A VISION CHECKLIST AS A VISION SCREENING TOOL BY GRADE R TO GRADE 3 TEACHERS IN QUINTILE 1 SCHOOLS

BY

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DEDICATION

I dedicate this dissertation and acknowledge with a deep sense of reverence, my gratitude towards my parents, my mother and late father for always believing and supporting us in all we do. I would not be the person I am today if it was not for them. My husband Tshiamo for, amongst other things his steadfast support, I would not have completed this without his love and support.

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And lastly to my two boys, Masegoame (5) and Oboitshepo (2), whom I hope were too young to remember the time mommy missed their favourite bedtime stories working on her thesis – I promise to make it up.

DECLARATION

I hereby declare that the compilation of this mini-dissertation is the result of my independent work. I have acknowledged persons who assisted me in this endeavour. I have tried to use the research sources cited in the text responsibly and to give credit to the authors and compilers of the references for the information provided, as necessary. I further declare that this work is submitted for the first time at this institution and faculty to obtain a Magister Degree in Optometry and that it has never been submitted at any other institution to obtain a qualification. I also declare that all information provided by study respondents will be treated with the necessary confidentiality.

_____ 04/09/2020

MS B. RAMANTSI **DATE**

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ABSTRACT

Background: Vision screening in schools has been shown to identify children with visual disorders who are thereafter referred for a comprehensive eye examination with an optometrist and or ophthalmologist. In South Africa, the government has introduced an integrated school health policy that includes vision screening which is conducted by few school health nurses, who cannot screen all school children. Teachers spend most of the time with children in their classrooms and thus, educating them on common vision disorders and training them to screen the learners in their classrooms can help identify children with vision disorders.

Aim: This research aimed to investigate the use of a vision checklist as a screening tool by Grade R to Grade 3 teachers to detect visual disorders among learners in Bloemfontein.

Methods: The study population comprised of 41 teachers and 1360 learners from the 11 Quintile 1 schools. Convenience sampling was done to enrol 36 teachers from 11 Quintile 1 schools and 1360 Grade R to Grade 3 learners aged between five and thirteen years around the Bloemfontein area in the study. The study was done in three phases. In the first phase of the research study, the researcher administered the first questionnaire with nine items to evaluate baseline teachers' knowledge and thereafter an educational session was done covering the most common visual disorders in children. A second questionnaire with nine items was administered after the educational session to assess the acquired knowledge of visual disorders and their management. The teachers were classified as having good knowledge if they obtain seven or more correct answers. The teachers were also trained on how to use the vision checklist in their classrooms as a vision screening tool. In the second phase of the study, the teachers screened the learners in their classrooms using the vision checklist. The learner would fail the screening if the teacher recorded any "no" response. In the last phase of the study, the research team screened learners from the two randomly selected schools (School A and School B) using the basic optometric vision screening tests to validate the screening results of the teachers. The two schools had 8 teachers and 261 learners from Grade R to Grade 3. The learner would fail the screening if any of the tests conducted were recorded as "fail". The descriptive statistics and diagnostic tests were calculated per group. A *p*-value of less than 0.05 was considered to indicate statistical significance.

Results: Phase 1: All 36 teachers who participated in this study were female whose ages ranged between 27 and 36 years. Most of the participants (n=16, 44.44 %) had been teaching for more than 10 years. The highest qualification attained by the participants was Bachelor of Education Honours (n=2, 5.56%), and most participants (n=10, 27.78 %) had an Advanced Certificate in Education.

Thirty-four participants (94.44%) obtained a score of seven and higher in the first educational questionnaire. The second questionnaire results showed that all participants obtained a score of seven and higher. Twenty-one participants (58.33%) showed improvement in knowledge, while two participants (5.56%) regressed. Overall, there was a statistically significant difference (p<0.0001) between the scores of participants before and after the educational.

Phase 2: A total number of 1360 Grade R to Grade 3 learners whose ages ranged from five to thirteen years old were screened by the 36 teachers using the vision checklist, five hundred and forty learners (39.7%) failed the screening.

Phase 3: The total number of children tested by both the teachers and the research team was 221; this was (84.67%) of the total amount of 261 learners in those schools. The research team found that 102 learners failed the vision screening, as a result the prevalence of the vision disorders in learners was 46% (95% CI: 39% – 53%). The teachers only identified 20 learners out of 102 to have vision disorders therefore, missed 82 learners with vision disorders. The sensitivity of the screening with a vision checklist was 19.61% (95% CI: 12% – 29%) and specificity of 83.19% (95% CI: 75% – 89%).

Conclusion: The current study showed that teachers had adequate knowledge of common vision disorders in children which was improved through the educational session. However, the teachers missed 80% of the learners who had vision disorders when using the vision checklist as a screening tool. Thus, the results showed that the vision checklist used in this study was not a sensitive screening tool as it could only identify 19.61% of learners with vision disorders. It can be speculated that teachers' current workload, large numbers of learners in classes and lack of motivation could have resulted in the high false-negative rate found in the study.

Keywords: Vision Checklist; Vision screening; Vision Disorders; Quintile 1 Schools; Grade

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LIST OF ABBREVIATIONS

AAPOS	American Association for Paediatric Ophthalmology and Strabismus
DOE	Department of Education
DPHHS	Department of Public Health and Human Services
FN	False Negative
FP	Foundation Phase
FPv	False Positive
HRR	Hardy - Rand and Rittler pseudoisochromatic colour vision test
HSREC	Health Sciences Research Ethics Committee
LogMAR	Logarithm of the Minimum Angle of Resolution
MVAT	Massachusetts Visual Acuity Test
NPC	Near Point of Convergence
NPV	Negative Predictive Value
PPV	Positive Predictive Value
SAISHP	South African Integrated School Health Policy
TN	True Negative
TP	True Positive
UK	United Kingdom
USA	United States of America
VA	Visual Acuity
WHO	World Health Organization

GLOSSARY

Accommodation: The process by which the crystalline lens changes its focus to maintain clear vision when looking at different distances due to its flexibility.

Amblyopia: Also known as "lazy eye." Amblyopia is a childhood visual defect where there is reduction in vision in one or both eyes with a correction.

Anisometropia: This is the visual condition in which the difference in refractive power (glasses prescription), between the two eyes, is 1.00D or more.

Astigmatism: A visual condition in which the surface of the cornea is not spherical and results in a person having blurred vision when looking at the distance and at near objects.

Cataract: An ocular condition where the crystalline lens loses its transparency which can be due to smoking, diabetes, ageing and other conditions.

Colour vision: Colour vision is the ability of the eye to detect and discriminate different wavelengths of light, which correspond to different colours.

Cover test: The cover test is a test used to determine the alignment of the eyes. If there is a misalignment or deviation, the test will determine both the type of ocular deviation and the amount of deviation.

Crowding phenomenon: It is a phenomenon where a letter or an object that is easily recognised on its own becomes difficult to see when it is surrounded by other letters or objects.

Esophoria: Latent inward deviation of the eye observed during the cover test. Esophoria occurs in both eyes, the covered (occluded) eye will turn inward and the uncovered eye will straighten to fixate. This deviation is only observed when fusion is broken.

Exophoria: Latent outward deviation of the eye observed during cover test. Exophoria occurs in both eyes, the covered (occluded) eye will turn outward and the uncovered eye will straighten to fixate. This deviation is only observed when fusion is broken.

Foundation phase: This is the first phase of formal schooling in South Africa where primary skills, knowledge and values are taught. The foundation phase is from Grade R to grade 3, with learners between the ages of 6-10 years.

Glaucoma: Glaucoma is an eye disease due to an increase in the eye pressure (intraocular pressure) which damages the optic nerve, resulting in the loss of vision and can lead to blindness. It can be managed if the disease is detected and treated early.

Hyperopia: Also known as " farsightedness." It is the visual defect in which people can see distant objects clearly seen, but near objects appear blurred. The light focuses behind the retina (the light-sensitive tissue lining the back of the eye).

Latent hyperopia: The amount of hyperopia that is compensated by accommodation and is due to hypertonicity of ciliary muscles. It will not be manifested and can be measured when the ciliary muscles are paralysed.

Myopia: Also termed near-sightedness, is a vision condition in which people can see close objects clearly, but objects farther away appear blurred. The light focuses in front of the retina.

Negative predictive value: It is the probability that subjects (or learners) with negative test results, do not have a disease or a visual condition.

Ocular health: This is the health of the different structures of the eye. It is also called eye health. Clinically ocular health is assessed through the use of ophthalmoscope and slit-lamp.

Ocular motilities: Ocular motilities refer to eye movements and consist mostly of saccades and pursuit eye movements. Saccades are rapid eye movements that help individuals when they are reading as the persons looks from one object to the other object. Pursuits are smooth tracking movements, which maintain foveal fixation when viewing a moving object and hence stabilise the retinal image. Ocular motility tests assess the movements and alignment of eyes.

Ophthalmoscope: A handheld instrument that has a light source and lenses and is used

to assess the health of the different structures of the eye.

Phoria: A phoria is a deviation or misalignment of the eyes that only appears when one eye is covered (fusion is broken) and the two eyes are no longer looking at the same object. Phoria is observed during the cover test.

Positive predictive value: This is the probability that subjects (or learners) with positive test results, have a disease or visual condition.

Ptosis: It is a droopy eyelid, which occurs when the muscle that elevates the eyelid (the levator palpebrae superioris muscle) is weak. In children, the common cause is the underdevelopment of the levator palpebrae superioris muscle. Ptosis can cause astigmatism, amblyopia and may cause a child to have a "chin-up position".

Quintile school system South Africa: This is the system used to allocate public schools into five categories, ranging from Quintile 1 schools designating the poorest schools to Quintile 5 designating the wealthy schools. Classification of schools is assigned based on the income of the school's surrounding community. Schools in Quintile 1, 2 and 3 were declared no-fee schools as they get 100% government subsidy, while schools in Quintiles 4 and 5 are fee-paying schools and they receive less government subsidy.

Refractive error: A visual disorder that occurs when the light from the object located at far cannot focus clearly on the retina (back of the eye), which may result in blurred vision, which can cause visual impairment.

Refractive status: Refractive status is the outline of the refractive state of the eye, and this could either be emmetropia, astigmatism, myopia or hyperopia.

Sensitivity: The ability of a particular test to identify people with the disease or visual condition correctly and is also known as the true positive rate.

Specificity: The ability of a particular test to identify people without the disease or visual condition correctly and is also known as the true negative rate.

Strabismus: A visual disorder where the eyes are not properly aligned with each other resulting in each eye not focussing on the same point. It is also referred to as crossed

eye(s), squinting or tropia.

Vergence: Vergence is the simultaneous movement of both eyes in opposite directions to obtain or maintain single binocular vision.

Visual acuity: The ability of the eye to resolve details. In a clinical setting, it is the smallest line that the person can read at distance and at near.

Visual perceptual skills: These skills allow a person to recognise, discriminate, recall, organise and interpret what the eyes see.

Vision screening: Vision screening is a short examination to detect if an individual has a visual problem or not. The exact problem with the eyes or diagnosis is not given and the results of the screening are used to refer the individual for a comprehensive eye examination.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Vision and hearing play a significant role in the learning process of children at school. The impairment of both vision and hearing have been linked to lifelong deficits in speech and language acquisition, poor academic performance, personal-social maladjustments, emotional difficulties and the quality of life in general (Scheiman & Rouse, 2006; Wang *et al.*, 2011; White *et al.*, 2017). White *et al.* 2017 provided evidence that children who were referred to the vision and eye health professionals following a vision screening had significantly reduced academic achievement levels than their peers who were not referred. This evidence highlights the importance of vision screening in identifying children at risk of underachieving in the classroom. The researcher followed this approach in the current study that early detection and treatment of children's vision disorders optimise learning and academic development and is also based on the researcher's practical experiences in the clinical setting.

