THE PREVALENCE OF DYSLEXIA AMONG CHILDREN AGED 7 TO 9 IN A NAIROBI SCHOOL

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DECLARATION

I Irene Jepkoech Cheruiyot do declare that this dissertation is my own original work carried out in fulfillment of the requirement for the award of the degree of Masters of Science in Clinical Psychology at The University of Nairobi. I further declare that this dissertation proposal has not been submitted for the award of any other degree or to any other university.

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DEDICATION

I whole heartedly dedicate this research work to my beloved husband Peter, our daughters Phylis and Vicky and my sister Moureen whose continued support and encouragement has seen me through this long journey.

I also dedicate this work to the children of this country (Kenya) who despite their average or above average intelligence, struggle with learning due to specific learning difficulty (Dyslexia). Indeed your dreams are valid.

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ABBREVIATIONS AND ACRONYMS

APA: American Psychiatric Association

ARQ: At Risk Quotient

BDA: British Dyslexia Association

DSM IV-TR: Diagnostic Statistical Manual for Diagnosis of Mental Illnesses, 4th Edition Text Revision

DSM 5: Diagnostic Statistical Manual for Diagnosis of Mental Illnesses, 5th Edition

DST-J: Dyslexia Screening Test for juniors

fMRI: Functional Magnetic Resonance Imaging

ICD 10: International Classification of Diseases, 10th Edition

IQ: Intelligence Quotient

KNH: Kenyatta National Hospital

OERB: Oshwal Education and Relief Board

SPSS: Statistical Package for the Social Sciences

WHO: World Health Organization

DEFINITION OF OPERATIONAL TERMS

Dyslexia- Dyslexia is a specific learning difficulty that is characterized by the inability of a child to read, spell and write, despite the child having normal or above normal intelligence, well motivated and has appropriate level of education necessary for reading, spelling and writing.

Developmental dyslexia: Refers to a condition characterized by difficulty with learning to read fluently and with accurate comprehension despite normal intelligence.

Discrepancy: The difference in a learner's reading age and his/her chronological age.

Screening for dyslexia: Tests and procedures conducted to give indications of possible dyslexic difficulties.

Phonological awareness: The term refers to an individual's awareness of the sound structure of spoken words.

Phonic regularity: Refers to patterns of preferences exhibited by a language at the phonological/sound level.

Transparent Language- A language with fewer sounds and has a direct correspondence between sounds and letters making it easier to decode written words.

ABSTRACT

Background: Dyslexia is a term that describes why given populations of school-going children fails to learn to read in spite of normal intelligence, adequate environmental and educational opportunities. Some studies indicate that the prevalence of dyslexia is overestimated while others indicate an underestimation.

Objective: To identify the prevalence of dyslexia among children aged 7 to 9 in a Nairobi school and describe the child and parental demographic characteristics and dyslexia.

Method: With a sample size of 120, the study recruited children in class 2 and 3 attending a primary school in Nairobi. The Burt reading test was used to identify those children with a reading discrepancy of 9 months and over. The DST-J was then used to assess children who are at risk for dyslexia. The statistical package for social science (SPSS, version 20), was used to analyze the data which was then presented using tables, graphs, pie charts and narratives.

Results: The prevalence of dyslexia was 7.49%. The child's reading age (mean = 25.87 SD= 78.8, $p < 0.0001$) and the child's history of reading difficulties (mean = 1.86 SD= 0.35, $p< 0.0001$) was statistically significant with dyslexia. There was weak connection between parental demographic characteristic and dyslexia.

CHAPTER ONE

1.1: Introduction and Background

Literacy skills and in particular reading is essential for success in school as reading skills are utilized in all areas of academic subjects. There are children who read with ease yet there are those learners with developmental reading difficulties or dyslexia, whose reading is extremely a daunting task (Muter & Likierman, 2008). Their struggle with reading does overshadow the level of intelligence that they are in possession of as dyslexics have average or above average intelligence (Davis, 2003; Muter & Likierman, 2008 pp.15). Dyslexia, a neurological condition discovered over 100 years ago, is characterized by difficulties in phonological awareness, verbal memory, verbal processing speed and difficulties in processing visual and auditory information (Lyon, 2003). It is the commonest type of learning difficulty with each classroom having at least one learner with dyslexia in the USA (Hudson et al., 2007). Many of these children do experience emotional trauma, low self-esteem and usually tend to resort to disruptive behavior and clowning in order to mask their learning difficulties. Although learners with dyslexia do not tend to catch up nor improve their reading skills with time (Shaywitz et al., 1999), early identification and subsequent early intervention enable these children utilize alternative methods to learn to read at an early age. There is therefore a need to identify these children with dyslexia and those at risk for dyslexia

early enough in order to provide early intervention and avert the chances of dropping out of school and becoming delinquent due to frustration from difficulty with reading.

Some studies subdivide dyslexia into Acquired dyslexia and Developmental dyslexia (Coslett, 2000). Acquired dyslexia or alexia (divided into peripheral and central alexia) refers to a reading disorder acquired after the ability to read has been successfully established. The loss in the ability to read may be as a result of strokes or injuries such as Traumatic Brain Injury (Coslett, 2000). Unlike Acquired Dyslexia, Developmental dyslexia is present at birth and its effect last a life time (British Dyslexia Association, 2013) and is the focus of this study. Children with dyslexia will present with clinical characteristics such as difficulties with letter formation, naming letters, associating sounds(phonetics) with symbols (grapheme), spelling, writing, following instructions, distinguishing left from right, short term or working memory, balance, lack of organization among others (British Psychological Society (1999) as cited in Lyons, 2003). The term dyslexia will be used interchangeably in this study to mean Developmental Dyslexia.

1.2: STATEMENT OF THE PROBLEM

Dyslexia is a neurobiological disorder that affects 80% of all learners with learning difficulties. It is a disorder that cuts across all socio-economic classes and exists in all cultures though the prevalence may vary from one language to another depending on how transparent the language is and ranges from a low prevalence of 3% to a high of 17%. It is identified in childhood and persists through adolescence to adulthood. Failure to identify the disorder early enough and provide early intervention, leads to learners struggling with poor academic performance coupled with low self-esteem, emotional trauma and increased chances of school dropout.

CHAPTER TWO

2.0: LITERATURE REVIEW

There is a general consensus that children with dyslexia have difficulties at the phonological level (Fawcett & Nicolson, 2004; Scheepers, 2009) and thus have difficulties identifying letters sounds, mapping the letter names to their letter sounds and breaking a word into its constituent sound. Thus a child with dyslexia may substitute, replace, omit or add some letter sounds during a reading discourse or spelling task (Strydom & du Plessis, 2000 pp.122). Some children will have difficulties blending sounds to make words, while some will have difficulties with word storage and retrieval. A dyslexic reader will stumble, guess or sound out words while reading, their reading speed or fluency is much slower than non-impaired readers of their age and thus their reading is always a laborious task (Muter & Likierman, 2008 pp.14).

2.1: DEFINITION

Dyslexia is a neurobiological disorder that is present in all cultures, cuts across all socio-economic backgrounds and is present in children of low, average and superior intelligence (Bolhasan, 2009). The World Health Organization, ICD 10 defines dyslexia as a disorder manifested by difficulty learning to read despite conventional instruction, adequate intelligence and socio-cultural opportunity (WHO, 1993) whereas the

American Psychiatry Association DSM IV-TR, defines it as the reading achievement that is substantially below that expected given the person's chronological age, measured intelligence and age-appropriate education. The APA, DSM IV-TR categorizes reading disorder/ dyslexia as a disorder first diagnosed in infancy, childhood or adolescence (American Psychiatric Association, 2000). The DSM 5 has dyslexia under the category of specific Learning Disorders (SLD) and defines SLD as "persitent difficulties in learning and using academic skills as indicated by either in accurate or slow and effortful word reading or by difficulties with spelling or both" (APA, 2013). " It is a disorder that is characterized by an expected difficulty in reading in children and adults who otherwise possess the intelligence, motivation and schooling considered necessary for accurate and fluent reading "(Shaywitz, 1998) as cited in Shaywitz et al. (2002 pp.101). The disorder persists in adulthood as there is no evidence that children with dyslexia do ever catch up with their reading skills (Shaywitz et al., 1999). A comprehensive definition comes from the British Dyslexia Association, (2013) which defines dyslexia as a specific learning difficulty that mainly affects the development of literacy and language related skills. The disorder is likely to be present at birth and its effects are life-long. Difficulties with phonological processing, rapid naming, working memory and processing speed are also mention as characteristics present in dyslexics by the BDA definition.

2.2: ETIOLOGY

Research into the etiology of dyslexia is vast and ongoing and despite this, scientists are still unclear of the cause of dyslexia. We will discuss three factors that stand out as the cause (s) of dyslexia: genetic, neurobiological and environmental factors.

2.2.1: Genetic Factors

Dyslexia is thought to run in families and is heritable (Shaywitz et al., 2008) and thus children whose parents are dyslexic stand a 23% to 65% chance of being dyslexic whereas a child whose sibling is dyslexic stands a 40% chance of being dyslexic too(Pennington & Gilger, 1996 as cited in (Shaywitz et al., 2008). Recent genetic studies place the proportion of inherited factors involved in the development of dyslexia to be between 40% and 80% (Schumacher, 2007). This gives a proof that dyslexia is biological as its genes can be transferred from one generation to the next.

Linkage findings in dyslexia are relatively consistent across studies in comparison to findings for other psychiatric disorders (Schumacher, 2007). Several studies have been conducted to ascertain the exact genes that are linked to reading difficulties. Researchers working in the field of molecular genetics have implicated genes on four chromosomes (chromosome 2, 6, 15 and 18) to be linked to dyslexia (Sun et al., 2009). The researchers have gone further and have identified developmental dyslexia candidate regions/ DD regions which refer to nine regions on chromosome 15q, 6p, 2p,

6p, 3cen, 18p, 11p, 1p and Xq (Grigorenko et al., 2007; Sun et al., 2009). The regions represent the exact location of dyslexia on the gene loci.

2.2.2: Neurobiological Factors

Neurobiologists argue that the brain of a dyslexic child functions slightly different from that of non- dyslexic child. Results from neuroimaging techniques indicate that there are both structural and functional differences in the brains of dyslexic and non-dyslexic learners (Shaywitz et al. 2002). Using neuroimaging techniques such as the functional Magnetic Resonance Imaging (fMRI), researchers have been able to identify brain regions that are deficient in learners with dyslexia. The fMRI studies have indicated that dyslexia is linked to a failure of the left hemisphere posterior brain regions to function properly during reading. Three brain regions in particular the Broca's area, the parieto-temporal region and the occipito-temporal regions have been shown to be less active as they are under-stimulated during reading in learners with dyslexia (Shaywitz et al., 2002; Shaywitz & Shaywitz, 2004). The three regions are well known for their role in reading. The Broca's area is involved in articulation and word analysis, the parieto-temporal region is also involved in word analysis while the occipito-temporal region is involved in fluent reading (Shaywitz & Shaywitz, 2004).

A recent PET study of motor sequence learning shows that there are abnormalities in cerebellar activation in automatic processing and in new learning in dyslexics. This

indicates a cerebellum deficit, adding weight to the previous findings that up to 80% of dyslexic children show clinical signs of cerebellar abnormality. (Fawcett & Nicolson, 2004).

2.2.3: Environmental Factors

Although there is evidence that structural and functional difference in the brains of dyslexic and non-impaired readers exist (Shaywitz et al., 2002), studies have shown that early reading difficulties in some dyslexics may be as a result of adverse environmental conditions for language and literacy development or by poor teaching (Vellutino & Fletcher, 2005 pp. 373). Of all the causes of dyslexia, about 50% is attributed to environmental influences (Olson & Byrne, 2005) as cited in (Shaywitz et al., 2008). Environmental factors such as home conditions (e.g. poverty, delay in developmental milestones and inadequate stimulation), school conditions and literacy environment play a major role in influencing dyslexia (Sameulsson & Lundberg, 1996). Studies show that family environmental factors account for up to 25% of the childhood IQ (Lyon et al., 2003). While the environment may affect all other measures of dyslexia such as the working memory, verbal memory, verbal and visual processing speed among others, phonological ability is the only measure that is relatively unaffected by environmental influences (Samuelsson and Lundberg , 1996). Thus environmental influences play a major role in children's intellectual development and indeed anecdotal reports show that a stimulating environment can dramatically increase IQ, whereas a deprived environment can lead to a decrease in IQ (Strydom & du Plessis, 2000 pp.51). Sample (2006) reports of a randomized clinical trial set up to investigate the effects of social deprivation on the emotional, psychological and physical health of children in a Romanian orphanage. The study found that a child's environment had a marked effect

on intelligence and emotional development. It showed that children in the most deprived conditions had exceptionally low IQs, but once they were removed to foster homes, improved when tested again at 42 and 54 months (Sample, 2006).

