ❑ 7 Tamil ❑ 8 Any African language 62

Appendix C: Suffolk Reading Scale 2



Suffolk Reading Scale 2

First name

Surname

Boy ☐ Girl ☐

Date of birth ☐☐/☐☐/☐☐ Date of test ☐☐/☐☐/☐☐

Pupil ID

School name

Class Year

For teacher's use only

AGE at date of testing		RAW SCORE total number correct	STANDARDISED SCORE with 90% confidence band		PERCENTILE RANK	AGE EQUIVALENT with 90% confidence band		
years	completed months		lower limit	upper limit		lower limit	years months	upper limit

Mark boxes like this ■ .

Practice Items

P1. The sky was _____ .

girl ☐ leg ☐ blue ■ grass ☐ smile ☐

P2. You _____ water to make tea.

boil ☐ milk ☐ fill ☐ paint ☐ match ☐

P3. A monkey is an _____ .

envelope ☐ octopus ☐ excuse ☐ apron ☐ animal ☐

P4. The complicated problem was _____ to solve.

divided ☐ definite ☐ difficult ☐ squared ☐ physical ☐