This first chapter is an introduction to the study that was conducted to investigate the use of a vision checklist as a vision screening tool by Grade R to Grade 3 teachers in Quintile 1 schools. The background information relating to the importance of vision in learners, global statistics on visual impairment in children, vision screening and the importance of involving teachers to identify vision disorders among learners is given. This is followed by the problem statement, research aim, research objectives and research questions aligned with the objectives of the study. The chapter concludes with the significance of the study and the outline of the different chapters.

1.2 BACKGROUND

Visual factors such as visual acuity, refractive error, ocular motilities, vergence, accommodation, visual perceptual skills and ocular health have a significant impact on

academic performance (Kulp & Schmidt, 1997; Kulp, 1999; Maples, 2003; Scheiman & Rouse, 2006). Vision disorders are the most common handicapping condition in childhood (Ciner *et al*., 1999) and have been linked to poor academic performance (Scheiman & Rouse, 2006; Wang *et al.,* 2011, White *et al*., 2017). Moreover, the societal consequences have been linked to high school drop-out rates, social and emotional problems, juvenile delinquency, adult literacy problems and incarcerations (Snow, 1983; Zaba, 2001; Zaba, 2011). There is a high rate of learners dropping out of schools in South Africa due to different problems, including visual problems (Inglis, 2009).

It is estimated that globally about 19 million children under the age of 15 years are visually impaired. Of these children, 12 million are visually impaired due to refractive errors, which can be easily diagnosed and corrected (WHO, 2014). The other common causes of visual impairment are cataract and glaucoma. If cataract can be detected early in children, it can be treated, and vision can be regained. Only 1.4 million children have irreversible visual impairment and need visual rehabilitation interventions for psychological and personal development. Thus, there should be a mechanism for early detection of the causes of reversible visual impairment among children.

Vision screening is not diagnostic but it is a practical approach to early identification of children in need of professional eye services. It is an economical and efficacious manner of detecting possible vision problems in the preschool and school-age populations (DPHHS, Montana, 2015). Vision screening can detect refractive errors, cataracts, glaucoma, ptosis, strabismus and other more severe conditions such as tumours or neurological diseases that may affect the visual system of the child (AAPOS, 2014). The main goal of vision screening is to identify children who have or are at risk of developing conditions that may lead to visual impairment. Vision screening in children is crucial because many children are often unaware that one or sometimes, both of their eyes are not seeing well (Gursoy *et al*., 2013). In addition to detecting vision problems, vision screening programs are valuable in raising the awareness of parents, teachers and the community to the importance of eye care. The goal of a vision screening program is the referral of those children who failed the screening to the vision and eye health professional for a comprehensive eye examination and management.

Most states in the United States of America (USA) have preschool and school vision screening policies and guidelines. It is mandatory in most states that each child should have a vision screening done before starting formal schooling and during schooling years (Ciner

et al., 1999). Vision screening is done by either optometrists, school health nurses or teachers depending on the state. In the United Kingdom (UK), the school entry vision screening is done by orthoptists (Toufeeq & Oram, 2014). South Africa introduced a South African Integrated School Health Policy (SAISHP) in 2012 to screen learners for medical conditions, including vision (ISHP, 2012). The SAISHP aims to provide a more comprehensive package of services, which addresses not only barriers to learning but also other conditions that contribute to morbidity and mortality amongst learners during both childhood and adolescence. The SAISHP requires that every learner should be assessed once during each of the four educational phases namely, foundation (Grade R-3), intermediate (Grade 4-6), senior (Grade 7-9) and further education and training (Grade 10-12). The school health nurses are responsible for the screening and referral of the learners who fail the screening.

By any measure, the level of inadequate vision care for children in South Africa is significant. There are about 3879 registered optometrists, of which less than 5% are in the public sector (HPCSA, 2020). This is an inadequate number of optometrists to screen over 12 million learners in South Africa (DOE, 2016). It is a challenging task, hence the need to enlist teachers as vision screeners in the classrooms.

1.3 PROBLEM STATEMENT

Vision is important for two primary purposes namely learning to read and reading to learn (Scheiman & Rouse, 2006). Vision screening among learners is part of the SAISHP (2012). However, screening is done only by school health nurses. There are few school health nurses available (Dibakwane & Peu, 2018) and they cannot screen all schools and all Grade R, Grade 1, Grade 4, and Grade 8 children as directed by the SAISHP. The other compounding factors are the lack of facilities and the lack of support from the school management, which impedes the delivery of school health services.

Other countries like the UK and the USA have utilised orthoptists and optometrists for school vision screening and examination programmes. Given the fact that there are few school health nurses, optometrists and orthoptists in South Africa to screen all the learners, this study investigated the use of a vision checklist by teachers as a screening tool for visual problems. Teachers spend more time with the children in classrooms, and it can be speculated that a vision checklist, as used in the USA can supplement the school health nurse's work in visual screening.

The vision checklist used in this study was adapted from the vision checklist used in the USA (Texas School for the blind & visually impaired, 2000; Kansas Department of Health & Environment, 2004; Colorado Department of Education, 2006; Missouri Department of Health, 2009; New York State Education Department, 2014). However, there is no published study on the effectiveness of the vision checklist as a screening tool. This is the first study to assess the use of a vision checklist as a vision screening tool by Grade R to Grade 3 teachers in Quintile 1 schools in South Africa and globally.

The focus of this research was on investigating the use of a vision checklist by foundation phase (FP) teachers as a school vision screening tool in Bloemfontein.

1.4 RESEARCH AIM

This research aimed to investigate the use of a vision checklist as a vision screening tool by Grade R to Grade 3 teachers to detect visual problems among learners in Bloemfontein.

1.5 RESEARCH OBJECTIVES

i. Objective 1: To determine Grade R to Grade 3 teachers' knowledge of children's vision before an educational session on common visual disorders affecting children was presented to them.
ii. Objective 2: To educate Grade R to Grade 3 teachers on children's vision by giving them a PowerPoint presentation on common visual problems that affect children and reassessing their knowledge of common visual problems after the educational session.
iii. Objective 3: To implement the vision checklist as a screening tool for visual problems among Grade R to Grade 3 children by teachers.
iv. Objective 4: To validate Grade R to Grade 3 teacher's vision screening results by the research team conducting vision screening among learners that have been screened by the teachers in the two selected schools.

1.6 RESEARCH QUESTIONS

i. What is the knowledge of Grade R to Grade 3 teachers about common visual disorders affecting children before the educational session?
ii. What is the knowledge of teachers about common visual disorders affecting children

after the educational session?

iii. How effective is the use of a vision checklist by Grade R to Grade 3 teachers in detecting visual disorders in their classrooms?

1.7 SIGNIFICANCE OF THE STUDY

The study will contribute to the improvement of the overall teaching and learning experience of both the teachers and learners as most of the participants who failed the visual screening will be referred to either an optometrist or an ophthalmologist for a full eye examination. The outcome of the study will result in teachers who are confident in recognising most common vision disorders in children and will have learners that are attentive to their learning material with an improved attitude, self-confidence and prevention of visual disorders that would have been problematic had they not been detected.

1.8 LIMITATIONS OF THE STUDY

The study was only conducted in the low socioeconomic status (Quintile 1) schools and only in the foundation phase. Thus, the results cannot be inferred to all educational phases and other quantile (medium and high socioeconomic status) schools because the teaching environment is different and other quantiles' teachers have access to technology and there are few learners in their classrooms compared to the Quintile 1 schools. The time given for the presentation was approximately 45 minutes after school was not sufficient, more time allocated to do the presentation about common vision disorders in children, could result in teachers being aware of more conditions in detail.

The validation of the teachers screening was done in only two schools which may not represent the ability of all the Grade R to Grade 3 teachers that attended the educational session and were trained in how to use the vision checklist.

1.9 RECOMMENDATIONS

- Although the vision checklist has been used successfully in other countries and was adapted for the current study, future studies may look at reducing the number of items on the checklist to minimise time spent by teachers on screening.

- Data of those learners who were absent during the screening done by the researcher can be provided so that they can be consulted by the vision and eye health professional for a comprehensive eye examination and management.
- The Department of Education could allocate time in the curriculum to do various health screening tests. Teachers will also not see vision screening as an extra task for them.
- The school principals could motivate their staff by alluding to the importance of health screening tests, including vision screening.
- The teachers could have a continuous vision screening in their classrooms by noting down vision difficulties experienced by the children.
- Other Quintile schools and all grades should be included in future studies.

1.10 OUTLINE OF CHAPTERS

The study is presented in the following chapters:

Chapter 1: Introduction

Introduces the reader to the study by first emphasising the importance of vision, vision screening in learners and the importance of involving teachers to identify vision disorders among learners is given. It gives an introduction to the study that was conducted to investigate the use of a vision checklist as a screening tool by grade R to grade 3 teachers in Quintile 1 schools. Policies and guidelines from developed, developing countries and in South Africa also recognised. Aim, objectives and the significance of the study outlined.

Chapter 2: A literature review

Provides a detailed review of relevant literature on teachers' knowledge of common visual problems in children and previous studies that have been done on the training of teachers to perform vision screening on learners as done in other countries and South Africa. The review will also examine the use of a vision checklist as a tool for learners' vision screening.

Chapter 3: Methodology

This chapter describes in detail the methodology utilised in this study. It describes the research method chosen and the schools and grades selection procedures which were done for the study. The tools used by teachers to do the vision screening on learners and the instruments used by the research team for validation of the results are also described in detail.

Chapter 4: Article 1: Foundation phase teachers' knowledge on common visual problems affecting children: A South African case study

This article is on Grade R to Grade 3 teachers' knowledge of children's vision before and after educating them on common visual problems that affect children.

Chapter 5: Article 2: Teachers using a vision checklist as a screening tool to detect visual problems among learners

This article looks at a checklist used as a vision screening tool by the teachers and the validation of the teachers' results by the research team.

Chapter 6: The chapter looks at the summary of the results, limitations, recommendations and conclusion

Teachers had their educational session on common vision disorders in children and vision screening using a vision checklist done on the children. Limitations of the current study and recommendations for future studies as well as what is recommended concerning how school screening should be done was outlined.

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CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

In the previous chapter, an introduction and orientation of this study was given, which included the problem statement, aim and objectives of the study. This chapter will provide an overview of the main issues underlying the research, starting with reviewing the previous studies done on teachers' knowledge on common vision problems in children and on the training of teachers to perform vision screening on learners as done in other countries and South Africa. The review will also examine the use of a vision checklist as a tool for learners' vision screening.

2.2 KNOWLEDGE OF TEACHERS ABOUT THE COMMON VISION DISORDERS OF CHILDREN

A study was conducted by Ambika and Nair (2013) using a structured questionnaire to assess the awareness of primary school teachers regarding refractive errors and its early identification among primary school children in Mysore, India. The sample consisted of 60 primary school teachers, and the majority (91.67%) were females. The majority of teachers (60%) were younger than 30 years of age. Most teachers (33.33%) had attained BSc B. Ed qualifications, 30% had B.A.B. Ed and 26.67% attained D. Ed/TTC qualifications. Majority of the teachers (71.67%) had between 11 – 20 years of teaching experience. Although most of the teachers (80%) had adequate awareness regarding refractive errors in children, none of them could identify or classify the different types of refractive error. The knowledge of school teachers regarding the refractive errors was vital for the detection of any symptoms of refractive errors in school children as uncorrected significant refractive error can cause visual impairment. The study recommended nurses to encourage the school teachers to integrate the awareness with the practice of identification of different types of refractive errors in children.