Children in lower social classes have a relatively deprived environment and may have fewer learning resources, less privacy for study, less parental assistance, poorer role models, lower-quality schools, less motivation to excel intellectually among others (Sparknotes, 2013). Thus a child may not be considered or qualify as dyslexic under such circumstances.

2.3: PREVALENCE

There has been a long debate on the actual prevalence of dyslexia in a given population with some studies citing 10% (Roongpraiwan et al., 2002) while others citing a prevalence higher or lower than 10%, (Shaywitz et al. 2001). Estimates of the prevalence of dyslexia have been complicated since different studies apply different cut-off points as criteria for identifying learners with dyslexia (Schumaker et al., 2007; Shaywitz et al., 2008) and dyslexia manifests itself differently in various language according to levels of phonic regularity (Miles, 2004), but of all the children with learning difficulties, dyslexia affects 80% of the children. In the United States for instance, each classroom is said to have at least one child with reading difficulties (Hudson et al., 2007) with the prevalence of dyslexia among school-age going children in the USA being estimated to range between 5% to 17% (Shaywitz et al., 2002 ; Shaywitz & Shaywitz, 2003). Different estimates ranging between a prevalence of 3% to 6% is reported among school-going

children in the UK (Miles, 2004). In Italy, Barbiero et al. (2012) carried out a cross sectional study to evaluate the prevalence of dyslexia in an unselected school population. They worked with 8-10 year olds and found that the prevalence of dyslexia ranged from 3.1% to 3.2%. They concluded that dyslexia was largely underestimated in Italy.

Dyslexia is also evident in fast growing economies of the East. Incidence of dyslexia in primary school children in India is reported to be between 2- 18 % (Karande & Kulkarni, 2005). Most recent studies by (Mogasale et al., 2012) confirm this. Using a cross sectional multi-staged stratified randomized cluster sampling method and working with children aged 8-11 from 3rd to 4th grade, Mogasale et al.(2012) found out the prevalence of dyslexia to be 11.2% in a South Indian city. Still in Asia, a recent cross sectional study involving primary school children from 3rd to 6th grade shows the prevalence of dyslexia being 3.9 % in China with a reported high ratios in boys than girls (Sun et al., 2013).

In Africa, the documentation of the prevalence of dyslexia is unknown (Wajuihian and Naidoo, 2011). A study of the prevalence of reading difficulty in 2nd and 3rd grades in elementary school population in Egypt reported a 1% prevalence with the low prevalence being attributed to how the Arabic language is taught (Farrag et al., 1988) as cited in (Waijuihian & Naidoo, 2011). Catherine Hattingh in the International Book of

Dyslexia (Smythe, Everatt & Salter, 2003) reports that 40% to 50% of black school learners in South Africa have learning difficulties and mainly due to socio-political ideologies. She reports further that the term 'dyslexia' is scarcely used and addressed. The reason being that the huge number of reading disability found in learners in South Africa is as a result of causes that are neither neurological nor psychological in origin but mainly due to past socio-political injustices. Scheepers, (2009) recent research study on the relationship between the working memory and dyslexia confirms that little focus has been given to the subject of Dyslexia in South Africa. In Kenya, a study by Wanyoike, (1978) attempted to identify the reading difficulties exhibited by Kenyan children and the extent of the difficulties. The sample composed of eight Nairobi City Council 'High Cost' primary schools and used checklists and dyslexia screening test to identify the learners at risk for dyslexia. The results of the investigation supported the presence of dyslexia in Kenyan children but were too inconclusive to establish a reliable estimate of the prevalence. Eric William Fergusson in the International Book of Dyslexia on the other hand reports a 10% dyslexia incidence in Kenya and specifically from independent schools (Smythe, Everatt & Salter, 2003).

It is evident therefore that the variability in the prevalence of dyslexia is due to particular definition used, different methods and tests adopted for diagnosis (Schumacher et al, 2007), the type of disability evaluated whether dyslexia or learning

disability, different age ranges considered, the different geographical setting evaluated as well as the different language spoken by the children.

Sex-ratio is a subject of an ongoing debate. Anecdotal reports show that the prevalence of dyslexia is higher in boys than girls with the ratio of boys to girls being as high as 4:1. Though some epidemiological studies indicate that the prevalence is the same in both sexes (Shaywitz et al., 1990) and that the over representation of boys in the prevalence of dyslexia than girls is a result of bias behavioral observation (Shaywitz et al., 2008), recent studies indicate that the ratios of boys with dyslexia is higher than that of the girls (Berninger et al., 2008; Hawke et al., 2009 and Sun et al., 2013). Indeed Ruffer et al.(2004), provides evidence from four epidemiological studies about the nature, extent and significance of sex differences in dyslexia with results indicating that the rates of reading disability are significantly higher in boys (Ruffer et al., 2004). In general the sex ratio may be influenced by severity, IQ, and assessed cognitive profiles. (Olson RK. as cited in Schumacher et al., 2007).

2.4: EARLY IDENTIFICATION

Dyslexia is a neurological condition that tends to persist to adulthood and thus the difficult road of reading that children with dyslexia go through is immeasurable (Davis, 2003 introd.). It is essential that these learners are identified early enough and early intervention done. Though learners with dyslexia do not tend to improve nor even

catch up with their reading skills, they are able to utilize alternative reading skills if intervention is done early enough (Shaywitz, 2003).This is so as at an early age the human brain is malleable and capable of developing alternative neural pathways but after the period of brain plasticity subsides, it becomes extremely difficult for children to learn new ways of word identification and reading (Shaywitz, 2003). For children with dyslexia alternative reading skills means improved reading comprehension, fluency and accuracy of reading. This goes further to improve their self- esteem and the children become better adjusted emotionally.

2.5: RATIONALE

Knowledge about dyslexia is gaining ground all over the world but more so in the developed world. Measures have been put in place to ensure effective and in-time screening and identification of children with dyslexia and provision of early intervention to ensure that these children fully realize their potential and achieve their life goals. The developing countries are still lagging behind on these and thus have their learners going through the academic system unidentified and miserably struggling with their studies all through and through. There is often no scrutiny in Kenyan public schools and children with dyslexia are easily labeled as confused, lazy, thick-headed among other titles. Unlike the rest of the world, there is lack of research in the area of

dyslexia in Kenya and thus its prevalence is not fully known. Most information about dyslexia comes from the independent schools most of which follow the USA or BNC curriculum. Little is known about community and state-run schools incidences of dyslexia. The purpose of this study is to find out the prevalence of dyslexia among primary school children attending a community school. The researcher presumes that the high economic status and availability of advanced academic program with English as their second language, will aid in eliminating the disadvantages that come with low economic status and the risk factors for developing dyslexia among learners attending the school. After establishing the prevalence in the better off school, the same will later be expanded to public schools/ socially marginalized children. The findings from the study will not only add to the body of knowledge about dyslexia but will also open up fields for further research. The study findings will also be used by policy makers in providing programs for assessing, screening and provision of early intervention programs for learners with dyslexia.

2.6: STUDY QUESTION

The research study question is: What is the prevalence of Developmental Dyslexia among children in primary school?

2.7: OBJECTIVES

Broad Objective

To determine the prevalence of Dyslexia among children aged 7 to 9 attending primary school and whether environmental factors influence dyslexia outcomes.

Specific Objective

- Determine the prevalence of Dyslexia among children aged 7 to 9
- Describe the association between parental demographic data and Dyslexia
- Describe the association between child demographic data and Dyslexia

Secondary Objective

To provide suggestions based on the research findings that may aid in early identification and intervention of learners with Dyslexia and those at risk for Dyslexia.

CHAPTER THREE

STUDY DESIGN AND METHODOLOGY

3.1: STUDY DESIGN

The study was a descriptive cross-sectional kind and the methodology is described further here below.

3.2: STUDY AREA DESCRIPTION

The Primary school under study is located in Westlands Division of Nairobi County, offering British National Curriculum. It stands on a 2 acre piece of land and has 6 streams with a total of 36 classrooms with a student population of 894. The administration is made up of the headmistress at the top, followed by the deputy head-teacher and two Key-stage coordinators. It has a total of 86 teaching staff and 13 support staff. The school has different departments catering for the varied needs of the learners such as: The Inclusive Education Department offering academic and ADL (Activities of Daily Living) to children with special needs, Learning Support Department offering academic support to learners with learning difficulties (LD), English department and eight other departments.

3.3: STUDY POPULATION

The Primary school under study had a population of 894 pupils. The population of study was 318 being made up of children aged 7 to 9.

3.4: SAMPLING FRAME

The sampling frame involved the children aged 7 to 9.

3.5: INCLUSION CRITERIA

All participants who were attending the primary school were eligible if a) they were of ages 7 to 9 and were willing to participate in the study b) they were able to provide a written informed assent c) their parents were able to provide a written informed consent.

3.6: EXCLUSION CRITERIA

The researcher excluded participants who a) were unwilling to participate in the study b) were below 7 years or above 9 years c) those without a written informed consent d) presence of any significant psychopathology or distress that might interfere with assessment e) presence of a significant physical ailment that would interfere with assessment.

3.7: SAMPLE SIZE DETERMINATION AND FORMULAE USED

The researcher used the Cochran's sample size formula (Cochran, 1977) to get a sample size for the study.

$$n = \frac{Z^2 P (1 - P)}{d^2}$$

Where; n = the minimum sample size, Z= 1.96 which corresponds with 95% confidence interval, P = prevalence under investigation set at 3.9% (Sun et al., 2013), d = the degree of accuracy or margin of error set at 5% or 0.05.

The researcher used a significance level of 0.05, a prevalence of 3.9 % and population size of 318.

Therefore: $n = \frac{1.962 \times 0.05 (1 - 0.05)}{0.039} =$ n =120

Since the population under investigation is less than 10,000, adjustment is necessary for a representative size to be achieved:

$nf = n/1 + (n/N)$

Where nf = the final sample size, when the population is less than 10,000

n = the sample size population of 10,000 or more

N = the size of total population from which the sample size is drawn

Therefore;

$nf = \frac{120}{} + \frac{120}{}$

1 318

nf = 120

3.8: SAMPLING METHOD

The study applied systemic random sampling to select the participants whose parents had consented to their participation in the study. The researcher obtained class lists from the class teachers, systematically randomized them and then picked all the children whose names appeared in multiples of 3 i.e. 3rd 6th 9th 12th 15th 18th and so on until the desired sample size was achieved.

3.9: RECRUITMENT AND CONSENTING PROCEDURE

The study recruited participants from a primary school in Nairobi. The researcher then presented the project proposal to the University of Nairobi, Department of Psychiatry for approval. The proposal was then presented to the KNH and UON Ethics and Research Committee for clearance. Permission was then obtained from the school governing body.

An invitation was made by the researcher through the head teacher to all parents whose children fell under the age bracket of 7 to 9 for a sensitization meeting on Specific learning difficulties and a brief overview of the research. A letter was then sent out to

all parents whose children were in the age bracket of 7 to 9 with a reply slip to indicate their interest to participate in the research. The children's names were randomly sampled and the parents, who had agreed to their child taking part in the study, were contacted and times arranged with the school or parents.

Since the participants in the study were under the age of 18, a written informed consent from the parents and a written informed assent from the children were obtained. This was after a written and verbal explanation of the study's purpose, procedure, benefits and risk had been done. Each participant was briefed about the study and assured of the confidentiality of his/her child's information and outcome of the assessment. The content of the consent form will be explained to the participants. They were also informed of their free will to participate and that they were at liberty to withdraw from the study at any point without being victimized. They were allowed to ask questions and/or get clarifications about the study and given consent forms to give their consent.

3.10: DATA COLLECTION

3.10.1: DATA COLLECTION PROCEDURE

Once clearance was obtained from the KNH/UON Ethics and Research Committee and the OERB, the participant who met the criteria of the study were contacted and times arranged with the school or parents. Assessment of the children took place in a quiet

room in the school. The participants were briefed by the researcher to ensure that they fully understood the study's purpose, benefits and risks involved.

Data was thereafter collected in several stages. First, the researcher used the Burt Reading Test (1974) Revised to identify children whose reading age was way below their chronological age (usually a discrepancy of 9 months and above). The test took approximately 15 to 35 minutes to administer depending on the reading level of the child. The participants were required to read out the words which were arranged in groups of ten and with increasing order of difficulty. The researcher then noted down the reading ages of the participant and those participants whose age discrepancy was less than 9 months were thanked and dropped from the study.