A study was done in Pakistan to determine the preschool and primary (up to 5th grade) school teachers' level of knowledge about children's common eye problems, prevention and best treatment options (Habiba *et al.*, 2017). Using a self-administered questionnaire was

used on 443 primary school teachers. The questionnaire was divided into two parts, the knowledge of children's eye health and practices of teachers regarding the eye care of their learners in the classrooms. General knowledge about children's eye health included common eye diseases and symptoms to observe in the classroom. Most of the teachers (85.7%) were female, and 65.6% of the teachers were teaching in private schools. About 44% of the teachers had completed a Bachelor's degree, and 4.3% had a Master's degree and higher. Public school teachers showed a significantly higher knowledge about glaucoma, refractive error, trachoma, conjunctivitis, pterygium, age-related macular degeneration, and diabetic retinopathy as compared to private school teachers. The teachers who had experienced eye disease or had a close relative with eye disease were more knowledgeable compared to those with no experience of eye diseases. The majority (76.2%) knew that some blindness could be prevented while 5.4% reported that any type of blindness could not be prevented. The study revealed a gap of knowledge and practices among the primary school teachers of public and private schools regarding eye care of their students and this demonstrated an essential area of need for improved.

Elbahi (2014) conducted a study on awareness of eye-related disorders among primary and secondary school children and their teachers in Tripoli, Libya. A questionnaire was distributed to a total number of 124 participants from three different schools. Of this number 92 were school children and 32 were teachers. Most of the children in the study believed that healthy eyes are those, which could see well and diseased eyes to be those, which have redness, itchy and discharges. Teachers noted that children with visual difficulties have challenges in reading and writing. The majority of children and their teachers indicated that they would consult a doctor if children injured their eyes. The study concluded that school children and their teachers had good knowledge of eye-related disorders, but most of them would not know how to deal with an eye injury. The study results show that health education in the schools must be taken into account as well as the need for a national vision screening program as many vision problems and eye diseases can be detected and treated early.

Tchiakpe *et al*. (2016), investigated the knowledge of junior high school teachers in Ledzokuku Krowor Municipality, Ghana, on most ocular disease and healthy practices that promote good visual health in children. A self-administered, semi-structured questionnaire was used to gather demographic characteristic, information on the attitudes and knowledge of teachers on common eye diseases and conditions, signs and symptoms used by teachers to identify eye problems among children, source of information on ocular conditions and

preventive eye health practices that teachers recommend to children. A total of 346 teachers took part in the study with a gender distribution of 192 males (55.49%) and 154 females (44.51%). The mean age of teachers was 32.85 years (±9.72). Most teachers (30.06%) had the highest qualification degree, and the majority (35.84%) had been teaching for one to five years. Most teachers (89.88%) knew about red-eye while pterygium was the condition least known by the teachers, only (7.51%) of teachers knew about pterygium. The study also found that there was a statistically significant difference between the age of teachers and knowledge of ocular conditions. The older teachers and those with higher academic qualifications were more knowledgeable about eye problems. The ocular conditions known by most teachers were as follows: red eye (89.88%), refractive error (82.08%), eye injury (80.06%) and glaucoma (61.85%). The study concluded that teachers had adequate knowledge of most ocular diseases and healthy practices that promote good visual health.

A study was done in Gondar, Ethiopia, to determine knowledge, attitude and associated factors among 565 primary school teachers regarding the refractive error in school children (Alemayehu *et al.*, 2018). A structured questionnaire was used to collect data from teachers. The mean age of the teachers was 42.05 years (±12.01 years), and 52.92% were female. Most of the teachers (75.75%) had a diploma certificate, 73.62% were teaching in government schools in which 57.69% of them taught grades 5 to 8. In this study, 55.93% of primary school teachers had good knowledge regarding the refractive error in school children. The odds of good knowledge regarding refractive error among teachers who had previous training on eye health were two times greater than the odds of good knowledge for teachers with no history of training on eye health. The odds of good knowledge regarding refractive error among teachers with 11 to 20 years of experience were 2.53 times higher than the odds of good knowledge among teachers who had 1-10 years of experience. In this study, 57.17% of teachers had a favourable attitude towards a refractive error in school children. The study concluded that the knowledge and attitude of teachers towards refractive error were low. Therefore, training of teachers on refractive errors is still needed as it can play an important role in encouraging students to seek treatment that helps in reducing the burden of visual impairment.

Juggernath and Knight (2015) investigated the knowledge of Grade 5 teachers in Chatsworth, South Africa about the signs and symptoms that are linked to poor vision. A self-administered questionnaire was used to collect data from 19 intervention and 18 control teachers. Teachers in the intervention group (n=19) underwent simple structured training

on how to recognise children with visual impairment and to use the VA chart to assess visual acuity of learners in a classroom environment. The control group (n=18) consisted of teachers who received no training. Before the training, 63% of teachers in the intervention group knew about the signs and symptoms of poor vision as compared to 44% of teachers in the control group. After the training, 95% of teachers in the intervention group were more knowledgeable about the signs and symptoms of poor vision among learners. The study concluded that teachers can be trained effectively about reduced vision in learners and how to perform VA screening using clinical signs and symptoms and standardised Snellen chart in a classroom setting.

2.3 TEACHERS' TRAINING AND VISION SCREENING OF LEARNERS BY TEACHERS

2.3.1 Teachers' vision screening where training was effective

Krumholtz (2004) conducted a study to determine whether New York public school teachers' abilities to detect vision problems in their students could be increased by teacher's training on the different visual problems. The teachers (n=18), were asked to specify in a class list whether the child had vision problems or not, and the teachers had to specify the problem if any. The optometrists screened all the classes of the teachers who participated in the study. Of the 377 children screened, 111(29%) were referred. The referral group was divided into two groups, the acuity referral (the learners failed either distance or near visual acuity) and the functional group referrals (learners failed stereopsis, near the point of convergence, cover test and accommodation). There were 77 acuity referrals whereby 39% were correctly identified by the teacher as having a vision problem and of the 34 functional referrals, the teachers identified 29% of the children correctly. Two years later, the same teachers were given a lecture and hand-outs about the symptoms of various visual problems before they were asked to identify children with visual problems. In total there were 126 referrals (31%) with 82 acuity referrals and 44 functional referrals. Of the 82 acuity referrals, teachers correctly identified 68% and of the 44 functional referrals, teachers correctly identified 67% of children as having visual problems. Thus, teachers' ability to accurately identify children with identifiable vision problems was enhanced by increasing their awareness about the visual problems through a lecture and hand-outs. Therefore, teachers can be good vision screeners if there is prior teachers' training on vision problems that may impact learning performance.

Lattorre-Arteaga *et al*. (2014), conducted a study in remote communities of Peru where optometrists and ophthalmic nurses trained 26 preschool and primary school teachers on basic visual functions, signs and symptoms of common vision disorders in children, how to do visual screening in the classroom and also the health and risk prevention. A pre and post-training questionnaire to determine the knowledge of the teachers was also done. Thereafter, the teachers were asked to conduct vision screening in their respective schools as part of school activities by observing any eye abnormalities, measuring the visual acuities and checking pupil reactions using a penlight. The school children who did not meet the screening criteria were referred to the eye hospital for a comprehensive eye examination. To check the validity of the screening performed by the teachers, two ophthalmic assistants visited selected school and repeated vision screening on 63 children, which was 15% of the total sample. The results showed that the specificity of teachers' vision screening was higher (95.8% for pre-schoolers and 93% for primary school children) and the positive predictive value (PPV) was 59.1% for pre-schoolers and 47.8% for primary school children. The study concluded that trained school teachers showed an optimal validity for the early detection of visual acuity deficit caused by refractive problems, even in preschool. However, the PPV was low, sensitivity values were not given, and the results of the pre- and post-training questionnaire to determine the knowledge of the teachers were not presented.

Saxena *et al*. (2015), investigated the accuracy of visual assessment by primary and secondary school teachers from both government schools and private schools in a school eye screening program in Delhi, India. The study also assessed the effects of changing the cut-off for referral on the sensitivity and specificity of the procedure. Forty teachers were trained to conduct vision screening of 9838 learners using modified early treatment diabetic retinopathy survey (ETDRS) vision chart that had four lines of ETDRS from 6/9.5 to 6/19 at 4m. The results of the teachers were compared to the screening results of the primary eye care workers. Using a VA of 6/9.5 as a cut-off, the sensitivity and specificity were 79.2% and 93.3% respectively, compared to 77.0% and 97.1% respectively, when using the 6/12 cut-off. Using a VA of 6/9.5 as a cut-off for referral, the teachers had 6.7% of the children incorrectly referred for subnormal vision (false positives), which added time and cost component for evaluation by the eye care providers and that also caused anxiety of for both the parents and children after been informed that they have failed the vision screening. Using VA of 6/12 as a cut-off for referral, the false positives came down (3.0% of children as compared to 6.7%) with lesser referrals. The study concluded that the use of teachers and the referral cut-off VA of 6/12 for the school eye-screening program appeared to be appropriate and would substantially reduce the workload of eye care providers.

Panda *et al*. (2018), evaluated the efficacy of multistage screening of school teachers in the detection of impaired vision and ocular anomalies in school children aged 5 to 15 years in India. Two hundred and sixteen teachers were trained on recording VA using Snellen 'E' chart at 6m, basic eye anatomy and common visual and ocular disorders. The sensitivity of teachers in identifying the visual problem was 80.51%, and PPV was 93.05%. Specificity and negative predictive value (NPV) were 53.29% and 26.02%, respectively. Thus, high sensitivity and PPV indicated that the teachers detected most of the children with impaired vision. The low specificity and NPV indicated that many children with no vision problems were referred for a full eye examination, which has a negative effect on the cost. Concerning ocular disorders, the specificity and NPV for detection of cataract were high (98.74% and 99.71%, respectively) and sensitivity and PPV were low (5.56% and 1.32%). Detection of strabismus had a sensitivity of 31.45%, followed by eyelid anomalies (10.71%) and corneal problems (10.23%). Thus, these results showed that teachers could not identify most children with ocular disorders. The study concluded that teachers could be good screeners for vision disorders and more training needed to be provided for ocular disorders.

Omar *et al*. (2018), conducted a study to assess the effectiveness of vision screening programme conducted by 60 preschool teachers in Malaysia. The teachers were arranged into two groups comprising of the study group (n=30) and the control group (n=30). The study group was given a participative (hands-on) training on vision screening. Included in the training was theory and practical sessions, and the control group was only given brief instructions verbally on conducting the screening. Visual acuities were taken using a LEA Symbol Chart at 3m. The failing criteria for visual acuities per age group were as follows: VA of worse than 6/12 in four-year-olds, VA worse than 6/9 in five-year-olds and a VA of worse than 6/7.5 in six-year-olds. The results of the screening by the teachers were compared with the results of the screening performed by optometrists. The specificity of preschool vision screening by teachers was found to be higher (97.4%) in the study group compared to the control group (95.2%). The NPV of the screening test results for both groups were found to be almost the same, 96.9% in the study group and 96.4% in the control group. This indicated that preschool teachers were able to identify children who had no vision impairments with an accuracy of over 96%. The sensitivity of the vision screening conducted by teachers in the study group was markedly higher (67.7%) compared to the control group (26.7%). This meant that the preschool teachers who were given comprehensive training on preschool vision screening were able to detect 67.7% of children who had vision impairment. However, the teachers who were not trained were only able to

identify 26.7% of children with vision impairment. The study concluded that a comprehensive training session is an important aspect of preschool vision screening.

Tabansi *et al*. (2009) conducted a study to evaluate teachers' performance of vision screening in primary school children in Port Harcourt in Nigeria. One hundred and thirty teachers from 13 private and public primary schools were trained at a six-hour skill acquisition workshop on common vision disorders in children. The teachers were also trained on how to use a Snellen's alphabetic and tumble 'E' visual acuity charts at 6m. There were 1300 school children screened by the teachers and rescreened by the research team comprising of medical doctors, paediatricians and ophthalmologists. The research team's visual acuity screening results were used as a reference standard to which the teachers' visual acuity testing results were compared. The results showed a sensitivity of 53.3% and specificity of 98.4%. Thus, teachers were able to detect 53.3% of children with reduced vision and were able to identify children with normal vision to a high degree of accuracy, respectively. The study demonstrated the competence of trained primary school teachers at performing simple vision screening using VA charts.

Wedner *et al*. (2000), investigated whether teachers could successfully do school vision screening after being trained in a one-day workshop to assess visual acuity at 6m and administer questionnaire with three questions to 1438 primary school children in Tanzania. The ophthalmic nursing officer, under the supervision of an ophthalmologist, trained six teachers. After the training, the teachers were given one week to screen and administer the questionnaire. The eye care professional team consisting of the trained interviewers, ophthalmic nursing officer and the ophthalmologist interviewed and examined the school children who have been screened by the school teachers. The results showed that the trained teachers could correctly identify 80% of children with poor vision with the specificity of 91%. When using the VA testing alone, the trained teachers could identify 70% of children with poor vision with the specificity of 97%. Thus, the study showed that in countries where there is a shortage of eye care personnel, teachers could be effective school vision screeners if they are trained and that the sensitivity increases with the use of both the questionnaire and the VA testing. The researchers argued that the sensitivity could be higher if the trained teachers are supervised to make sure that only trained teachers do the screening, and there is no fabrication of the results.

2.3.2 Teachers' vision screening where training was not effective

Concannon and Robinson (1997) investigated the feasibility of teachers to detect visual problems amongst 1087 preschool children from 22 schools in Australia using a questionnaire and also to assess the effectiveness of training teachers on visual problems. The questionnaire comprised of three non-specific items on vision; "do you believe that this child can't see properly, does this child screw up or rub his or her eyes when reading and does this child have problems reading which may be related to poor sight?" The 22 schools were divided into two randomly selected groups. The teachers from the eleven schools received the questionnaires and the standard school health manuals on visual problems. The other teachers from the 11 schools received half an hour training on the manual before completing the questionnaire for each preschool child. The teachers then completed the questionnaires in their respective preschool classes. Subsequently, the nurses performed standardised vision screenings among the same preschool children. The overall resultant questionnaire sensitivity was 13.9% and specificity of 96.5%. The results for the trained group showed a sensitivity of 18.2% and specificity of 94.4%, and for the group that was not trained a sensitivity of 7.1% and specificity of 99.1%. Although the specificity was satisfactory, the sensitivity was very low, indicating a high false-negative rate. Therefore, even though there was prior teachers' training on the manual before completing the questionnaire, teachers' screening still resulted in false-negative values. The study concluded that the teacher's questionnaire could not be an alternative to vision screening done by professionals as most children with visual problems are not identified with the screening tool.

Sudhan *et al.* (2009), conducted a study to assess the effectiveness of teachers in a vision screening program for children in the 5th to 12th grades in India. Five hundred and thirty teachers were trained on how to take distance visual acuities using a VA of 6/9 as a cut-off for passing the screening and how to recognise common eye diseases among school children. Ophthalmic assistants then screened all children that had been screened by the teachers using the same screening tools as the teachers. The results showed that there was a false positive rate of 58%. Thus, nearly two-thirds of referrals to the ophthalmic assistant were not necessary, resulting in an increased workload of ophthalmic assistants. The false-negative rate was 6%, which was reasonably good. Reducing the false-negative rate further will ensure that children who need care are not missed out. Thus, the study concluded that the teachers were not good visual problem screeners.

Muralidhar and Vijayalakshmi (2016) conducted a study to determine the sensitivity and specificity of vision screening by school teachers among primary school children in South India. Sixty-five primary school teachers from 56 schools were invited to a half-day training program presented by ophthalmologists and optometrists along with the school eye health coordinator. The first half of the training included an introduction to the anatomy of the eye, its function, common eye problems in school children, and the importance of recognising these problems at an early stage. The second part was devoted to practical training on how to measure visual acuity using Snellen's E chart. With visual acuity done at 6m, children with VA of 6/9 or better were marked as "Good Vision" and those with VA worse than 6/9 as "Not Good Vision". All children underwent vision screening by the optometrists using the Snellen and the ETDRS charts. The hospital-based team comprising of ophthalmologist, refractionists and a child counsellor did a full eye and vision examination on all the children. The screening was completed for 5150 children from classes 1-5 in 56 schools. Thirteen children were excluded as forms were incomplete and another seven for having missed one of the two screenings. Of the 5130 children, a total of 145 children (2.83 %) were found to have a poor vision by optometrists. Teachers identified 5027 children as having good vision and 103 (2.01%) with poor vision. The sensitivity was thus 24.8% and specificity was 98.65%. Optometrists screening had a sensitivity of 82.76% and a specificity of 97.9%. The study concluded that the teachers had poor sensitivity, and thus children with vision disorders were missed. The study recommended the need for standardised teacher training and screening.

2.3.3 Teachers' training not done

OstadiMoghaddam *et al*. (2011) undertook a study to evaluate the validity of vision screenings measured by teachers in Iran among 662 elementary and 501 middle school learners. Visual acuities were taken by teachers using a LogMAR chart, and VA of 6/7.5 was used as a cut-off for passing the screening. Optometrists also measured visual acuities under the same conditions as teachers. There we 847 children screened by both teachers and optometrist. The false-negative rate was 62.5%, sensitivity was 37.5%, and specificity was 92.03%. The findings indicated that teachers were not good visual screeners when using visual acuity as a screening tool as they missed a considerable number of children with vision impairment and the screening performed by teachers lacked the required sensitivity for case detection.

2.4 SUMMARY

All of the above studies highlighted the importance of vision screening in school children in detecting visual impairments and ocular anomalies. Most western (high income) countries, as mentioned earlier in Chapter 1 have preschool and school vision policies and guidelines for school vision screening. Most of the low and middle-income countries do not have published school vision screening policies, and those countries have to the limited number of ophthalmic trained staff, optometrists and financial resources to conduct school vision screening.

Teachers spend more time with children at school, and it is easier for teachers to get the children under their care to willingly cooperate and participate in the vision screening as they will have greater trust and familiarity with their teachers. Most studies indicated that teachers had a high false referral rate; this may be due to the teachers being overly cautious and being worried that they might miss children with vision problems. Over-referral would be a burden for eye care professional and having more training and regular evaluation to improve the accuracy of vision impairment detection in school children will alleviate the burden. Regular training for teachers will also keep them motivated, and they will not consider it as an additional workload.

The methods and different VA charts used by teachers for screening differed from study to study; hence the findings were different. Studies done by Sudhan *et al.* (2009), Lattorre-Arteaga *et al*. (2014), Tabansi *et al*. (2009), Saxena *et al*. (2015), Panda *et al*. (2018), Muralidhar and Vijayalakshmi (2016) and Omar *et al*. (2018) trained the teachers to take visual acuities and to observe the common eye diseases over one or two training sessions. However, in the study done by OstadiMoghaddam *et al.* (2011), teachers were not trained on taking visual acuities in children. Visual acuity taking is an easy technique for trained health professionals but cannot be mastered over one or two training sessions by non-health professionals, which will have contributed to the high false-positive rate in the Sudhan *et al.* (2009) study, high false-negative rate in the OstadiMoghaddam *et al*. (2011) study and a poor sensitivity by teachers in the Muralidhar and Vijayalakshmi (2016) study. Another factor that could have attributed to high false positives is that the teachers may not have been motivated to do the screening and they could have had a negative attitude towards the whole process of screening, even if they have been trained. It was also speculated that screening could have been an extra workload added to the existing workload of teachers which could hinder their primary responsibility of teaching (Sudhan *et*

al., 2009) and possible lack of motivation among teachers, difficulty in getting cooperation in the age group and inadequate spare time among teachers to accomplish the activity (Muralidhar and Vijayalakshmi (2016). Therefore, there is a need for teachers to understand the benefit of vision screening and also for them to buy into the program of vision screening for the program to succeed.

The current study chose the vision checklist as a screening tool instead of the visual acuities as it was time-saving and easy to understand for the teachers as they are non-healthcare professionals. The vision checklist used in this study was adapted from the vision checklist used in the developed countries like the USA (Texas School for the blind & visually impaired, 2000; Kansas Department of Health and Environment, 2004; Colorado Department of Education, 2006; Missouri Department of Health, 2009; New York State Education Department, 2014). However, there is no published study on the effectiveness of the vision checklist as a screening tool. This is the first study to assess the use of a vision checklist as a vision screening tool by Grade R to Grade 3 teachers in Quintile 1 schools in South Africa and globally.

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CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter aims to describe the methodology that was used to investigate the use of a vision checklist as a screening tool by Grade R to Grade 3 teachers to detect visual problems among learners in Bloemfontein. The description of the study design, study participants, population size, sample size, measuring instruments and methods used for collecting the data and data analysis are discussed.

3.2 STUDY DESIGN

A research study design is a framework, or the set of methods that are used to collect and analyse data based on the aim and the objectives of the study (Ranganathan and Aggarwal, 2018). A quantitative research study was conducted to quantify the teachers' knowledge of children's vision disorders. Qualitative information was obtained during the educational session through the discussion by observation and also from comments that the teachers made. Quantitative research is an explaining phenomenon by collecting numerical information that is analysed using mathematically based methods (Muijs, 2004). The research method chosen for the study was to quantify data gathered from questionnaires used for teachers' knowledge (before and after the educational sessions), from vision checklists and from the optometrists' data forms.

A cross-sectional design is an observational study analysing data from the population; it is the most relevant design when assessing the prevalence of diseases, attitudes and knowledge among participants (Kesmodel, 2018). Data was collected from the Grade R to Grade 3 teachers regarding their knowledge of vision disorders in children. Analytical studies encompass cross-sectional studies, which measure exposure and outcome at the same time and compare variables between groups (Alexander *et al.*, 2015) as done in the current study where the results from the teachers were compared and validated by the results from the research team.

3.3 STUDY POPULATION AND SAMPLING

3.3.1 Target population

There are 88 primary schools in Bloemfontein, and only 12 primary schools are classified as Quintile 1. This school system classification is based on the income of the community within the school's catchment area. Schools in the low socioeconomic status communities are classified as Quintile 1, and those serving the high socioeconomic status communities are classified as Quintile 5. The Quintile system was introduced in 1998 as part of the National Norms and Standards of the Department of Education to improve equity in education (DOE, 1998).

In this study, only schools classified under Quintile 1 were included. These were schools from the poorest areas of Bloemfontein. Eleven schools out of the 12 Quintile 1 primary schools had grade R classes. The total number of teachers teaching Grade R to Grade 3 in the 11 schools was 41, and the total number of learners in Grade R to Grade 3 was 1360 (FSDOE, 2018). All foundation phase (FP) teachers and learners in the 11 Quintile 1 schools in Bloemfontein were asked to participate.