Secondly, the researcher on a different day administered Pearson DST-J tests to those participants whose age discrepancy were 9 months and above in order to identify the children at risk for dyslexia. The test took approximately 30 to 40 minutes to administer and was in form of games and puzzles. The child were asked to write some words, spell some words, read some words and identify some pictures. The children were thanked at the end of the procedure and assured of the confidentiality of his/her test results. Time taken by the participant to perform each task was scored. The scores were calculated and interpreted as per the test's scoring instructions. Those children found to be at risk for dyslexia were referred together with their parents to a school psychologist

for further assessment and to the learning support services present in the school for academic intervention.

The researcher also filled in the information that the parent gave on the socio-demographic questionnaire. The socio demographic questionnaire was used to collect general information such as child's age, gender, medical history, parental education, occupation, family economic status among others.

3.10.2: DATA COLLECTION INSTRUMENTS

The researcher used the Burt Reading Test (1974) Revised the Pearson Dyslexia Screening Test for juniors (DST-J) and the socio-demographic questionnaire.

The Reading Test

The Burt Reading Test (1974) Revised is a standardized test that was designed by Burt Inglls, (1974) to be used by teachers in class for the purpose of identifying with ease children with reading difficulties for remediation purposes. It was later revised in 2007 by the Scotland Centre Research in Education (SCRE) at the University of Glasgow. The revised version of the test was developed using the results from a representative sample of 2200 primary school children aged 4-12 in Scotland. It is designed to be used for children aged 6 years 5 months and over. The test comprises of 110 words arranged in groups of ten and presenting with increasing order of difficulty. It is administered

individually with the administration time that runs from a minimum of 15 minutes to a maximum of 35/ 40 minutes. This is dependent on the reading level of the child. The test is discontinued when the child 10 errors in succession.

Scoring is done by counting the number of words that have been read correctly which gives the raw score. The raw score is then converted into a reading age by comparing it with the corresponding reading age on the attached table (see Appendix 3). The discrepancy in reading is then obtained by getting the difference between the reading age obtained and the child's chronological age. A discrepancy of more than 9 months indicates that the learner is struggling with reading.

The Dyslexia Screening Test

The Dyslexia Screening Test- Junior (DST-J) is designed to screen and identify children who may be at risk for dyslexia for the purpose of providing early intervention. The test takes approximately 30 to 40 minutes to administer and is suitable for children from ages 6.6 to 11.5 years (Fawcett & Nicolson, 2004). The DST-J has been used with children from a British origin and showered very good reliability and validity correlations. For instance it was administer to some 34 children ages 6.5 to 12 years and showed a reliability correlation ranging from a satisfactory 0.7 and above in 3 subtests , good to very good (0.8- 0.88) in 4 subtests to an excellent 0.9 in 5 subtests. Scheepers, (2009) used the DST-J together with the Automated Working Memory Assessment (AWMA) to find

out the relationship between working memory and dyslexia among the children ages 6 to 9 in South Africa. The DST-J reported consistency with its qualitative and quantitative results. The DST-J has not been extensively used in the Kenyan population and even though it has and continues to be used by the International schools, there is no published literature on its use in Kenya. Most of the subtests involve both a practice and a main test. The purpose of the practice being to ensure that the child understands the task he/she is being asked to do.

There are 12 subtests with each having instructions on how to administer and when to discontinue the test. They each have an aspect of dyslexia that they screen for i.e. 3 subtests are attainment tests and tests reading, spelling and writing while the rest 9 are diagnostic tests. The subtests are;

Rapid Naming. In Rapid Naming test, the child is asked to name a series of outline pictures on an A4 sized card. The child is supposed to name the pictures as fast as he/ she could as he/she is being timed. This is so as there is evidence that suggest that children with dyslexia are slower at naming familiar pictures compared to their non-dyslexic counterparts (Fawcett & Nicolson, 2004).

Bead Threading. In Bead Threading, the child's eye-hand co-ordination and manipulative skill is assessed through the child's ability to thread 15 round wooden

beads onto a string under timed condition (30 seconds). Dyslexic children often depict a mild degree of clumsiness or a deficit in their motor skills (Fawcett & Nicolson, 2004).

One Minute Reading. The One Minute Reading test requires the child to read a page of individual words which are graded in difficulty under timed condition. The test has been designed to assess the child's reading speed as well as reading accuracy (Fawcett & Nicolson, 2004).

Postural Stability. Here the child's balance is assessed by blindfolding and giving him/her a controlled push to the back using a balance tester. Recent discovery has shown that children with dyslexia show difficulties in the cerebellum whose function is closely involved in balance, motor skills and eye movement control (Fawcett & Nicolson, 2004).

Phonemic Segmentation. Studies indicate that dyslexic children have difficulties in their ability to detect rhymes; a type of phonological ability that may persist to adulthood (Fawcett & Nicolson, 2004).Phonemic Segmentation assesses the child's ability split words into their basic sounds or essential parts by deleting a syllable or a consonant.

Two Minute Spelling. The Two Minute Spelling test was devised by Nicolson and Fawcett (2004), to assess speed of writing as well as accuracy of spelling. The child is given pen/pencil and paper and asked to spell as many word as possible within two minutes. Children with dyslexia not only struggle with their speed in writing but also

with their spelling, a skill that they are worse in than their reading (Fawcett & Nicolson, 2004).

Backward Digit Span. The examiner reads out a series of digits with a moderate speed and asks the child to repeat the sequence in a backward order. The Backward Digit Span test assesses the maximum number of digits the child can remember in the backward order putting the working memory to test. Children with dyslexia struggle more with backward digit span than forward digit span (Fawcett & Nicolson, 2004).

Nonsense Passage Reading. The child is asked to read a passage aloud that has a mixture of both real and nonsense words under timed condition. The tests assess the child's reading speed as well as accuracy in reading nonsense words (Fawcett & Nicolson, 2004).

One Minute Writing. Children with dyslexia have a slow speed in writing compared with their non-dyslexic counterparts and thus have difficulties completing their work in time. The test assesses the child's speed and accuracy in transcription of a short passage given depending on age. Like most of the other subtests, this too is timed (Fawcett & Nicolson, 2004).

Verbal Fluency. Verbal Fluency test assesses the number of words beginning with the letter S that the child can generate in a minute. Most children with dyslexia score relatively poor on this task (Fawcett & Nicolson, 2004). Recent work by (Griffith S. &

Frith U., 2002) has suggested that a profile of good semantic fluency (the number of animals the child can say in a minute) together with poor verbal fluency (the number of words beginning with S the child can say in a minute) might be characteristic of dyslexia.

Semantic Fluency. This test is analogous to Verbal Fluency test and requires the child to give as many names of animals as possible all under one minute. Children with dyslexia tend to perform much better on this test than the Verbal Fluency test (Fawcett & Nicolson, 2004).

Vocabulary. In this test the child is given three pages with row of four pictures each. The examiner has 16 words that match with the pictures and asks the child to circle the correct picture of the given word. The test is designed to assess receptive vocabulary in a multi choice format with some of the words included to check reasoning ability (Fawcett & Nicolson, 2004).

Scoring. Each subtest has clear instructions on how they are to be scored. The scores from the subtests are separately and appropriately entered in the Response Sheet (see Appendix 4). Once done, the Score Sheet (see Appendix 5) is then ready for scoring. The scores from the Response Sheet are entered appropriately in the 'Test Score' column and the normed scores are then worked out with the aid of a Score Key appropriate for the child's age. The normed scores enable the calculation of the 'At Risk Quotient' for each subtest. This then allows for the calculation of the overall 'At Risk Quotient' which is

attained by finding the sum total of each subtest's ARQ and dividing it by 11. The Rhyme Test is optional.

Interpretation. An ARQ of 0.9 or greater is a strong evidence of being at risk for dyslexia while an ARQ of 0.6 – 0.8 indicate mild evidence of being at risk for dyslexia. (See table below)

DST-J Percentile scores

Score	**Risk level**	**Percentile**
---	High risk	0-4
--	Moderate risk	5-11
-	Mild risk	12-22
0	Normal (no risk)	23-77
+	Above average (no risk)	78-100

Socio-demographic Questionnaire

Socio-demographic Questionnaire was also used to acquire personal and family information from the respondents such as parent and child's name, age, gender, history of dyslexia in the family, education background among others.

3.11: ETHICAL CONSIDERATION

3.11.1: CONSENT EXPLANATION

Introduction

Permission to carry out the research was sort from the KNH/UoN Ethics and Research committee. Permission was then sort from the OERB who run the participating school. An invitation was made by the researcher through the head teacher to all parents whose children fell under the age bracket of 7 to 9 for a sensitization meeting on learning difficulties and a brief overview of the intended research. A letter was sent out to all parents whose children were in the age bracket of 7 to 9 with a reply slip indicating their interest to participate in the research. The children's names was randomly sampled and the parents, who agreed to their child taking part in the study, were contacted and times arranged with the school or parents.

The researcher obtained a written informed consent from the parents after a written and verbal explanation of the study's purpose, procedure, benefits and risk had been done. Each participant was briefed about the study and assured of the confidentiality of his/her child's information and outcome of the assessment. The content of the consent form was explained to the participants. Since the children were minors, the parents provided voluntary informed consent on behalf of their children to participate in the study. Beside the parental consent, the researcher asked the children individually if they are willing to participate and verbally explained to them that they were under no

obligation to take part in the assessments. Those children who agreed were asked to write their names on the assent form indicating their willingness to continue. Each participant was allowed to ask questions for clarification before signing the consent and assent form. The consent and assent form was signed by both the researcher and the participant in duplicate so that each had a copy of the consent and assent form.

Consent explanation to the parent and the child plus assessment of the children by the researcher took place in a quiet room in the school. Data was then collected from the participants were at liberty to consent or refuse to their information being included in the study. It was made clear to the children that they could stop at any time if they did not want to continue with the assessment or if they changed their mind about taking part in the study.

Those children who were found with reading related problem or difficulty, their parent were informed and the children referred to the school psychologist for further assessment.

Benefits

The participants were made to understand that they would not receive any token or monetary benefit by participating in the study and that part or whole of the study would be availed to them on request. The children who were found at risk for dyslexia were then referred to the learning support department for academic intervention.

It was hoped that the outcome of the study would result in early identification and improved intervention for learners with learning difficulties which would go further to improving their mental health.

Risks

The potential risk of stigmatization of the participants could occur. To ensure that stigmatization of the participant did not arise, all parents of children falling under the age bracket of 7 to 9 were invited to the school for a sensitization meeting on learning difficulties. Later teachers and pupils each had a separate session at the end of the process with the researcher to sensitize them on Specific learning difficulties/ dyslexia. Thus the psycho-education served to sensitize and also prevent stigmatization of participants while assuring the participants of the confidentiality in the information they had contributed.

Participation

It was made known to the parents that participation in the study was completely voluntary and the participants were at liberty to withdraw at any point of the study without losing benefits. All the participants who had met the inclusion criteria had equal chances of being included in the study.

Confidentiality

All information provided by the participants was kept confidential and no name that identified any participant was to be published only the findings of the combined results of all participants were used.

Participants' confidentiality was maintained from the beginning to the end of the research. In the report publication, the name of the school or the community did not feature. This was to ensure anonymity and confidentiality of the children, the school and the community is maintained. The researcher assigned a unique identifying code to each participant's data. All participants' forms with identifying information such as the consent forms, names of participants, socio demographic responses among others were kept in locked storage boxes. The researcher was the only person with access to the lockable storage boxes and the participants' information therein.

Procedure

Participation involved the child completing a reading test- Burt Reading Test (1974) Revised, in order to identify his/her reading age. The test takes approximately 15-35 minutes depending on the child's reading level. The participants were required to read out the words which were arranged in groups of ten and with increasing order of difficulty. Those participants whose age discrepancy was less than 9 months were thanked and dropped from the study. Those participants whose reading age was way

below their chronological age (usually a discrepancy of 9 months and above), were recalled on a different day and given another test-The Pearson DST-J test to find out if they were at risk for specific learning/ reading difficulties. The test takes approximately 30 to 40 minutes to administer and is in form of games and puzzles. The child were asked to write some words, spell some words, read some words and identify some pictures while taking down the time the child used to perform the given tasks. The child were also given some beads to thread and later asked to give names of things. The children found to be having reading difficulties were referred to a school psychologist for further assessment and to the learning support department for academic intervention. The researcher also filled in socio- demographic information provided by the parent on the semi- structured questionnaire. The socio-demographic information included age, marital status, education level, socio economic status among others. The participants were made to understand that there was no right or wrong answer.

3.12: DATA MANAGEMENT AND STATISTICAL ANAYSIS PLANS

Handling of data after the screening procedure of the participants was only done by the researcher alone. All the data collected from the study was stored carefully under lock and key by the researcher to avoid damage or leaking of any information collected from the study thereby not exposing the participants in any way possible. Privacy and

confidentiality was maintained throughout the study. Anonymity was employed so as not to reveal the participants' real identity this was done through the researcher assigning a unique identifying code to each participant's data. The questionnaires for instance had a number code unique to each participant. While sharing data with a biostatistician for data analysis purposes or with supervisors for study consultation, the researcher used only the number coded questionnaires and not the front pages that had the participants' identities and contacts so as to maintain anonymity and confidentiality.

Data Analysis

Data entry was done constantly during data collection period. The collected data was carefully cleaned and handed over to the data analyst who then analyzed the data using SPSS version 20. Descriptive statistics for continuous data was summarized using measures of central tendency and dispersion. Non-parametric tests were used for analysis to help determine whether the differences between the means of two groups were statistically significant.

The prevalence of Dyslexia among children aged 7 to 9 was estimated using simple proportions. Categorical data was presented on a 2x2 table and the odds ratio determined in order to conclude on an association i.e. the effects of the predictor variables on the outcome. The level of significance was set at 0.05. The computed data

was then presented using descriptive statistics which include pie charts, bar graphs and tables and narratives.

CHAPTER FOUR

4.0: Results

The following are the results of the research on dyslexia as obtained from respondents. The results describe parental and child demographic data and Dyslexia.

4.1: The Assessments

4.1.1: The Burt Reading Test

The researcher administered The Burt reading test to the 120 children of class 2 and 3 to determine their reading age (R.A). A majority of the children (34.2%, n=41%) were reading at the age range of 8.0 to 8.11 years, 20% (n= 24) were reading at between ages 7 to 7 years 11 months while 19.2% (n= 23) were reading between the age of 9 years to 9 years 11 months. This is shown in figure 1 below.

The children's reading ages were then each compared to their real/chronological age to find out if there was any discrepancy. This is summarized in table 1 below. 74.2% (n=89) were either reading at their age or had a reading age that was much higher than their real age. 7.5% (n= 9) had the negative difference between their R.A and real age ranging between 1 month to 4 months difference while 8.3% (n=10) had a 5 to 8 month negative

difference in their R.A and real age. Only 10% (n=12) had a discrepancy of 9 months and over between their R.A and their real age and of this 8 were boys and 4 girls.

Fig. 1: Frequency in Reading ages of the 120 children

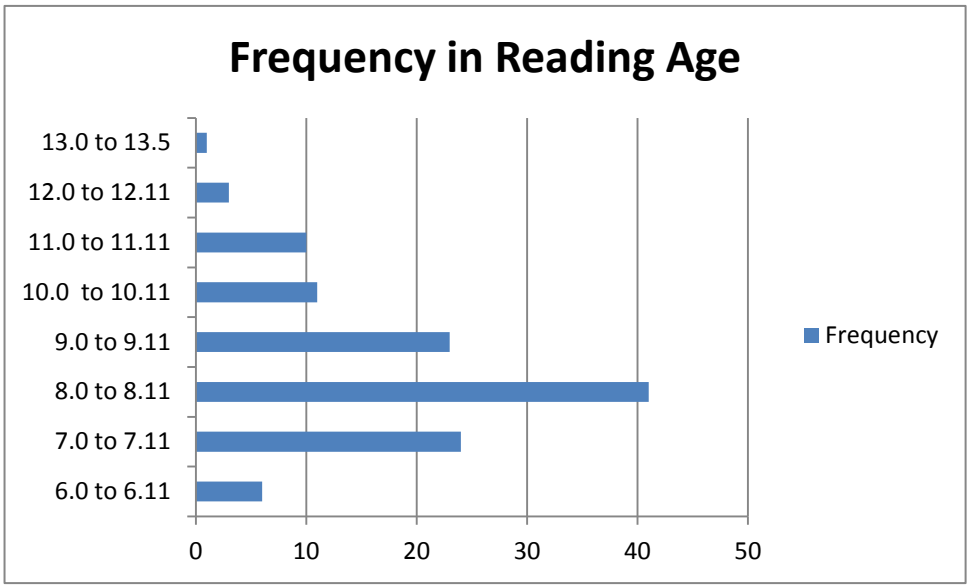


Table 1: Discrepancy in real age and reading age

Difference in real age & Reading age	Diff. of ≥ 0.0 months	Diff. of 1 to 4 Months below real age	Diff. of 5 to 8 Months below real age	Diff. of ≤ 9 Months below real age
Boys Girls	48 41	4 5	7 3	8 4
Total	89	9	10	12

4.1.2: The DST-J test

The DST-J test was then administered on the 10% (n= 12) whose reading age and chronological age had a discrepancy of 9 months and above. This was to determine if they had Dyslexia.

There are 12 subtest in the DST-J, 3 of which are attainment test and do test the child's reading, spelling and writing while the rest 9 are diagnostic subtests. The child's At Risk Quotient was then worked out based on the child's performance at his/ her age. Table 2.1 below shows a performance profiles and At Risk Quotients for the 12 children on 11 DST-J subtests.

Table 2: DST-J Tests scores for the 12 children at risk for dyslexia

Child	Rapid naming	Bead threading	One min reading	Phonemic segmentation	Two min. spelling	Backward digit span	Nonsense pass. Reading	One min. writing	Verbal fluency	Semantic fluency	Vocabulary	ARQ
1	52	6	13	6	10	2	30	14	14	10	11	0.4
2	45	5	10	5	6	0	19	17	17	17	10	1.2
3	38	12	83	8	16	5	24	19	10	11	15	0
4	50	6	31	5	8	2	8	14	13	19	10	0.7
5	38	7	13	8	7	3	20	6	7	18	12	1.2
6	48	6	18	7	14	2	21	14	7	14	10	0.8
7	50	8	32	7	16	4	21	23	9	13	12	0.5
8	72	5	12	5	8	4	15	16	5	9	9	1.5
9	82	7	19	6	5	2	18	20	9	16	12	1.5
10	46	8	14	8	11	3	21	14	7	18	11	0.8
11	40	8	13	7	11	4	21	13	5	25	14	0.7
12	65	5	14	3	10	3	16	9	6	13	9	1.2

A Score Key appropriate for the child's age was then used to work out the above test scores into normed scores. The normed scores enabled the calculation of the 'At Risk Quotient' for each subtest and the overall 'At Risk Quotient' as summarized in Table 2.2 below. An ARQ of 0.9 or greater is a strong evidence of being dyslexic while an ARQ of 0.6 – 0.8 indicate mild evidence of dyslexia.

Table 3: Normed Scores and ARQ for the 12 children at risk for dyslexia

Child	Rapid naming	Bead threading	One min reading	Phonemic segmentation	Two min. spelling	Backward digit span	Nonsense pass. Reading	One min. writing	Verbal fluency	Semantic fluency	Vocabulary	ARQ
1	-*	+	0	-	+	--	0	0	+	0	0	0.4
2	-	0	--	--	-	---	-	0	+	+	--	**1.2**
3	0*	+	+	0	+	+	0	0	0	0	+	0
4	-	+	0	--	0	--	--	0	+	0	--	**0.7**
5	0	+	--	-	--	-	--	--	-	+	-	**1.2**
6	-	+	-	-	+	--	-	0	0	0	--	**0.8**
7	-	+	0	-	+	0	-	+	-	0	-	0.5
8	--*	0	---	--	0	0	--	0	--	-	---	**1.5**
9	---*	+	---	--	-	--	-	+	0	+	-	**1.5**
10	-	+	--	-	+	-	-	0	-	+	-	**0.8**
11	-	+	--	--	0	0	--	0	+	+	0	**0.7**
12	--	0	--	---	0	0	---	0	-	0	---	**1.2**

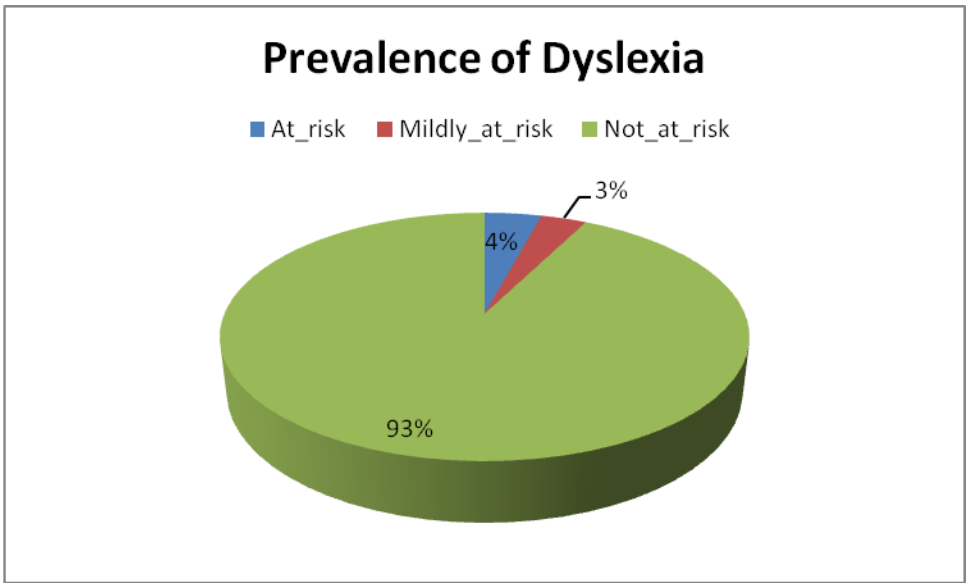
*0 is normal, + is above average, - is mild risk, -- is moderate risk and --- is high risk

From the data above, 3 children were found not to be dyslexic as they had an ARQ of <0.6 while 4 children had an ARQ of between 0.6 and 0.8 indicating that they were mildly dyslexic. 5 children were found to be dyslexic having an ARQ of more than 0.9.

4.1.3: Prevalence of Dyslexia

Thus the 108 children Not At Risk for dyslexia plus 3 children who were At Risk but found not to be dyslexic by the DST-J test gave a total of 111 (93%) children who were not dyslexic as shown by the pie chart in Fig 2. The 4.16% (n= 5) who exhibited strong evidence of being dyslexic and 3.33% (n=4) who showed mild evidence puts the prevalence of dyslexia at 7.49 %.

Fig 2: Prevalence of Dyslexia



4.1.4: The Attainment and Diagnostic subtests

In the 3 attainment subtests of the DST-J; One-Minute Reading, Two=Minute Spelling, and One Minute Writing, the dyslexic children performed better in the spelling test with only 3 children performing poorly. The dyslexic children however showed marked impairment in the reading subtest with 8 out of 12 children being at risk/performing poorly as shown in the Table 3.1 below. There was a correlation between At risk for dyslexia and reading (r = 0.042) and At risk for dyslexia and spelling (r= 0.028).

Table 4: Performance in the DST-J Attainment subtests

N= 12			
Risk factor	One minute reading f (%)	Two minute spelling f (%)	One minute writing f (%)
High risk Moderate risk Mild risk Normal Above average	2 (16.7%) 5 (41.7%) 1 (8.3%) 3 (25%) 1 (8.3%)	0 (0%) 1 (8.3%) 2 (16.7%) 4 (33.3%) 5 (41.7%)	0 (0%) 1 (8.3%) 0 (0 %) 9 (75%) 2 (16.7%)
% at risk	8 (66.7%)	3 (25%)	1(8.3%)

In the diagnostic tests, the dyslexics performed better in Bead threading, Semantic fluency and Verbal fluency tasks with few or no children being at risk. They were however significantly impaired in phonemic segmentation (91.6%, n=11), Rapid naming and Nonsense passage reading each with 10 out of 12 children being at risk, and vocabulary (75%, n=9) tasks. Table 3.2 below shows a summary of the performance.