3.3.2 Sample size

Through a nonprobability convenience sampling, a total of 41 teachers from the 11 schools were asked to participate in the study to assess objectives 1, 2 and 3. Two schools, namely School A and School B were randomly selected to represent the larger population of other Quintile 1 teachers and learners for the validation of the screening results of the teachers by the research team. The two schools had eight teachers and 261 learners from Grade R to Grade 3. Convenience sampling was utilized, and the number of learners screened depended on the number of teachers that agreed to participate in the study in those two schools, learners who gave assent and whose parents gave consent.

Inclusion criteria were Grade R to Grade 3 teachers and learners in Quintile 1 schools in Bloemfontein, teachers who gave written consent, learners whose parents gave written consent and learners who gave assent. Teachers and learners from other grades and Quintiles, the teachers who did not give consent, the Grade R to Grade 3 learners who did not give assent and learners whose parents did not give consent were excluded from the study.

3.4 MEASURING INSTRUMENTS AND PROCEDURE

The study commenced after approval was obtained from the Health Sciences Research Ethics Committee of the University of the Free State, clearance number: UFS-HSD2017/0985 (cf. Appendix A) and permission obtained from the Free State Department of Education (cf. Appendix B) and principals of schools (cf. Appendix C). Consent was given by teachers (cf. Appendix D) and parents (cf. Appendix E). Learners whose parents signed the consent forms had to sign assent forms (cf. Appendix F) before participating in the study. Information documents (cf. Appendix G) were sent out to all the Grade R to Grade 3 teachers giving a short introduction to the study, what the study involved and outlined the benefits and risks of participating in the study. Information documents (Appendix H) were also sent out to the parents explaining the study procedures, venue, reassurance to keep confidentiality of learners' information and the importance of vision screening. Child information documents (cf. Appendix F) with pictures were sent out to all the Grade R to Grade 3 learners explaining the procedures of the study. The learners were reassured that they will not be harmed and that they could leave the study at any point when they do not want to participate anymore. All the information documents were made available in English, Sesotho, and Afrikaans and were sent out in the preferred language for ease of understanding.

The study consisted of three phases, Phase I was to assess the knowledge of teachers on children's vision before and after educating them and to train the teachers on the vision checklist. Phase 2 was the screening of Grade R to Grade 3 children by teachers using the vision checklist. Phase 3 was the visual screening by the researcher and trained research assistants of the children who were screened by teachers in School A and School B. Phase 1 activities took place in the staff room of each school that participated in this study. Phase 2 was done in the classrooms of the teachers that were participating in this study while Phase 3 activities took place in the halls of School A and School B.

3.4.1 Phase 1: Educating teachers and assessing their knowledge

3.4.1.1 *Instruments*

Two questionnaires (cf. Appendices I1-I6) were designed by the researcher to address Objective 1 which was to determine Grade R to Grade 3 teachers' knowledge of children's vision before and after educating them on common visual problems that affect children.

The first questionnaire (cf. Appendix I1-3) consisted of items on teachers' knowledge of common vision disorders in children, vision difficulties that children experience in the classroom and when to refer children with vision difficulties or disorders for a complete eye examination. The questionnaire was made available in English (I1), Afrikaans (I2) and Sesotho (I3) for the teachers to complete in their comfortable language. The questionnaire consisted of nine items, and the teachers were scored as having a good knowledge of children's vision if they obtained a score of seven (78%) and higher.

The second questionnaire (cf. Appendix I4-6) consisted of nine items on teachers' knowledge of common vision disorders in children, vision difficulties that children experience in the classroom and when to refer children with vision difficulties or disorders. However, in the second questionnaire, there were also pictures of different common vision disorders. The questionnaire was made available in English (I4), Afrikaans (I5) and Sesotho (I6) for the teachers to complete in their comfortable language. They were all completed in English. The second questionnaire was to test the teachers' knowledge after the educational session. All teachers were expected to score 78% and higher to indicate good knowledge.

To educate the teachers, a 45-minute presentation on common vision disorders in children, vision difficulties in the classroom, and when to refer to an ophthalmologist or an optometrist was designed and presented by the researcher (cf. Appendix J). The presentation was printed in English (cf. Appendix J1), Afrikaans (cf. Appendix J2) and Sesotho (cf. Appendix J3) presented using the teachers' comfortable language.

The vision checklist (cf. Appendix K) was used as a vision screening tool to identify FP learners with vision difficulties affecting their functioning in the classroom. This vision checklist was adapted from the school vision programmes in the United States of America (Texas School for the blind & visually impaired, 2000; Kansas Department of Health & Environment, 2004; Colorado Department of Education, 2006; Missouri Department of Health, 2009; New York State Education Department, 2014). The checklist included the following: the appearance of the learner's eyes, behaviour of the learner when given a task, child's complaints in the classroom and teacher's observation. The teacher's task was to indicate on the vision checklist whether or not the learner had a vision problem as per the list of signs and symptoms given. The vision checklists were made available in English (cf. Appendix K1), Afrikaans (cf. Appendix K2) and Sesotho (cf. Appendix K3) for the teachers to complete in their comfortable language.

3.4.1.2 *Procedure*

The participating teachers were given the first questionnaire (cf. Appendix I1-3), to complete before the presentation, and this was to assess the teachers' knowledge of common vision disorders in children. Thereafter, the researcher gave a 45-minutes PowerPoint interactive presentation to the teachers on the common eye problems among children. The teachers were encouraged to ask questions and discuss the presentation. Immediately after the presentation and discussion, the second questionnaire (cf. Appendix I4-6) was administered to the teachers to assess their knowledge. Thereafter, the researcher discussed the vision checklist, and the teachers were trained on how to complete the checklist. Each teacher was then given the vision checklists according to the number of children in their classes.

3.4.2 Phase 2: Screening of Grade R to Grade 3 learners using the vision checklist

Each participating teacher was asked to complete the vision checklist for each learner in her class. The teachers were given a month to complete all the vision checklists for their classes. The teachers were also asked to place the completed vision checklists in a closed box (with a slit) that was left in each school by the researcher. The researcher collected the completed vision checklists.

3.4.3 Phase 3: Optometry vision screening

The researcher, together with two trained research assistants (optometrists) conducted a vision screening among Grade R to Grade 3 learners who were screened by the teachers at School A and School B. The optometry vision screening was done to address objective 4. Tests done in the optometry vision screening included visual acuity at distance and near, cover test at distance and near, near the point of convergence, refractive status, colour vision, and ocular health. The researcher selected these tests as they will be able to screen for most vision disorders found in children, and the results will assist in the referral to either an optometrist or an ophthalmologist for full eye examinations and management.

The vision screening was divided into three stations. Station 1: the researcher performed three tests, namely refraction using an autorefractor, colour vision using the Hardy-Rand and Rittler (HRR) pseudoisochromatic test, and ocular health examination using a direct

ophthalmoscope. Station 2: research assistant one, assessed the children's distance and near VA and performed the +2.00D VA test. In Station 3, research assistant two, did a cover test at a distance and near and the near point of convergence. The participant could start at Station 1 or 2; however, for Station 3, the participant should have been screened first in Station 2.

3.4.3.1 *Visual acuity (VA)*

Instruments

The ability to see at distance and near was measured through visual acuity testing. In this study, crowded LEA Symbols VA cards were used to measure distance visual acuity to improve the sensitivity for amblyopia detection due to the crowding phenomenon (Zadnik, 1997). The crowded LEA Symbols per VA level (cf. Appendix L) consisted of four symbols (pictures) namely, apple, house, circle, and square. The VA ranged from 6/19 to 6/4.8, and there were four cards per VA with each card containing five symbols. Here, the task of the participant was to identify the middle symbol. There was a response card that has the same five symbols that are on the crowded LEA Symbols VA cards. The crowded LEA Symbols VA cards were held at a distance of three metres from the participant's eye.

Near visual acuity was measured using a Massachusetts Visual Acuity Test (MVAT) (cf. Appendix L) which consisted of the same symbols as the distance crowded LEA Symbols cards. The test was performed at 40cm and had the right and left groups of symbols for the right and left eyes respectively and a cord to ensure proper testing distance. The VA ranged from 6/19 to 6/3, and there were five symbols per VA.

Procedure

The participant was seated on a chair in a well-lit room with the response card on his/her lap. Before the test was performed, research assistant one explained and demonstrated to the participant how the test was to be conducted. The crowded LEA Symbols Chart was mounted on the wall, 3m from the participant and was set at a correct and consistent height. With both eyes of the participants opened, research assistant one pointed to the symbol/picture of the 6/60 VA cards on the crowded LEA card and asked the participant to match the shown picture by pointing to the same pictures on the response card.

The testing began by placing the occluder before the left eye of the participant, to enable the testing of the right eye. The testing started with the 6/9.5 VA symbols and proceeded to the 6/7.5, 6/6, and 6/4.8 VA levels until two symbols were incorrectly identified at any successive level or the testing was completed. If the participant missed three of the 6/9.5 symbols, the participant was shown the 6/19 symbols, and if the participant could not correctly identify three of the 6/19 symbols, then the testing was stopped. If the participant could identify three or more of the 6/19 symbols, then the testing proceeded to the next successive level until the participant was unable to identify three symbols at a level correctly. The participant had to accurately identify three or more symbols on the visual acuity level to get credit for that visual acuity level.

The occluder was then placed before the right eye so that the left eye was tested. The above testing procedure was then repeated. The data was recorded on the data form (cf. Appendix M). The test duration was about three minutes per participant. All participants whose VAs were worse than 6/9.5 were referred for a full eye examination.

Testing near visual acuity was done at 40cm using a Massachusetts Visual Acuity Test (MVAT) near card consisting of the same symbols as the distance LEA Symbols cards. The participant was seated on a chair in a well-lit room. Before the test was performed, research assistant one explained and demonstrated to the participant how the test was to be conducted. Research assistant one stood next to the participant, holding the MVAT near the card. To ensure that the card was held at the correct distance, the cord was pulled to measure the distance from the card to the participant's eye. With both eyes of the participants opened, research assistant one pointed to the symbol/picture of the 6/60 VA cards on the MVAT card and asked the participant to match the shown picture by pointing to the same pictures on the bottom of the MVAT card.

The testing began by placing the occluder before the left eye of the participant, to enable the testing of the right eye. The testing started with the 6/9.5 VA symbols and proceeded to the 6/7.5, 6/6 and 6/4.8 VA levels until two symbols were incorrectly identified at any successive level or the testing was completed with all the cards. If the participant missed three of the 6/9.5 symbols, the participant was shown the 6/19 symbols, and if the participant could not correctly identify three of the 6/19 symbols, then the testing was stopped. If the participant could identify three or more of the 6/19 symbols, then the testing proceeded to the next successive level until the participant was unable to identify three symbols at a level correctly. The participant had to accurately identify three or more symbols

on the visual acuity level to get credit for that visual acuity level.

The occluder was then placed before the right eye so that the left eye was tested. The above testing procedure was then repeated. The data was recorded on the data form (cf. Appendix M). The test duration was about three minutes per participant. All participants whose VA was worse than 6/9.5 were referred for a full eye examination.

3.4.3.2 *+2.00 VA test*

Instrument

The +2.00 VA test was done to rule out the presence of latent hyperopia. Latent hyperopia is the amount of hyperopia that is 'masked' when the accommodative muscles are used to increase the eye's focusing power (Grosvenor, 2007). Since children under 10 years of age have tremendous focusing ability, they can partially correct their farsightedness by focusing on or accommodating their own eyes. If a child has latent hyperopia, they will complain of difficulty in maintaining a clear focus on close objects, eye strain, headaches or fatigue after performing work at a close range, painful or tearing eyes, poor eye/hand coordination and occasional crossing of eyes. These symptoms may affect reading and general school performance.