Table 5: Performance in the DST-J Diagnostic Subtest

N= 12								
Risk factor	Rapid naming	Bead threading	Phonemic segmentation	Backward digit span	Nonsense passage reading	Verbal fluency	Semantic fluency	Vocabulary
High risk Moderate Mild risk Normal Above-average	1(8.3%) 2(16.7%) 7(58.3%) 2(16.7%) 0 (0%)	0 (0%) 0 (0%) 0 (0%) 3(25%) 9(75%)	1(8.3%) 5(41.7%) 5(41.7%) 1(8.3%) 0 (0%)	1(8.3%) 4(33.3%) 2 (16.7%) 4(33.3%) 1(8.3%)	1 (8.3%) 4(33.3%) 5(41.7%) 2 (16.7%) 0 (0%)	0 (0%) 1(8.3%) 4(33.3%) 3(25%) 4(33.3%)	0 (0%) 0 (0%) 1(8.3%) 6(50%) 5(41.7%)	2(16.7%) 3(25%) 4(33.3%) 2(16.7%) 1(8.3%)
% at risk	83.3 %	0%	91.6%	58.3%	83.3%	41.7%	8.3%	75%

4.2: Demographic Characteristics of Respondents

4.2.1: Continuous variables

The dyslexic in this sample had heterogeneous properties. It was expected that a few would be screened positive for dyslexia. A Kolmogorov-smirnov test was run to see if there was a relation between dyslexia and the age of the parent, age of the child, child's reading age and number of siblings. The results are presented in the Table 4 below.

Table 6: Continuous Demographic variables

		Dyslexic			Kolmogorov-smirnov P value
		Non-Dyslexic	Dyslexic	Total	
age of parent	Median	36	35	36	0.935
	Percentile 25	32	35	32	
	Percentile 75	40	40	40	
age of the child	Median	8.4	8.4	8.4	0.115
	Percentile 25	7.6	8.2	7.7	
	Percentile 75	9.1	8.5	9.0	
reading age	Median	9.1	7.6	9.0	<0.0001
	Percentile 25	8.4	7.2	8.3	
	Percentile 75	11.1	7.8	11.1	
number of siblings	Median	1	2	2	0.968
	Percentile 25	1	1	1	
	Percentile 75	2	2	2	

4.2.1.1: Age of the Child and Reading Age with dyslexia outcomes

The children were in the age range of 7 years 6 months to 8 years 6 months and the median age being 8.4. Of the nine dyslexic children (n=9), seven were 8 years old while two of them were 7 years old. As shown in the Table 4 above the age of the child was not statistically significant predictor of dyslexia outcome (mean= 21.19, SD=26.36, p=0.115).

The child's reading age revealed that 34.2% (n=41) of the children were reading at the age range of 8.0 to 8.11 years, 20% (n= 24) were reading at between ages 7 to 7 years 11 months while 19.2% n= 23 were reading between the age of 9 years to 9 years 11

months. 10% of the children were reading 9 months or more below their real age. With (mean = 25.87 SD= 78.8, $p < 0.0001$), the child's reading age was statistically significant with dyslexia.

4.2.1.2: Child's Number of siblings and dyslexia incidence

The Number of siblings revealed that 15% (n= 18) of the respondents had no siblings, 34.2% (n= 41) had 1 sibling while over a half of the respondents (50.9%, n= 51) had at least 2 siblings or more. The Number of siblings a child has was not a predictor of dyslexia outcome (mean = 1.53, SD 0.97, $p = 0.968$).

4.2.1.3: Age of parent and dyslexia outcome

The median age of the parent was 36 for the non-dyslexics and 35 for the dyslexics as summarized on Table 4 above. A majority of respondents' parents were in the age range of 34-37 (66.6%). Age of parent was not statistically significant with dyslexia (mean= 36.33 SD= 5.013, $p = 0.935$).

4.2.2: Categorical variables

A Fisher's Exact test was run for the categorical variables ; History of reading difficulty, Sex of the child, birth order, Parental Occupation and Level of education, Marital status,

Family type, Home language and Population group to find out whether the mentioned variables had a statistical significance with dyslexia as shown in the Table 5 below.

Table 7: Categorical Demographic variables

		Dyslexia					Fisher's exact P value
		Non-Dyslexic		Dyslexic		Total	
		n	%	n	%	N	
Marital status	Unmarried	14	100.0%	0	0.0%	14	0.596
	Married	97	91.5%	9	8.5%	106	
Population	Non-Asian	19	86.4%	3	13.6%	22	0.363
	Asian	92	93.9%	6	6.1%	98	
Home language	English	18	85.7%	3	14.3%	21	0.192
	Non-English	93	93.9%	6	6.1%	99	
Family type	Nuclear	38	97.4%	1	2.6%	39	0.268
	Extended	73	90.1%	8	9.9%	81	
Education level	Below university	76	93.8%	5	6.2%	81	0.470
	University	35	89.7%	4	10.3%	39	
History of reading difficulty in the family	Yes	11	64.7%	6	35.3%	17	<0.0001
	No	100	97.1%	3	2.9%	103	
Occupation	Employed	45	91.8%	4	8.2%	49	0.803
	Self employed	59	93.7%	4	6.3%	63	
	Unemployed	7	87.5%	1	12.5%	8	
Sex of child	Male	57	90.5%	6	9.5%	63	0.496
	Female	54	94.7%	3	5.3%	57	
Birth order	Others	67	91.8%	6	8.2%	73	0.999
	First born	44	93.6%	3	6.4%	47	
If psychological or educational evaluation done	Yes	2	28.6%	5	71.4%	7	<0.0001
	No	109	96.5%	4	3.5%	113	
If child diagnosed with learning difficulties	Yes	3	27.3%	8	72.7%	11	<0.0001
	No	108	99.1%	1	1.0%	109	
Child has changed schools	Yes	20	90.9%	2	9.1%	22	0.669
	No	91	92.9%	7	7.1%	98	
If the child repeated a year at school	Yes	3	100.0%	0	0.0%	3	0.999
	No	108	92.3%	9	7.7%	117	

4.2.2.1: History of reading difficulty

While 97.1% (n=100) of the Non-dyslexic respondents and 2.9% (n = 3) of the dyslexic respondents had no history of reading difficulty in their families, 64.7% (n= 11) of the non-dyslexic respondents and 35.3% of the dyslexic respondents responded positively to having a history of dyslexia in their families as summarized in Table 5 above. With $p< 0.0001$, the History of reading was statistically significant with dyslexia.

A multivariate analysis was done on Reading age and History of reading difficulty in the family. Adjusting for reading age, the multivariate analysis revealed that people who have a history of reading difficulty have 25 times higher risk of developing dyslexia as shown in the Table 6 below.

Table 8: Multivariate Analysis

	Coefficient	Standard error of coefficient	P value	Odds Ratio	95% C.I. for OR	
					Lower	Upper
History of reading difficulty in the family	3.250	.821	<.0001	25.792	5.162	128.869
Reading age	.024	.020	.224	1.025	.985	1.066

4.2.2.2: Sex of the child and Birth order with dyslexia outcomes

Table shows a summary of the frequencies on sex of the child. 57 males and 54 females were non-dyslexic and 6 males and 3 females were found to be dyslexic. This gives a

ratio of male to female dyslexics at 1: 2.The sex of the child was not statistically significant (mean= 1.48 SD= 0.50, p = 0.496).

The birth order had 93.6% (n = 44) of the non-dyslexic respondents and 6.4% (n=3) of the dyslexic respondents being first-borns while 91.8% (n= 67) and 8.2% (n= 6) of the dyslexic respondents were either in-between children or last-borns. With (mean= 1.91 SD= 0.889, p= 0.999), the Child's birth order was not a predictor of dyslexia outcome.

4.2.2.3: Psychological Evaluation and Dyslexia outcome

Table 5 above shows that, out of the 111 Non-dyslexic children, only 2 had had a psychological or educational assessment done. The Dyslexic children had 5 out of the 9 having had a psychological or educational evaluation done prior to the current assessment. Thus with $p<0.0001$, psychological or educational evaluation was statistically significant with dyslexia.

4.2.2.4: Previous Diagnosis of Specific Learning Difficulty (SPLD)

As shown in Table 5 above, seven Non-dyslexic children had a previous diagnosis of a learning difficulty. The Dyslexic had 8 children who had a previous diagnosed learning difficulty with 4 having reading difficulties, 2 had math difficulties, 1 had ADHD and reading difficulty and 1 was struggling with reading since reading was an added language as shown in Table 6 below. With a $p< 0.0001$, having a previous diagnosis of a learning difficulty was a strong predictor of dyslexia outcome.

Table 9: Previous Diagnosis of SPLD

N= 9		
SPLD	F (%)	Mean (SD)
Reading difficulties	5 (44.4%)	
Math difficulties	1(11.1%)	1.33(1.5)
ADHD	2(22.2%)	
ESL	1 (11.1%)	
None	1(11.1%)	

4.2.2.5: Changing Schools and Repeating a Year in School

From Table 5 above, 18 children had changed schools once, 5 children had changed schools more than once and 97 had not changed schools at all. At p= 0.669, changing schools was not statistically significant with dyslexia.

Only 3 of the non-dyslexic participants had repeated a year in school with none of the dyslexic participants had ever repeated a year in school. With p= 0.999, repeating a year in school was not a predictor of dyslexia outcome.

4.2.2.6: Marital Status and Family Type

A majority of the respondents' parents were married; 91.5% (n= 97) non-dyslexic and 8.5% (n= 9) dyslexic. Only 14 non-dyslexic respondents and had parents who were not married. The dyslexic all had their parents being married. There was however no

statistical significance between marital status and dyslexia (mean= 2.10 SD= 0.60, p= 0.596).

The family type had 90.1% (n= 73) of the non-dyslexic respondents and 9.9% (n= 8) of the dyslexic respondents being from extended families while 97.4% (n= 38) non-dyslexic respondents and 2.6% (n= 1) dyslexic respondents were from nuclear families. With (mean= 1.68 SD= 0.47, P =0.268) there was no statistical significance between family type and dyslexia.

4.2.2.7: Parental occupation and Level of Education

As shown in Table 5 above, 91.8%, n= 45 (Non-dyslexic) and 8.2%, n= 4 (dyslexic) respondents had parents who were employed, 93.7%, n= 59 (Non-dyslexic) and 6.3%, n= 4 (dyslexic) had parents who self-employed and only 7 parents of Non-dyslexic children and 1 parent of a dyslexic child were unemployed. Parental occupation was not statistically significant with dyslexia (mean = 1.66 SD = 0.60, p = 0.803).

The highest level of education of the parent revealed that only 89.7%, n= 35 of the non-dyslexic respondents and 10.3% n= 4 of the dyslexic respondents had parents who had a university education. 93.8% n= 76 of the non-dyslexic respondents and 6.2% n= 5 of the dyslexic respondents had parents whose highest education level was either a tertiary or a secondary education. Parental highest level of education which was not statistically significant (mean = 3.24 SD = 0.594, p= 0.470).

4.2.2.8: Home language and dyslexia outcomes

85.7% of the Non-Dyslexic respondents and 14.3% of the dyslexic respondents used English as their home language while 93.9% (Non-dyslexic) and 6.1% of the dyslexic respondents used their varied mother tongue languages such as Swahili, Gujarati, Panjabi and Marathi. With (mean= 2.65 SD= 763, p = 0.192), Home language was not statistically significant with dyslexia.

4.2.2.9: Population group and dyslexia outcomes

As shown in Table 5 above, 93.9% (n=92) of the Non-Dyslexic respondents and 6.1% (n= 6) of the dyslexic respondents were from an Asian population group while 86.4% (n= 19) of the Non-dyslexic respondents and 13.6% (n=3) made up the Non-Asian population i.e. Arabs, Africans and American. The resultant outcome of population group and dyslexia was not statistically significant (mean = 2.03 SD= 0.458, p = 0.363).

CHAPTER FIVE

5.0: Discussion

5.1: Prevalence of dyslexia

Children have varied reading ages. Some will read at their real age, others will read far above their real ages while others will read lower than their real ages. From the results above 10% (n=12) of the respondents screened using Burt Reading Test, were reading nine months below their real age. Subsequently, when the 10% were subjected to the DST-J test, 25% were found not to be at risk for dyslexia making up 92.5% the total number of non-dyslexic children. 4.16% exhibited strong evidence of being dyslexic and 3.33% showed mild evidence of being dyslexic. This puts the prevalence of dyslexia at 7.49% a figure closely in line with Snowling, (2008) study which reports a 4 to 6 % prevalence as cited in Rose, (2009) and 5.52% (Vlachos, 2013) but in contrast with some recent studies (Sun et al., 2013) which had a lower prevalence of 3.9% and Mogasale et al., (2012) which had a much higher prevalence of up to 11.2%. The difference in the prevalence of dyslexia may be related to differences among languages in the regularity of grapheme-phoneme correspondence (Downing, 1973) and/or attributed to the writing systems that differ vastly from one culture to the next (Wydell, 2012).