The test was done when each eye has a VA of 6/6 or better at distance. Thus, this test would only be performed after distance VA in each eye has been assessed. The +2.00D lenses were used after distance visual acuities are taken. The effect of the +2.00D lens is the blurring of symbols or letters on the VA card.

Procedure

The participant was seated on a chair in a well-lit room. Research assistant one placed +2.00D trial lenses in front of the participant's right and left eyes (binocularly) and the participant was asked to identify the middle symbol of the 6/9.5 VA cards on the distance crowded LEA Symbol Chart. The participant passed the test if he/she could not correctly identify three of the 6/9.5 symbols. If the participant was able to identify three or all of the 6/9.5 symbols, he/she failed the test and was referred for a full eye examination. The test took about one minute per participant. The results were recorded in the data form (cf. Appendix M).

3.4.3.3 Cover test

Instrument

The cover test was used to assess the presence and magnitude of a phoria or strabismus (Carlson and Kurtz, 2004). Alignment of the eyes during the early years of life is critical for the development of normal binocular vision and sensory fusion (Duckman, 2006). This is of paramount importance in learners. The cover test consisted of two subtests, namely unilateral and alternate cover test. A unilateral cover test is used to establish the presence or absence of strabismus (tropia). The alternate cover test is used to establish the presence of a phoria and to determine the direction and the magnitude of the phoria or tropia

The test was performed at distance (3m) and at near (40cm). The target used was based on the visual acuity of the child for each distance tested, and this was a symbol on one line above the VA of the worst eye. Thus this test will only be done after the visual acuities have been assessed. An occluder was used to cover the eye(s) and the prism bar used to measure the amount of the eye movement or deviation.

Procedure

The participant was seated on a chair in a well-lit room with distance LEA chart symbol placed at 3m. The participant's target was a VA symbol one line above VA of the worst eye. Research assistant two will start the testing by performing the unilateral cover test and then followed by the alternate cover test.

The participant was asked to look at the selected symbol and to keep it clear. With both eyes open, research assistant two covered the participant's left eye for three seconds and observed the right eye for any movement as soon as the left eye was covered. The occluder was removed and allowed two to three seconds for the two eyes to resume their normal position of gaze. The procedure was repeated three times. The right eye was then covered for three seconds, and the procedure was repeated as above. No movement meant the participant had no tropia and any movement observed meant the participant had a tropia. For the alternate cover test, the participant was asked to keep on looking at the symbol with both eyes, the right eye was covered for three seconds, and the research assistant two observed the left eye for any movement. Then the research assistant two quickly moved the occluder to cover the left eye while observing the right eye. The occluder was moved

to the right eye and the procedure repeated for at least 3 times. If a movement is seen, the amount of the movement was measured using the prism bar according to the direction of the eye movements. The results were recorded on the data form (cf. Appendix M). The duration of the test was two minutes. The expected norms are one prism dioptre esophoria to 3 prism dioptres exophoria (Scheiman & Wick, 2013). The participants found to have values outside the expected norms, and all participants with tropia were referred for a full eye examination.

For the near cover test, the participant was seated on a chair in a well-lit room with a Massachusetts Visual Acuity Test (MVAT) near card placed at 40cm. The participant's target was a VA symbol one line above VA of the worst eye. Research assistant two will start the testing by performing the unilateral cover test and then followed by the alternate cover test.

The participant was asked to look at the selected symbol and to keep it clear. With both eyes open, research assistant two covered the participant's left eye for three seconds and observed the right eye for any movement as soon as the left eye is covered. The occluder was removed and allowed two to three seconds for the two eyes to resume their normal position of gaze. The procedure was repeated three times. The right eye was then covered for three seconds, and the procedure was repeated as above. No movement meant the participant had no phoria, and any movement observed meant the participant had a tropia. For the alternate cover test, the participant was asked to keep on looking at the symbol with both eyes, the right eye was covered for three seconds, and the research assistant two observed the left eye for any movement. Then the research assistant two quickly moved the occluder to cover the left eye while observing the right eye. The occluder was moved to the right eye and the procedure repeated for at least three times. If a movement is seen, the amount of the movement was measured using the prism bar according to the direction of the eye movements. The results were recorded on the data form (cf. Appendix M). The duration of the test was two minutes. The expected norms are one prism dioptre esophoria to three prism dioptres exophoria (Scheiman & Wick, 2013). The participants found to have values outside the expected norms, and all participants with tropia were referred for a full eye examination.

3.4.3.4 *Near point of convergence (NPC)*

Instrument

The purpose of the test was to determine the participant ability to converge the eyes while

maintaining fusion (Carlson & Kurtz, 2004). NPC is important for reading. The test was performed using a Woolf ball. This procedure was performed after the cover test for distance and near was done.

Procedure

The participant was seated on a chair in a well-lit room with the research assistant two sitting and facing the participant. Research assistant two held the Woolf ball about 40 to 50 cm away and instructed the participant to look at the Woolf ball and report how many balls he/she saw. If the Woolf ball was reported to be double, the research assistant two moved it further from the participant until it appeared single before proceeding with the test. The target was moved towards the participant until one eye loses fixation. This was recorded as a breakpoint. The target was then moved away from the participant's eyes until there were refixation and the distance at which the deviated eye regains fixation was recorded as a recovery point. This was repeated three times, and an average for break and recovery was recorded as the NPC. The data was recorded on the data form (cf. Appendix M). The duration of the test was roughly two minutes. The expected norms are Break 7cm / Recovery 10cm (Scheiman & Wick, 2013). Participants found to have values outside the expected norms were referred for a full eye examination.

3.4.3.5 *Autorefraction*

Instrument

An autorefractor was used as a screening tool to determine the refractive status of the eye without the need for subjective judgements by the optometrist or the participant. Welch Allyn Spot Vision Screener, which is a handheld autorefractor, was used. The Spot Vision Screener allows the examiner to test paediatric participants, regardless of the colour of the eyes, or other potentially limiting factors for the potential presence of myopia, hyperopia, astigmatism, anisometropia, and strabismus (Kulp *et al.,* 2014).

Procedure

The participant was seated on a chair in a dim lit room. The researcher, while standing, aligned the participant's right eye with the target line located on the side of the Spot Vision Screener autorefractor. The researcher asked the participant to look at the picture inside

the autorefractor, and then measurements were automatically taken. Five values were taken for the right eye. The procedure was repeated for the left eye. The data was then recorded on the data form (cf. Appendix M). The duration of the test was roughly two minutes.

All participants found to have a refractive error of +1.00DS and above of hyperopia, -1.00DS and, above of myopia and -1.00DC and above of astigmatism were referred for a full eye examination.

3.4.3.6 *Colour vision*

Instrument

Colour vision is the ability to discriminate light of different spectra, regardless of their relative intensities (Duckman, 2006). Colour is a vital part of the preschool and foundation phase (FP) therefore it is especially important to identify children with colour deficits at the earliest possible age (Ramachandran *et al.,* 2014). The Hardy-Rand & Rittler (HRR) pseudoisochromatic test (cf. Appendix L) was used to evaluate colour deficiencies. It consists of 24 pseudoisochromatic plates with easily identifiable objects such as circle (**O**), triangle (Δ) and a cross (X). The first four plates are for demonstration purposes, while the screening is done using plates 5 to 10. Plates 11 to 24 are used to determine the type, and the extent of the colour vision defect. In this study, the demonstration and the screening plates were used.

Procedure

The participant was seated on a chair in a well-lit room facing the researcher who was holding the HRR test at 40cm. The demonstration plates (1-4) were not scored, first two demonstration plates (circle X and X triangle), one coloured symbol (O) on the third one, and a no coloured symbol on the fourth one. The demonstration was done with both eyes open. An occluder was placed over the left eye when the right eye was tested. Starting with plate five, the participant was required to identify the symbols by answering the following questions, "how many coloured symbols do you see?", "what are they?' and "where are they?". The test was done for plates 5-10 and repeated for the left eye with the right eye occluded.

A participant had a normal colour vision when all the six plate boxes were correctly identified. When plates five or six were incorrectly identified, the participant had a defective blue-yellow vision and thus failed the screening. When any of the plates from seven to ten were incorrectly identified, the participant had a defective red-green vision and failed the screening. The data was recorded on the data form (cf. Appendix M). The duration of the test was roughly two minutes. Participants who failed the colour vision test were referred for a full eye examination.

3.4.3.7 *Direct Ophthalmoscopy*

Instrument

An ophthalmoscope was used to assess the ocular health status of the learners (Carlson & Kurtz, 2004). A thorough assessment of ocular health is imperative to identify vision conditions that have the potential to cause permanent vision loss. It is important to diagnose and treat ocular abnormalities early.

Procedure

The test was performed with the participant seated, viewing a distance target and the researcher holding an ophthalmoscope handle in her hand. The researcher used her right eye to view the participant's right eye and vice versa. The external eye examination of the eyelids, eye lashes, conjunctiva, pupils and sclera was done by the researcher shining a direct light on the eyelids to assess for cysts, inflammation, lid droop, the conjunctiva to assess bleeding of blood vessels, the pupils to assess their shape, size and response to light and sclera to assess any lumps and colour changes. The researcher started the dial on the ophthalmoscope from a high plus power to view the iris and clarity of the media and then reduced continuously until the ophthalmoscope was very close to the participant's face and the fundus in focus. The optic nerve was examined, the posterior pole of the fundus and also the macula. This was repeated for the left eye. The data was recorded on the data form (cf. Appendix M). The duration of the test was roughly two minutes. Participants found to have any ocular abnormalities were referred for a full eye examination.

3.5 DATA MANAGEMENT AND ANALYSIS

After all the vision screening tests were done, the researcher checked the optometrist vision screening data forms (cf. Appendix M) for the participants who have passed and failed the screening according to the norms. Parent/guardian Notification (cf. Appendix N) were given to the teachers to give to parents of all participants who passed the vision screening. Vision screening referral letters (cf. Appendix O) were given to the teachers to give to parents of those learners who failed the vision screening.

All data from the questionnaires (before and after the educational sessions), from the teachers' vision checklists and the research team, were captured on an excel spreadsheet.

The descriptive statistics namely means, medians, standard deviations and percentiles for numerical variables and frequencies and percentages for categorical variables were calculated per group. The groups were compared utilising 95% confidence intervals and statistical tests, namely Chi-square or Fisher's exact test for categorical data, Kruskal-Wallis test for numerical data and McNemar's test for paired data comparison. Diagnostic test statistics namely sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios were calculated and described by means 95% confidence intervals. A *p*-value of less than 0.05 was considered to indicate statistical significance.

The data analysis for this study was generated using Statistical Analysis System (SAS) software. Copyright, SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA. The analysis was done by the Department of Biostatistics, University of the Free state.

3.6 MEASUREMENT AND MEASUREMENT ERRORS

A closed box with a slit was left at school for teachers to put completed vision checklists in the box, and the researcher collected the box. The teachers were given one month to complete the vision checklist, and this date was before the date of screening by the research team. The teachers were given a short period (one month) so to minimise the risk of losing the forms. Teachers were encouraged during the training session to complete the checklist to have those children with vision disorders referred for an eye exam. The research assistants were trained by the researcher on the different techniques to eliminate any measurement errors that could occur.

3.7 CHAPTER SUMMARY

This chapter explained the reasons for the choice of research methodology. A quantitative research study was conducted to assess the teachers' knowledge on children's vision disorders, vision checklists were used by teachers to screen all the children in their classrooms and lastly, the research team verified the teachers' screening by conducting a vision screening of all the children screened by the teacher. Data collection, the handling of the data, measurement and measurement errors also were discussed.