Research suggests that reading disorders or struggles are caused by the interaction between genetic and environmental factors which will produce a higher or lower risk of having dyslexia (Snowling, et al., 2003). We thus embarked on a mission to find out and

describe the association between parental and child demographic characteristics and dyslexia.

5.2: Child Demographic characteristic

At (mean= 21.19, SD=26.36, p=0.115), the age of the child was not statistically significant. This is in contrast with recent studies by Bolhasan (2013), which found a correlation between age factor and Dyslexia (r= 0.13; p= 0.041). The child's reading age was however statistically significant with dyslexia with (mean = 25.87 SD= 78.8, $p < 0.0001$) this may mean that children who are poor readers in early years remain poor readers even in their adolescence and adulthood as reveled by other studies (Shaywitz, 2003; Berg & Stergelman, 2003) pointing to the persistence of dyslexia (Shaywitz et al., 1999).

The sex of the child was not statistically significant with dyslexia (mean= 1.48 SD= 0.50, p = 0.496). The ratio of male to female dyslexics was 2:1 a ratio consistent with a recent study by Vlachos et al., (2013) whose findings had 7.6% of the males being dyslexic and only 3.6% of the females were found to be dyslexic. Though estimates of sex ratios (males to females) in dyslexia incidences vary from one study to another; 4.51 to 1(Miles et al., 1998), 2 to 1.3 (Hawke et al., 2009) and 2 to1 (Vlachos et al., 2013), the various studies are all consistent with having the number of male dyslexics being more than female dyslexics. Bolhasan, (2013), reports in his study that while both boys and girls can have dyslexia, boys are far more likely to have it.

Consequently our study found that 93.6% (n = 44) of the non-dyslexic respondents and 6.4% (n=3) of the dyslexic respondents were first-borns while the rest of the respondents (n= 73) were either in-between children or last-borns. The birth order of the child was not statistically significant with dyslexia (mean=1.91 SD= 0.889, p= 0.999) consistent with a recent study by Bolhasan, (2013) which found no difference in birth order in the incidence of dyslexia and that any child in the family whether oldest, youngest or in between child can be dyslexic.

Of the 7.49% (n = 9) children found to be dyslexic, 4 of them had other learning difficulties co-morbiding with dyslexia. 2 had math difficulties, 1 had ADHD and reading difficulty and 1 was struggling with reading since reading was an added language. The outcome is consistent with recent studies which reports that many dyslexics have co-morbid attention and mathematics difficulties (Willcut et al., 2005b; Rose, 2009). Only 4 dyslexic children had a previous diagnosis of reading difficulty/dyslexia meaning that a large percentage of children (55.6%) had their reading difficulty going unnoticed. This is made worse as they move on the grade levels since it becomes even difficult to identify these children with the reason being that they tend to catch up with their reading to an extent that they are technically 'remediated' (Fawcett & Nicolson, 2004).

It is not surprising that parents with struggling readers will strive to find out the reasons behind the struggles in literacy of their children and will therefore take their children (self referral) for a psychological or an educational assessment or have their children referred for these assessments. This study had psychological/educational evaluation being statistically significant with dyslexia at $p< 0.0001$.

5.3: Parental Demographic characteristics

The outcome of the age of the parent (mean age= 36.33 SD= 5.013, $p = 0.935$) was not statistically significant with dyslexia. Jayasekara and Street, (1978) had reported in their study that both increased paternal and maternal age contributes to a greater incidence of the dyslexia. Meaning that at conception, the greater the age of both parents the higher the chance of the child being dyslexic.

Parental occupation (mean= 1.66 SD = 0.60, $p = 0.803$) and level of education (mean = 3.24 SD = 0.594, $p= 0.470$) were not statistically significant with dyslexia either. This outcome differs from recent studies by Bolhasan, (2009) which had parental demographic characteristic specifically occupation and level of education showing weak significance relation with dyslexia with $p< 0.05$.

Recent studies on heritability of dyslexia puts the chances of a child being dyslexic from a dyslexic family at a low of 60% chance (Scarborough, 1990); Snowling et al., (2003), to a high of 88% (Hornsby, 1984). In this study, 64.7% (n= 11) of the non-dyslexic

respondents and 35.3% (n= 6) of the dyslexic had a history of reading difficulty running in their families. A multivariate analysis between history of reading difficulty in the family and reading age done (Table 8), went further to reveal that people who have a history of reading difficulty have 25 times higher risk of developing dyslexia confirming recent studies by Schumacher, (2007) and Shaywitz, (2008) that dyslexia run in families and is heritable. In looking at the heritability of dyslexia several studies (Lagae, 2008; Snowling et al., 2003; Lyytinen et al., 2005) have pointed to a future genetic research that may identify reliable predictors of dyslexia which would then allow for preventative interventions that can reduce the detrimental effects of the disorder.

Several studies done in the recent past have shown that dyslexia is present in all cultures (Wydell, 2012; Bolhasan, 2009; Rose, 2009). Despite this study having a vast majority (81.7%, n=98) of the study population being from the Asian community, the population group was not a predictor of dyslexia outcomes (mean = 2.03 SD= 0.458, p = 0.363) adding on weight to growing body of evidence that dyslexia is present in all cultures.

Home language is very vital in molding literacy skills in child's early years in school. A proficiency in first language is the best predictor of cognitive/academic language development in second language (Ball, 2010) In this study a majority (n= 99) of the

respondents were using their mother tongue as their home language with only 21 having English as their home language. With (mean= 2.65 SD= 763, p = 0.192), Home language was not a predictor of dyslexia outcome.

5.4: The Assessments

The researcher observed consistency in the performance of the two tests and of interest was the DST-J which had several subtests (11) ; attainment tests (reading, writing and spelling subtests) and diagnostic tests (rapid naming, bead threading, phonological awareness, backward digit span, semantic fluency, verbal fluency and vocabulary subtest).

According to Fawcett and Nicolson, (2004), reading, writing and spelling are the three critical tests for dyslexia and poor performance on at least one of these is a prerequisite for a diagnosis of dyslexia. Though the dyslexic children in this sample performed better in the spelling and writing subtests, they performed poorly in the reading subtests having 66.7% of the children being at risk as compared to 33.4% (spelling subtest) and 16.6% (writing subtest). There was a correlation between At risk for dyslexia and reading (r = 0.042) and At risk for dyslexia and spelling (r= 0.028).

In the diagnostic tests, the dyslexics performed better in Bead threading, Semantic fluency and Verbal fluency tasks with fewer children registering poor performance at

0%, 8.3% and 41.7% respectively. Of interest was the bead threading task which registered best performance when compared to all other subtests with no child being At Risk. This was in contrast with Nicolson and Fawcett study which found a significantly worse performance in bead threading among other tasks in children with dyslexia (Nicolson & Fawcett, 1994b). In comparing Verbal fluency and Semantic fluency subtests this results are in accordance with Frith, Landerl, and Frith, (1995) who found children with dyslexia performing badly on Verbal fluency but well on Semantic fluency tasks.

While Backward Digit Span (n=7, 58.3%) and Verbal fluency (n=5, 41.7%) had an average to slightly below average performance, the dyslexic children were significantly impaired in phonemic segmentation (n=11, 91.6%), Rapid naming and Nonsense passage reading (each with 83.3% at risk), and Vocabulary (n=9, 75%). This resembles Nicolson and Fawcett study which found that children with dyslexia performed significantly worse in similar tasks (Nicolson & Fawcett, 1994).

The dyslexic children were also significantly impaired in Non-sense Passage Reading as seen in the poor performance (n=8 (83.3%) were At Risk). Fawcett and Nicolson, (2004) had earlier reported that specific difficulties in reading non-sense words indicate difficulties in orthographic analysis skills, a skill whose deficit is associated with dyslexia.

The researcher observed in the Rapid Naming subtest (where the dyslexic had marked impairment) that the respondents would substitute doll for girl, hat for cap, boat for ship. This is characteristic to dyslexics as other studies have also reported fewer correct responses and more phonological substitution errors in dyslexic during confrontation naming tasks with pictures (Faust & Sharfstein-Friedman, 2003). Rapid naming tasks are known to be effective indicators of vulnerability for information processing (Albuquerque C. & Simoes M., 2010) and failure in rapid naming could be attributed to a range of possible causes that have to do with cognitive processing such as attention to stimuli, visual processes among others, any one which could lead to dyslexia (Araujo et al., 2011).

CHAPTER SIX

6.1: Conclusion

Dyslexia is a spectrum disorder which has symptoms ranging from mild to severe and may co-morbid with other learning difficulties such as ADHD and dyscalculia. Children with dyslexia will have particular difficulties with backward digit span, phonological awareness task, rapid naming task and reading unfamiliar words. Males are twice as much affected by dyslexia than females.

History of reading difficulties in the family was a clear predictor of dyslexia outcome ($p< 0.0001$). The reading age of the child, previous psychological/educational evaluation of the child and child's previous diagnosis of a learning difficulty were significant with dyslexia with all having a $p< 0.001$. There was no connection between parental age, occupation, level of education, marital status, family type or population with child's dyslexia outcome.

Since dyslexia runs in families and is heritable, genetics may be a solution to early identification and subsequent intervention of children at risk for dyslexia.

6.2: Recommendation

- For rapid and successful intervention, early identification of children at risk for dyslexia through screening and assessments should be done in all early years academic programs.
- Training of all teachers on Differentiated Instructions should be done by the Ministry of Education. This is to ensure that children with dyslexia do not loss out during a learning discourse.
- Provide appropriate reading instruction programs and accommodations for children who are at risk for dyslexia.

6.3: Limitation

- Given that the sample under study was a private school, the results may not be generalized to a public school.
- Since only early-grade children were assessed in this study the results obtained may not be a true representation of the entire larger population.
- Considering the study site is an urban setting (Nairobi), the results obtained may not be generalized to a rural setting.
- The tests were conducted in English which may be biased given that English is a second language for most of the children in the study population.

DISSEMINATION PLAN AND BUDGET

Dissemination Activities

Specific goal	Purpose	Target group	Dissemination tools	Timing
Consent Explanation and signing	Signing of the consent form with clear understanding of study's purpose, risks & benefits	Parent	Consent Form Explanation	5 min
Consent Explanation and signing	Signing of the consent form with clear understanding of study's purpose, risks & benefits	Child	Consent Form Explanation	5 min
Reading assessment	Assessing for child's reading age (R.A)	Child	Burt Reading Test (Revised)	15- 30 min
Screening for Dyslexia	Assessing if the child is at risk for dyslexia	Child	Pearson DST-J	30-40 min
Socio-demographic information	Get info. Age, sex, economic status etc.	Parent	Socio-demographic questionnaire	10 min

BUDGET

#	REASON	COST PER ITEM (Kshs.)	TOTAL COST FOR ITEM / DURATION (Kshs.)	ACTIVITY / ITEM	WHO THE MONEY IS GOING TO
1	Charges for the Kenyatta National Hospital/ The University of Nairobi/ Ethics Review Committee (KNH/UON/ERC) Services	-	1,500	For new post-graduate research proposal (local)	KNH/UON/ERC
2	For data collection purposes; stationery to input data in the questionnaires	-	5,000	Pencils, Pens, Pencil sharpener, Erasers, Stapler, Storage boxes etc.	Researcher and Participants
3	Operating expenses that may be incurred by the researcher: 1. Report writing 2. Feedback from participants	-	15,000	Printing final document	Researcher
4	Communication and Travelling expenditure	-	15,000	Airtime, Transport and lunches	Researcher
5	For making hard copies of the questionnaire	Printing black/white10	For 4 pages = printing 40 roughly 100	Printing and Photocopying of the questionnaire	Researcher
		Photocopying 2 per page for 4 pages = 8	For 4 pages for 120 participants; photocopying = 480		

6	For copies of the consent form for 120 participants	Photocopying 2 per page for 4 pages = 8	For 8 pages for 120 participants; photocopying = 960	Photocopying of the consent form for 120 participants	Participants
7	For copies of the assent form for 120 participants	Photocopying 2 per page for 2 pages = 4	For 4 pages for 120 participants; photocopying = 480	Photocopying of the consent form for 120 participants	Participants
8	Researcher's copies of consent forms for the 120 participants as each consent form will be filled in duplicate	Photocopying 2 per page for 4 pages = 8	For 8 pages for 120 participants; photocopying = 960	Photocopying of the consent form for each of the 120 participants	Researcher
9	Researcher's copies of assent forms for the 120 participants as each consent form will be filled in duplicate	Photocopying 2 per page for 2 pages = 4	For 4 pages for 120 participants; photocopying = 480	Photocopying of the assent form for each of the 120 participants	Researcher
10	Binding the final document; 5 copies	Paper binding 150	Paper binding for 5 = 750 roughly 1,000	Document Binding	Researcher
11	For efficient and accurate data entry and data analysis	25,000	25,000	Data Entry and Data Analysis	Bio-Statistician
		TOTAL COST	**65,380 Approximately 65, 400**		