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CHAPTER 4: ARTICLE 1: FOUNDATION PHASE TEACHERS' KNOWLEDGE ON COMMON VISUAL PROBLEMS AFFECTING CHILDREN: A SOUTH AFRICAN CASE STUDY

4.1 INTRODUCTION

This chapter addresses objectives 1 and 2 which are to educate Grade R to Grade 3 teachers on children's vision by giving them a PowerPoint presentation on common vision problems that affect children, and also to determine Grade R to Grade 3 teachers' knowledge on children's vision before and after educating them on common vision problems that affect children.

4.2 MANUSCRIPT 1

The article was prepared according to the journal submission guidelines for the *International Journal for African Vision and Eye Health (AVEH)* (cf. Appendix P).

FOUNDATION PHASE TEACHERS' KNOWLEDGE ON COMMON VISUAL PROBLEMS AFFECTING CHILDREN: A SOUTH AFRICAN CASE STUDY

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ABSTRACT

Background: Vision disorders are a public health problem as they cause a delay in academic progress and also affect learners' future career and their social well-being post-school years. Teachers spend most of the time with children at school and can help in the early identification and referral of children with visual problems and thus, reducing the number of children with vision disorders.

Aim: To evaluate the knowledge of Grade R to Grade 3 teachers on children's visual problems before and after educating them on the different visual disorders that affect learners in the classroom.

Setting: Low socioeconomic status (Quintile 1) schools in Bloemfontein, South Africa

Methods: In this quantitative study, two questionnaires with nine items each were administered to determine Grade R to Grade 3 teachers' knowledge on children's vision before and after educating them on common vision problems that affect children. Convenience sampling was done to enrol Grade R to Grade 3 teachers from 11 Quintile 1 schools in Bloemfontein. A 45-minute presentation on common vision disorders in children was presented by the researcher to educate the teachers. The teachers were classified as having good knowledge if they obtain seven or more correct answers in each questionnaire.

Results: Thirty-six female teachers participated in the study**.** Most of the participants (n=26, 72.2%) were in the age group of 36-years and older and sixteen (44.4 %) had been teaching for more than ten years. Thirty-four participants (94.44%) obtained the overall score of seven and higher before the educational session and all participants obtained a score of seven and higher after the educational session. There was a statistically significant difference (p <0.0001) between the scores of participants before and after the educational sessions.

Conclusion: The Foundation Phase teachers had adequate knowledge about common visual problems. The educational session was beneficial as it enhanced the teachers' knowledge.

Keywords: Visual Disorders in Children; Knowledge of Teachers; Educating Teachers; Children's vision; Teachers' Questionnaires; Quintile 1 school; Grade R to Grade 3 teachers

FOUNDATION PHASE TEACHERS' KNOWLEDGE ON COMMON VISUAL PROBLEMS AFFECTING CHILDREN: A SOUTH AFRICAN CASE STUDY

INTRODUCTION

Vision disorders are one of the most common handicapping condition in childhood (Ciner *et al.*, 1999; Donnelly *et al.,* 2005; Giordano *et al.,* 2009; Adhikari *et al.,* 2013; McKean-Cowdin *et al.,* 2013). Moreover, their societal consequences have been linked to high school drop-out rates, social and emotional problems, juvenile delinquency, adult literacy problems and incarcerations (Snow, 1983; Zaba, 2001; Zaba, 2011). Visual problems manifest as learning difficulties in learners which may lead to children's failure of a grade and even drop-out of school if these visual problems are not detected and corrected. There is a high rate of learners dropping out of schools in South Africa due to different reasons, uncorrected vision problems being one of them (Inglis, 2009). These visual problems can lead to visual impairments and cause a delay in learners' academic achievements.

Globally, the major causes of visual impairment are uncorrected refractive errors, cataract and glaucoma (WHO, 2019). An estimated 19 million children under the age of 15 years are visually impaired. Of these, 12 million are visually impaired due to refractive errors, a condition that could be easily diagnosed and corrected. Only 1.4 million children have irreversible visual impairment and need visual rehabilitation interventions for psychological and personal development. The most common vision complaint in learners is blurred vision due to uncorrected refractive error. A study done by Ezinne and Mashige (2018) reported that refractive error accounted for 86.6% of all causes of visual impairment in school children with myopia being the most prevalent refractive error (46.4%), followed by astigmatism (36.1%) and hyperopia (17.5%). Uchenna *et al.* (2019) reported that uncorrected refractive error in children resulted in reduced visual acuity, temporary blurred vision, headaches and continuous symptoms of sore eyes especially when doing near work, which could hinder their reading ability and affect their school work. Early detection and management can reduce the prevalence of visual problems and improve the quality of life in children. Thus, vision screening can be used as a tool to detect the causes of visual impairment among children and help in the early treatment and management of visual disorders. In the United States of America (USA), vision screening is done by either optometrists, school health nurses or teachers. The teachers use a vision screening checklist to screen for the visual problems among learners. Therefore, it is important for teachers to have knowledge of common visual disorders to help in the early identification of children

with visual disorders. Ambika and Nair (2013) found that 80% of primary school teachers were aware of refractive errors in children and thus, it was essential for teachers to have good knowledge on refractive errors for the detection of any symptoms of refractive errors in school children as uncorrected significant refractive error can cause visual impairment. Habiba *et al*. (2017) found that public primary school teachers showed a significantly higher knowledge about glaucoma, refractive error, trachoma, conjunctivitis, pterygium, age-related macular degeneration, and diabetic retinopathy as compared to private school teachers. Tchiakpe *et al*., (2016) study found that the ocular conditions known by most junior high school teachers were red-eye (89.88%), refractive error (82.08%), eye injury (80.06%) and glaucoma (61.85%) and concluded that teachers had adequate knowledge of most ocular diseases and healthy practices that promoted good visual health. Alemayehu *et al*., (2018) found that 55.93% of primary school teachers had good knowledge regarding the refractive error in school children. In a study that was done to determine the knowledge of Grade 5 teachers about the signs and symptoms that are linked to poor vision, 63% of teachers knew the signs and symptoms. However, after the training, 95% of the teachers had good knowledge of the signs and symptoms of poor vision (Juggernath and Knight, 2015). Thus, training teachers on common vision disorders found in children could be beneficial to learners.

South Africa introduced a South African Integrated School Health Policy (SAISHP) in 2012 to screen learners for medical conditions, including vision (ISHP, 2012). The SAISHP requires that every learner should be assessed once during each of the four educational phases namely, foundation (Grade R - Grade 3), intermediate (Grade 4 - Grade 6), senior (Grade 7 - Grade 9) and further education and training (Grade 10 - Grade 12). The school health nurses are responsible for the screening and referral of the learners who fail the screening. There are few school health nurses available (Dibakwane & Peu, 2018) and they cannot screen all schools and all Grade R, Grade 1, Grade 4, and Grade 8 children as directed by the policy. In this study, it is hypothesised that introducing teachers as the first component of the school vision screening program in addition to school nurses especially in rural areas can lead to early detection of visual disorders that can cause visual impairment as teachers spend more time with children at school. Hence, the need to investigate the knowledge of South African foundation phase teachers about the visual disorders.

This is the first study carried out to determine the knowledge of Quintile 1 Grade R to Grade 3 teachers in South Africa before and after educating them on common visual problems experienced by children. A Quintile 1 represents the most impoverished schools

based on the income and literacy of the community within the school's catchment area (Van Dyk & White, 2019). Given the background of the children attending Quintile 1 schools, teachers are the "next of kin" to the children as their parents might not be able to take them for regular eye examinations. Therefore, providing the teachers with information and knowledge on the common vision disorders in learners could assist in referring those in need to optometrists and ophthalmologists. The role of a teacher concerning children's development is a crucial one, as one in four school children have visual difficulties and if left untreated, can affect their ability to learn, personality and adjustment to school (AAV, 2020). This study aimed to determine the baseline knowledge of Grade R to Grade 3 Quintile 1 teachers about the common vision disorders in children and the effect of the educational session. The goal of equipping the teachers with knowledge on common vision disorders in children was to increase the teachers' awareness of common vision disorders so that the teachers can identify children with vision disorders and refer them to an optometrist or ophthalmologist for a full eye examination.

RESEARCH METHODS AND DESIGN

Study design and participants

This is a quantitative study that utilised the cross-sectional design to quantify the Grade R to Grade 3 teachers' knowledge of children's vision disorders before and after the educational session.

Setting

The study was conducted at the low socioeconomic status (Quintile 1) schools in Bloemfontein, South Africa.

Study population and sampling strategy

There are 88 primary schools in Bloemfontein, and only 12 primary schools fell under Quintile 1 classification (FSDOE, 2018). Eleven schools had foundation phase (Grade R - Grade 3) classes and 41 teachers of these foundation phase classes were recruited to participate in this study. A nonprobability convenience sampling was done to enrol the participants. Inclusion criteria were Grade R to Grade 3 teachers in Quintile 1 schools in Bloemfontein. Teachers who did not give consent and those teaching other grades, or other

Quintiles schools were excluded from the study.

Data collection

The researcher designed two questionnaires to assess the teachers' knowledge before and after the educational session. The first questionnaire which was administered before the educational session consisted of two sections. The first section was based on information and biographical or background data of the participants, which included gender, age, years of teaching and the highest qualifications obtained. The second section had nine items to assess the participants' knowledge on common vision disorders in children (red, itchy, swollen eyes, cataract, strabismus), vision difficulties in the classroom (struggling to see at distance or at near, seeing double, skipping lines when reading, using a finger to keep track of their reading material, closing or covering one eye when doing distance or near tasks) and when to refer the child for a full eye examination. The second questionnaire consisted of nine items; there were items addressing learners with vision difficulties in the classroom and when to refer them to an optometrist or an ophthalmologist for a full examination. The second questionnaire also included pictures of different common vision disorders. The second questionnaire was to test the participants' knowledge after the educational presentation by the researcher who is a qualified optometrist.

The researcher designed a PowerPoint presentation which consisted of definitions of common visual disorders (myopia, hyperopia, astigmatism, glaucoma, cataract, ptosis, and strabismus), explanations with pictures of conditions commonly found in learners including growth on eyelids, crusty eyes, red-watery eyes, swollen eyelids and incorrect postures adopted by learners when they have visual difficulties.

After the study was explained and consent forms were signed by the participants, the first questionnaire was administered. Thereafter, a 45-minute PowerPoint interactive presentation was offered to the participants by the researcher as a training intervention. The participants were encouraged to ask questions and discuss the presentation. Immediately after the presentation and discussion, the researcher administered the second questionnaire to assess the knowledge after the presentation.

Data analysis

Each correct response in the questionnaire was assigned a score of *one* while the incorrect response was given a score of *zero*. The data was checked and captured on an excel spreadsheet. The total score for each participant was calculated by adding the total responses given by the participant. The participants were scored as having adequate knowledge of vision disorders affecting children if they obtained a score of *seven* and *higher* (≥78%). A comparison of the results before and after the educational session was done.

The descriptive statistics namely frequencies and percentages for categorical variables were calculated. The groups were compared by means of 95% confidence intervals and the McNemar's test for paired data comparison. A p-value of less than 0.05 was considered to indicate statistical significance.