TIMELINE

Activity	Time/ Duration
Proposal Development	October 2013
Submission to Supervisors for comments & correction	November 2013
Proposal Presentation to the Department	February 2014
Submission to Research and Ethics Committee	April 2014
Resubmission to Research and Ethics Committee	July 2014
Data Collection	September 2014
Data Analysis & Report Writing	January2015
Result Presentation	March 2015
Final Report Submission	March 2015

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APPENDICES

APPENDIX I: CONSENT FORM EXPLANATION

THE UNIVERSITY OF NAIROBI

DEPARTMENT OF PSYCHIATRY

CONSENT FORM

THE PREVALENCE OF READING DIFFICULTIES AMONG CHILDREN AGED 7 TO 9 IN A NAIROBI SCHOOL

Researcher:

Irene Cheruiyot Institution: University of Nairobi Contact: 0723765608

Supervisors:

Dr. Manasi Kumar UON Department of Psychiatry 0717379687

Dr. Muthoni Mathai UON Department of Psychiatry 0727329904

Hello? My name is Irene Cheruiyot and I am a Clinical Psychology student at the University of Nairobi, Department of Psychiatry. A research study is part of the requirement for completion of my degree course. I am carrying out a study that seeks to find out the prevalence of specific learning difficulties among children aged 7 to 9. Literacy skills and in particular reading is essential for success in school as reading

skills are utilized in all areas of academic subjects. The study seeks to find out the incidence of reading difficulties among the children in the mentioned age bracket. This information will be used by policy makers in providing programs for assessing, screening and provision of early intervention for learners with reading difficulties.

Therefore I am seeking your permission to have your child participate in this study. I will explain the consent form to you and if you agree to allow your child to participate I will ask you to give a sign that you have agreed.

Your agreement allowing your child to participate is voluntary and you may withdraw from the study at any time without being penalized or losing benefits to which you are otherwise entitled.

Procedure: I will give your child a reading test in order to identify his/her reading age. If the child is reading above his age, at his age or his reading age is below 9 months when compared with his/her actual age (chronological age), then I will thank your child and drop him/her from the study. If the child's reading age is low with a difference of above 9 months compared to the real age, then I will assess the child on a different day using the Pearson DST-J tool to find out if he/she is at risk for specific learning/ reading difficulties. The test takes approximately 30 to 40 minutes to administer and is in form of games and puzzles. I will ask your child to write some words, spell some words, read some words and identify some pictures while taking down the time the child will use to

perform the given tasks. I will also give your child some beads to thread and later ask the child to give me names of things. If the child will be found to be having reading difficulties, then he/ she will be referred to a school psychologist for further assessment and to the learning support department for academic intervention. I will also fill in socio- demographic information that you will provide me with on the semi- structured questionnaire. The socio-demographic information includes age, marital status, education level, socio economic status among others. You should understand there is no right or wrong answer.

Confidentiality: All information provided by you or your child will be highly confidential and no name that identifies any participant will be published only the findings of the combined results of all participants will be used.

Compensation and benefits: You should understand that you will not receive any token or monetary benefit by participating in the study and that part or whole of the study will be availed to them on request. In the event that a participant is found to have difficulties in reading or specific learning difficulties, then he/ she will be benefit from academic support from the Learning Support services present in the school.

It is hoped that the results of this study will result in early identification and improved intervention for learners with specific learning difficulties this will go further to improving their mental health.

Risks: To ensure that stigmatization of you/your child does not arise, all teachers and pupils will each have a separate session at the end of the process with the researcher to sensitize them on specific learning difficulties. All information that you will contribute will be highly confidential.

You are welcome to ask any questions that will better your understanding of the nature of the study. If you need to seek clarification, kindly contact the researcher on 0723765608 or my supervisors whose addresses are listed above (page 1).

If you will need any clarification concerning the rights of the participant, you may contact the Chairman of KNH-UoN Ethics and Research Committee on the number 020-2726300-9.

RESEARCHER'S SIGNATURE…… DATE ……

PARENT STATEMENT AND SIGNATURE

I the undersigned agree to take part in this study. The project's nature and purpose has been fully explained to me by the researcher-Irene Cheruiyot. I understand that the information collected will be used for the purpose of the study only and that my participation and that of my child is voluntary. I also understand that I can withdraw

my child at any stage of the project without being penalized or losing benefits in any way. I therefore do hereby give consent for my child to participate in this study.

Participant's name …….

Signature…… Date ……

APPENDIX I. CONSENT FORM EXPLANATION (KISWAHILI VERSION)

CHUO KIKUU CHA NAIROBI

IDARA YA PSYCHIATRY

FOMU RIDHAA

IDADI YA WATOTO WALIO NA MATATIZO YA KUSOMA WALIO NA MIAKA 7 HADI 9 KATIKA MOJAWAPO ZA SHULE, NAIROBI

Mtafiti: Irene Cheruiyot Taasisi: University of Nairobi Nambari: 0723765608

Wasimamizi:

1. **Dkt. Manasi Kumar Chuo Kikuu cha Nairobi 0717379687**
2. **Dkt. Muthoni Mathai Chuo Kikuu cha Nairobi 0727329904**

Hujambo? Jina langu ni Irene Cheruiyot, na mimi ni mwanafunzi wa Kliniki Saikolojia katika Chuo Kikuu cha Nairobi, Idara ya Psychiatry. Kufanya utafiti huu unahitajika ili nimalize masomo yangu. Ninafanya utafiti unaopalia kutafiti idadi ya wanafunzi walio na matatizo yakusoma walio na miaka 7 hadi 9. Uweledi wa kusoma ni wa manufaa sana katika kuhakikisha fanaka katika elimu ya mwanafunzi shuleni. Utafiti huu basi unapalia kutafiti idadi ya wanafunzi walio na matatizo ya kusoma walio kati ya miaka 7 na 9.

Matokeo ya utafiti huu yatasaidia wizara ya Elimu kupanga huduma za mapema zakuwasaidia wanafunzi wanaopambana na matatizo kama haya masomoni.

Naomba ruhusa yako kumhusisha mwanao kwenye utafiti huu. Nitakuelezea yaliyomo katika fomu ridhaa kisha ukikubali kushiriki, nitakuitisha sahihi yako ili kuonyesha ya kwamba umekubali kushiriki katika utafiti huu.

Kukubali kwako kuhusishwa kwa mwanao ni kwa hiyari na waweza kumwondoa wakati wowote bila kupoteza faida au kuingia gharama yoyote.

Utaratibu: Kwanza nitampa mwanao mtihani wa kusoma ili kutadhmini umri wake wa kusoma. Umri wake wa kusoma utalinganishwa na umri wake halisi. Ikiwa umri wake wa kusoma utalingana na umra wake halisi au uwe juu zaidi ya miaka yake halisi basi nitamshukuru na kumtakia kila na heri masomoni. Naikiwa umri wake wa kusoma utakuwa chini sana nakuwa na tofauti ya zaidi ya miezi tisa au zaidi basi nitamwita siku nyingine ili ni mpe mtihani mwingine zaidi kutoka kwa Pearson-DST-J. Mtihani huu utachukua mda wa dakika 30 au 40 kuufanya. Nitamuuliza asome maandishi fulani, aandike majina fulani na atambue picha nitakazo mpa. Nitampa shanga aziweke kwenye ukanda huku nikinakili wakati atakao tumia kumaliza kila kazi. Ikiwa atapatikana kuwa na matatizo ya kusoma, basi rufaa ya kumwona daktari waki saikolojia shuleni kwa utafiti zaidi utafanywa. Pia atafaidika na masomo ya ziada ilikumwezesha kusoma kwa wepesi.

Nitajaza pia maelezo ya zenu za kijamii utakayo nipa katika kidodosi . Maelezo ya zenu za kijamii inahusisha mambo ya kijamii kama vile umri, jinsia, elimu, mapato na kadhalika. Fahamu yakwamba hakuna jibu sawa au lisilo sawa.

Usiri: Maelezo yoyote nitakayo pata kwako au kwa mwanao yatawekwa siri na hakuna majina ya wahisika wowote wa utafiti huu ambao utachapishwa. Matokeo yanayo wajumlisha wahusika wote wa utafiti pekee ndiyo yatachapishwa. Elewa pia kwamba majina yako na mwanao pamoja na maelezo yako ya kibinafsi yatawekwa siri.

Malipo na Faida: Elewa kuwa kukubali kwako kuhusishwa kwa mwanao ni kwa hiyari. Elewa pia kuwa hautapokea zawadi au malipo ya aina yoyote kwakuhusika kwako au mwanao katika utafiti huu nayakwamba ukiomba kupewa sehemu ya utafiti huu au matokeo ya utafiti mzima, utaupata. Ikiwa mhusika atapatikana kuwa na matatizo ya kusoma basi atafaidika na masomo ya ziada yanayopatikana shuleni. Nimatumaini yetu kwamba matokeo ya utafiti huu utatumika kuweka miundo msingi au mikakati ya kuwasaidia watoto wenye matatizo ya kusoma mapema kabisa ili masomo yao yasitatizike kwa vyovyote vile.

Hadhari: Ilikuzuia unyanyapa kwa wahusika katika utafiti huu, walimu wote na wanafunzi pia watakua na wakata wao wakipekee na mtafiti ili kuwaelimisha kuhusu matatizo ya kusoma. Maelezo yote utakayotoa yatawekwa kwa usiri mkubwa.

Uko huru kuuliza maswali yoyote yatakayo kuwezesha kuelewa utafiti huu zaidi. Ukihitaji maelezo ya ziada, tafadhali nipigie simu kwa 0723765608 au wasimamizi wangu kwa nambari zilizo tajwa awali kwenye ukurasa wa kwanza.

Ikihitaji maelezo Zaidi kuhusu haki zako kama muhusika katika utafiti huu, basi waweza kuwasiliana na mwenyekiti wa KNH/UoN- ERC kwa nambari ifwatayo: 020-2726300-9.

SAHIHI YA MTAFITI _____ Tarehe: _____

TAARIFA NA SAHIHI/SAINI YA MSHIRIKI

Nimeelezwa kuhusu utafiti huu uliyochapishwa hapo awali. Utafiti huu umedhahirishwa kwangu kikamilifu na mtafiti- Irene Cheruiyot. Naelewa yakwamba majibu au maelezo yangu yatatumika kwa utafiti huu pekee na ya kwamba kuhusika kwangu au mwanangu na wa hiyari. Naelewa pia kuwa naweza kumwondoa mwanagu wakati wowote bila kupoteza faida zangu zozote. Hivyo basi napeana idhini kwa sahihi yangu ya kuhusisha mwanangu kwenye utafiti huu.

Majina ya Mshiriki_____

Sahihi/Saini _____ Tarehe _____

APPENDIX I. CHILD'S ASSENT FORM EXPLANATION

Hello? My name is Irene Cheruiyot and I am a Clinical Psychology student at the University of Nairobi, Department of Psychiatry. I am carrying out a study to find out how common reading difficulties are in children aged between 7 and 9.

This information will be used by policy makers in providing programs for assessing, screening and provision of early intervention for learners with reading difficulties.

Therefore I am seeking your permission to have you participate in this study. I will explain the consent form to you and if you agree to participate, I will ask you to give a sign that you have agreed.

Your agreement to participate is voluntary and you may withdraw from the study at any time without being penalized or losing benefits to which you are otherwise entitled.

Procedure: I will first give you a reading test in order to identify your reading age. If your reading age is at par with your real age or above then I will thank and drop you from the study. If your reading age is very low, then I will give you another test- Pearson DST-J test, to find out if you are having some reading difficulties. I will give you this test on a different day. The test takes approximately 30 to 40 minutes to administer and is in form of games and puzzles. I will ask you to write some words, spell some words, read some words and identify some pictures while taking down the time you will use to perform the given tasks. I will also give you some beads to thread and later ask the child to give me names of things. In the event that I find that you have

difficulties with reading, then I will refer you to a school psychologist for further assessment and to the learning support department for academic intervention.

Be assured that all the information that you will provide plus the tests results will be highly confidential. You are free to ask any question that will further your understanding about the study.

RESEARCHER …… DATE ……...

APPENDIX I. CHILD'S ASSENT FORM

I the undersigned, do hereby give assent to participate in this study, whose nature and purpose have been fully explained to me. I understand that my participation is voluntary and that I can withdraw my participation at any stage of the study.

Participant's name…….

Signature …… Date ……...

APPENDIX I. CHILD'S ASSENT FORM EXPLANATION (KISWAHILI VERSION)

Hujambo? Jina langu ni Irene Cheruiyot, na mimi ni mwanafunzi wa Kliniki Saikolojia katika Chuo Kikuu cha Nairobi, Idara ya Psychiatry. Ninafanya utafiti unapalia kutafiti idadi ya wanafunzi walio na matatizo yakusoma walio na miaka 7 hadi 9. Matokeo ya utafiti huu yatasaidia Wizara ya Elimu kupanga huduma za mapema zakuwasaidia wanafunzi wanaopambana na matatizo kama haya masomoni.

Naomba ruhusa kukuhusisha kwenye utafiti huu. Nitakuelezea yaliyomo katika fomu ridhaa kisha ukikubali kushiriki, nitakuitisha sahihi yako ili kuonyesha ya kwamba umekubali kushiriki katika utafiti huu.

Kukubali kwako kuhusika kwenye utafiti huu ni kwa hiyari na waweza kujiondoa wakati wowote bila kupoteza faida au kuingia gharama yoyote.

Utaratibu: Kwanza nitakupa mtihani wa kusoma ili kutadhmini umri wako wa kusoma. Umri wako wa kusoma utalinganishwa na umri wako halisi. Ikiwa umri wako wa kusoma utalingana na umra wako halisi au uwe juu zaidi ya miaka yako halisi, basi nitakushukuru na kukutakia kila na heri masomoni. Naikiwa umri wako wa kusoma utakuwa chini sana, basi nitakuita siku nyingine ili nikupe mtihani mwingine zaidi kutoka kwa Pearson-DST-J. Mtihani huu utachukua mda wa dakika 30 au 40 kuufanya. Nitakuuliza usome maandishi fulani, uaandike majina fulani na utambue picha nitakazo kupa. Nitakupa shanga uziweke kwenye ukanda huku nikinakili wakati utakao tumia kumaliza kila kazi. Ikiwa utapatikana kuwa na matatizo ya kusoma, basi

rufaa ya kumwona daktari wakisaikolojia shuleni kwa utafiti zaidi utafanywa. Pia utafaidika na masomo ya ziada ilikukuezesha kusoma kwa wepesi.

Elewa kuwa maelezo yote utakayo toa pamoja na matokeo ya mitihani yatakuwa na usuri mkubwa. Uko huru kuuliza maswali yoyote yatakayokusaidia kuelewa utafiti huu zaidi.

Mtafiti…… Tarehe…….

APPENDIX I. CHILD ASSENT FORM (KISWAHILI VERSION)

Nimepata maelezo kamilifu kuhusu utafiti huu na nakubali kujisajili. Natambua kuwa kujisajili kwangu ni kwa hiyari na niko huru kujiondoa kwenye utafiti huu wakati wowote.

Majina ya Mshiriki_____

Sahihi/Saini _____ Tarehe _____

APPENDIX II: SOCIO-DEMOGRAPHIC QUESTIONNAIRE

Socio-demographic Information

This socio-demographic questionnaire is intended to collect information on age, sex and marital status, financial and educational characteristics for research purposes only.

PARENT

1. Code No. of parent…… Date ……..

2. Age of Parent……..

3. Marital Status

Single…… Married…….. Separated ……..

Divorced …… Widowed ……. Other (specify)……..

4. Population group: African Asian Other specify ……..

5. Home language……

6. Family type a. Nuclear family (Father, mother, children) b. Extended family (Father, mother, children, cousins, uncles, aunts, grandparents)

7. Highest Education Level

a) None b) Primary c) Secondary d) Tertiary College e) University

8. Is there any history of reading difficulties in your family? Yes No

9. Occupation: Employed …….. Casual employment …….

Self-employed …… Unemployed ……...

If Casual or Self-employed, specify type of job: ……

CHILD

11. Code No. of child…….

12. Sex of child: Male…… Female ……

13. How many siblings does your child have? ……

14. What is your child's birth order?

a. 1st born b. 2nd born c. 3rd born d. Last born e. Others specify …….

15. Has your child had psychological/ educational evaluation? Yes / No

16. Has your child been diagnosed with learning or reading disorder? Yes / No

17. If your answer is Yes to number 6 above, kindly specify the learning or reading disorder i.e. dyslexia, dyscalculia

18. Has your child had any other therapy such as the following?

Speech Therapy Occupational Therapy

Remediation lessons Other (specify)…….

19. Has your child changed school since he/she began schooling? Yes/ No

20. If Yes in 9 above, how many schools? ……..

21. Has your child repeated a year at school? Yes/ NO

APPENDIX II: SOCIO-DEMOGRAPHIC QUESTIONNAIRE (SWAHILI VERSION)

Kidodosi cha zenu za kijamii

Maswali yafwatayo yataulizwa ili kupata maelezo kuhusu mambo ya kijamii kama vile umri, jinsia, elimu, mapato na kadhalika.

MZAZI

1. Nambari sajili ya mzazi …….. Tarehe ……

2. Umri wa mzazi …….

3. Ndoa

Bila mume/ mke ……..... Umeolewa ……

Umetengana na mume/ mke wako …….. Umepewa talaka na mumeo/ mkeo ……..……..

Umjane……. Ikiwa la kwa yote haya toa maelezo ……..

4. Kikundi Mwafrika……. Mueshia…….. Mengine ……..

5. Lugha uitumiayo sana nyumbani……..

6. Aina ya familia a. Familia Ndogo ya baba, mama na watoto

b. Familia kubwa inayowajumuisha babu, nyanya, binamu n.k

7. Kisomo chako cha juu zaidi ni

a. Sijasoma b. Msingi c. Upili d. chuo (cheti/ stashahada) e. chuo kikuu

9. Kunaye yeyote kwenye familiya anayematatizo ya kusoma? Ndiyo La

9. Kazi

Nimeajiriwa kazi…….. Ajira ya muda mfupi …….

Nimejiajiri ……Sijaajiriwa……

Ikiwa ajira yako ni ya mda mfupi au umejiajiri, basi toa maelezo kuhusu aina ya kazi au biashara ……

MWANA

11. Nambari sajili ya mtoto ……

12. Jinsia: mume…… mke……

13. Mwanao ana mandugu wangapi?.....

14. Mwanao ni mtoto wangapi kuzaliwa?

    a. Kifungua mimba b. Wapili c. Watatu d. Kitinda mimba e. mengine…….

15. Mwanao amewai kufanyiwa uchunguzwa wa kisaikolojia au kielimu? Ndio/ La

16. Je mwanao amewai patikana kuwa na matatizo ya masomo/ kusoma? Ndio/ La

17. Kama jibu ni ndio kwa 6, basi to maelezo kuhusu aina ya tatizo k.v. kusoma. Hesabu

18. Je mwanao amewai kupata matibabu kama vile

    Kurekebisha tatizo ya matamshi……..

    Kurejeshewa uwezo wa kujifanyia kazi…….

    Kupewa masomo ya ziada……

    Nyingine (toa maelezo) ……..

19. Je mwanao amebadili shule tangia aanze masomo yake? Ndio/ La

20. Ikiwa ni ndio kwa 9, basi toa maelezo ya idadi ya shule……

21. Je mwanao amerudia darasa lolote? Ndio/ La

APPENDIX III: REVISED NORMS FOR BURT (RE-ARRANGED) WORD READING TEST

Score		2	3	4	5	6	7	8	9	10
Reading Age		5.3	5.3	5.4	5.5	5.6	5.6	5.6	5.7	5.7
Score	11	12	13	14	15	16	17	18	19	20
Reading Age	5.8	5.9	5.9	5.10	5.11	5.11	6.0	6.1	6.1	6.2
Score	21	22	23	24	25	26	27	28	29	30
Reading Age	6.2	6.3	6.4	6.5	6.5	6.6	6.7	6.8	6.8	6.9
Score	31	32	33	34	35	36	37	38	39	40
Reading Age	6.9	6.10	6.11	7.0	7.1	7.2	7.3	7.4	7.5	7.5
Score	41	42	43	44	45	46	47	48	49	50
Reading Age	7.6	7.7	7.8	7.9	7.10	7.11	8.0	8.1	8.2	8.3
Score	51	52	53	54	55	56	57	58	59	60
Reading Age	8.4	8.5	8.6	8.7	8.8	8.9	8.10	9.0	9.1	9.2

Score	61	62	63	64	65	66	67	68	69	70
Reading Age	9.3	9.4	9.6	9.7	9.8	9.9	9.10	10.0	10.1	10.2
Score	71	72	73	74	75	76	77	78	79	80
Reading Age	10.3	10.4	10.6	10.7	10.9	10.10	10.11	11.0	11.1	11.3
Score	81	82	83	84	85	86	87	88	89	90
Reading Age	11.4	11.5	11.6	11.7	11.9	11.10	11.11	12.0	12.1	12.3
Score	91	92	93	94	95	96	97	98	99	100
Reading Age	12.4	12.5	12.6	12.7	12.9	12.10	12.11	13.0	13.1	13.3
Score	101	102	103	104	105	106	107	108	109	110
R. Age	13.4	13.6	13.6	13.7	13.9	13.10	13.11	14.0	14.1	14.3

APPENDIX IV: DST-J RESPONSE SHEET

APPENDIX V: DST-J Score sheet

Subtest	**Test score**	**At Risk Index**	**---**	**--**	**-**	**0**	**+**
Rapid Naming							
Bead Threading							
One minute reading							
Postural Stability							
Phonemic Segmentation							
Two Minute Spelling							
Backward Digit Span							
Nonsense Passage Reading							
One Minute Writing							
Verbal Fluency							
Semantic Fluency							
Vocabulary							

APPENDIX VI: DST-J Subtests summary

Subtest	Description	Time	Discontinuation	Scoring
Rapid Naming	Measures the time taken to name a page of outlined drawings e.g. 	Start stopwatch and stop it when child completes the whole sheet	Do not discontinue. If child get stuck, provide help after 5 seconds and count as error	+5 sec. to time taken for each mistake made +10 sec if place card used
Bead Threading	Assesses hand-eye coordination & manipulative skills 	30 seconds	Do not discontinue. Start afresh if child drops the string.	No. of threaded bead-3 -1 if string dropped
One minute reading	Tests accuracy & fluency of reading a page of individual words graded in difficulty	1 minute	5 consecutive errors (ignore passes)	1 mark for correctly read word
Postural Stability	Tests balance by providing an accurate index of balance ability under the disturbance of a controlled push in the back with a balance tester.	none	None	0-rock solid 1-slight sway 2-rises up on toes 3-small step forward 4-marked steps forward 5-two controlled steps forward 6-loss of balance
Phonemic	Tests phonological skills	None	1st 4 wrong otherwise 3	Total no. correct

Segmentation	in detecting rhymes and splitting words into their constituent sounds		consecutive errors	
Two Minute Spelling	A quick spelling test that assess speed as well as accuracy of spelling	2 minute	Before 2 min. if 5 consecutive errors are made or child is distressed	1 point for correct spelling
Backward Digit Span	Tests max. no. of digits the child can remember in the right order in a backward fashion	None	2 lists wrong	Total no. of correct list
Nonsense Passage Reading	Tests the ability to break a written word down into chunks that can be articulated through reading a short passage with a mixture or real and non-sense words e.g. ober, chig.	Start stopwatch and stop when child reaches the end. After 3 minutes	5 consecutive error or child gives up	Basic -words completed Bonus -< 1 min Penalty-> 1 min
One Minute Writing	Writing skills tested through copying a phrase (s) correctly under timed constraint	I minute	None	Basic -words completed Bonus -< 1 min Penalty-errors, punctuation, H/writing
Verbal & Semantic Fluency	Tests creativity and non-verbal reasoning	1 minute	Don't stop until a minute is up	1 mark for @ valid word / animal

Vocabulary	Tests receptive vocabulary and reasoning ability	None	None	1 mark for @ correct item

APPENDIX VII: Other Tests available to identify dyslexic individuals

- CFT= Culture Fair Intelligence Test
- CTOPP= Comprehensive Test of Phonological Processing
- PIPS= Performance Indicators in Primary Schools
- SGWRT= Schonell Graded Word Reading Test
- WIAT= Wechsler Individual Achievement Test