The data analysis was done by the Department of Biostatistics of the University of the Free State and was generated using SAS software. Copyright, SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

Ethical considerations

Ethical approval to conduct this study was obtained from the Health Sciences Research Ethics Committee of the University of the Free State (clearance number: UFS-HSD2017/0985). Permission to conduct the study in the schools was obtained from the Free State Department of Education and the principals of the Quintile 1 schools. Written consent to participate in the study was obtained from the teachers after a verbal and written explanation of the study. The study adhered to the general principles outlined in the Declaration of Helsinki.

RESULTS

Demographic characteristics

Data was collected from 36 participants who were all female teachers. The majority of the participants (n=26, 72.22%) were in the age group of 36 years and older, and there were few participants (n=2, 5.56%) who were younger than 33 years (Table 1).

Table 1. Demographic characteristics of the participants

Age		
Age group	**Frequency**	**Percentage**
22 – 26 years	0	0
27 – 32 years	2	5.56 %
33 – 35 years	8	22.22 %
36 and older years	26	72.22 %
Years of teaching		
Years of teaching	**Frequency**	**Percentage**
0 – 2 years	6	16.67 %
3 – 5 years	6	16.67 %
6 – 10 years	8	22.22 %
11 years and more	16	44.44 %

Many of the participants (n=16, 44.44 %) had been teaching for more than ten years while 8 (22.22%) had been teaching between six and ten years. The age and years of teaching of participants could have a direct or indirect impact on the participants' knowledge about common vision disorders in children.

Table 2. Level of education of participants

Level of education	Frequency	Percentage
Matric	1	2.78 %
Advanced Certificate in Education (ACE)	10	27.78 %
Postgraduate Certificate in Education (PGCE)	7	19.44 %
Bachelor of Education (B.Ed.)	2	5.56 %
Bachelor of Education Honours (B.Ed. Hons)	2	5.56 %
Grade R diploma	1	2.78 %
Early childhood diploma (ECD)	6	16.67 %
N6 Educare	2	5.56 %
National professional diploma in education	1	2.78 %
Primary Teachers' Certificate (PTC)	1	2.78 %
No answer	3	8.33 %

Most participants (27.78%) had an Advanced Certificate in Education (Table 2). The highest qualifications attained by the participants (n=2, 5.56%) was Bachelor of Education Honours (B.Ed. Hons) followed by Postgraduate Certificate in Education (n=7, 19.44%) and Bachelor of Education (n=2, 5.56%). There was one participant in each of the following

qualifications: matric certification, primary teacher certificate, National professional diploma in education and Grade R diploma. The level of education of participants could have a direct or indirect impact on the participants' knowledge about common vision disorders in children.

Table 3. Knowledge of participants before the educational session

Knowledge of participants before the educational session		
Number of correct responses out of 9 items	**Frequency**	**Percentage**
4	1	2.78%
6	1	2.78%
7	4	11.11%
8	23	63.89%
9	7	19.44%

Seven participants (19.44%) gave correct responses to all the items on the questionnaire, twenty-three (63.89%) had one incorrect response and four (11.11%) had two incorrect responses (Table 3). Two participants (5.56%) obtained the total score of less than seven. Thus, thirty-four participants (94.44%) had obtained the overall score of seven and higher, and were therefore considered to have had adequate knowledge of children's vision disorders. Of the two participants who obtained a score of less than seven, the participant with the lowest score (four) was younger than 33 years of age and had between three and five years of teaching experience with an early childhood diploma as her highest level of education. The participant with a score of six was older than 35 years, had more than ten years of teaching experience, and there was no information in the questionnaire about her highest educational qualification. Of the two participants obtained the total score of less than seven, it seemed that neither age nor teaching experience contribute to acquiring knowledge.

The questionnaire results after the educational session showed that all participants obtained a score of seven and higher (Table 3). Twenty-one participants (58.33%) showed improvement in knowledge, 36.11% showed no improvement while two participants (5.56%) regressed.

Table 4. Participants' responses per different vision symptoms and signs

Conditions	Questionnaire results before the educational session		Questionnaire results after the educational session		McNemar test p-value
	n	%	*n*	%	
White pupil (cataract)	33	91.67	36	100	0.39
Squinting eyes (strabismus)	33	91.67	36	100	0.12
Red, swollen, crusty eye	34	94.44	36	100	0.24
Itchy and painful eyes	34	94.44	35	97.22	0.31
Blurred vision, holds book closer	35	97.22	33	91.67	0.20
Closes or covers eye, double vision	35	97.22	35	97.22	1.00
Skips lines	31	86.11	33	91.67	0.58
Uses finger, tilt head	15	41.67	32	88.89	<0.0001

Thirty-three participants (91.67%) before the educational session, indicated that children with white pupils and with one or both eyes squinting needed to be referred (Table 4). Thirty-four participants (94.44%) indicated that children with red, swollen eyes, complaining of itchy and painful eyes should be referred. Thirty-five participants (97.22%) indicated that children complaining of blurred vision at distance or near, double vision and closing one eye when performing distance or near tasks should be referred. Thirty-one participants (86.11%) indicated that children who skip lines when reading should be referred and fifteen participants (41.67%) indicated that children using fingers to track their reading material should be referred.

Comparison of participants' knowledge before and after the educational session

Twenty-one participants showed improvement in knowledge after the education session, as indicated by the positive difference between the scores (Table 5). Thirteen participants (36.11%) had no change in children vision disorder knowledge while two participants (5.56%) regressed and scored less in the questionnaire after the educational session. Overall, the Wilcoxon signed-rank test indicated that there was a statistically significant difference (p <0.0001) between the scores of participants before and after the educational sessions. This was in agreement with studies by Krumholtz (2004) and Juggernath & Knight (2015).

Table 5. Difference in knowledge before and after the educational session.

The difference in knowledge *(Scores after the educational session – Scores before the educational session)*	**Frequency**	**Percentage**
-1	2	5.56%
0	13	36.11%
1	17	47.22%
2	2	5.56 %
3	1	2.78 %
4	1	2.78 %

Table 5 displays a difference of 0 which indicates that there is no improvement while a positive difference will mean an improvement in knowledge and a negative difference indicates a regression in knowledge.

Thirty-three participants (91.67%) had correct responses about the white pupil and squinting eyes before the educational session, all participants (100%) gave the correct answers after the educational session (Table 4). However, there was no statistically significant difference ($p>0.05$) between the responses of the two sessions. Thirty-four participants (94.44%) indicated before the educational session that children with swollen red eyes should be referred and after the educational session, all participants indicated that they would refer such children ($p>0.05$). Concerning itchy and painful eyes, thirty-four participant gave correct responses before the education session while thirty-five participants (97.22%) gave a correct response after the educational session ($p>0.05$). McNemar's test showed that there was a significant difference ($p<.0001$) between the scores of the participant before and after the educational session concerning the question on children using fingers or tilting their heads when doing near tasks. Thus, more participants (88.89%) got correct responses after the educational session compared to before the educational session.

DISCUSSION

The current study found that most participants (94.44%) had good knowledge and 5.56% had inadequate knowledge of children's vision disorders before the educational session. After the 45-minute presentation and discussion about the common visual problems in children, all participants achieved a score of ≥78%. There was a significant difference between the baseline knowledge (before the educational session) and knowledge after the educational session (p <.0001). This is an indication that the teachers understood the material presented and discussed with them regarding children vision disorders. These findings agree with a study done by Krumholtz (2004) in New York and that showed that the teachers ability to identify children with common vision problems correctly was enhanced by increasing their awareness about the visual problems through a lecture and hand-outs. The current study is also in agreement with the results of the study done in Chatsworth, South Africa, whereby Grade 5 teachers were more knowledgeable about signs and symptoms of poor vision in learners after the training (Juggernath & Knight, 2015). Most studies done in low-income countries such as India, Pakistan, Libya, and Ghana showed that although teachers had some knowledge, they benefitted from educational session aimed at increasing their knowledge, awareness and attitude towards common vision disorders in children (Ambika & Nair, 2013; Habiba *et al.*, 2017; Elbahi, 2014; Tchiakpe *et al.*, 2016).

The participants were more knowledgeable on eye health problems (cataracts, swollen red eyes, strabismus) and this is in agreement with a study done by Tchiakpe *et al.* (2016), which concluded that teachers overall had adequate knowledge of most ocular diseases and healthy practices that promote good visual health. The current study showed that before the educational session, the teachers were less knowledgeable on signs and symptoms of learners caused by visual disorders (children skipping lines when reading, children using fingers to keep track of their reading material). These are signs and symptoms of ocular motility problems, which can impede the child's ability to read faster. All participants achieved a score of ≥78% after the educational session, indicating an improvement in the knowledge concerning these symptoms and signs.

Even though most teachers (94.44%) improved their knowledge on common vision disorders after the educational session, some (36.11%) did not improve their knowledge and it could be speculated that they were not motivated enough and the subject matter could be something they feel is not part of their job and the same reasons could also be for those teachers (5.56%) who regressed after the educational session. The other reason

could be that the teachers were not keen to learn as the study was conducted after school as several teachers alluded the fact that they had to stay behind after school hours for the educational sessions, they had to arrange alternative transport to go home.

STRENGTH AND LIMITATIONS

The strength of this study was its ability to address the most common vision disorders experienced by children and increase the teachers' awareness of the conditions. The use of pictures in the questionnaire after the educational session might have contributed positively as teachers were reminded of the conditions as was done in the presentation, resulting in an improvement seen after the educational session. Methods of collecting data were short and precise, making it easy for completion by participants.

This study had 36 teachers which is a small sample from Quintile 1 schools and only Grade R to Grade 3 teachers and thus the results cannot be inferred to all the Grade R to Grade 3 teachers in all Quintiles. The time given for the presentation which was approximately 45-minutes after school was not sufficient, more time allocated to do the presentation of common vision disorders in children, could result in teachers being aware of more conditions in detail.

RECOMMENDATION

- The department of education could include or set aside professional training time for teachers during school hours to cover eye health education for teachers; that way, they get to refresh all the common visual conditions children have and that could assist to keep them motivated. The study done by Sudhan *et al*. (2009) also recommended that teachers be visited often to refresh their knowledge so to maintain their interest.

- It is also recommended that the study be done in other Quintile schools and include teachers from other grades.

- The study could involve a large sample of teachers whereby a qualitative survey on the attitudes and practices of teachers about vision disorders is conducted to find reasons why some teachers did not improve their knowledge and their interest in visual disorders in children.

CONCLUSION

This study indicated that the Grade 1 to Grade 3 Quintile 1 teachers in Bloemfontein had adequate knowledge about the common visual disorders among children. The educational session on common vision disorders was beneficial as the teachers demonstrated significant improvement in their knowledge. Therefore, teachers can play a pivotal role in identifying children with visual difficulties and assist in detecting early signs and symptoms of some eye problems among the children. Their understanding and knowledge of the common vision disorders can further assist in referring those children in need of full eye-examinations.

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CHAPTER 5: ARTICLE 2: TEACHERS USING A VISION CHECKLIST AS A SCREENING TOOL TO DETECT VISUAL PROBLEMS AMONG LEARNERS

5.1 INTRODUCTION

This chapter addresses Objectives 3 and 4 which are to implement the vision checklist as a vision screening tool among Grade R to Grade 3 learners by teachers and the validation of the teachers' results by the research team. The chapter is in a manuscript format, and the topic of the manuscript is teachers using a vision checklist as a screening tool to detect visual problems among learners.

5.2 MANUSCRIPT 2

The article was prepared according to the journal submission guidelines for the *International Journal for African Vision and Eye Health (AVEH)* (cf. Appendix P).

TEACHERS USING A VISION CHECKLIST AS A SCREENING TOOL TO DETECT VISUAL PROBLEMS AMONG LEARNERS

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ABSTRACT

Background: Vision screening helps to identify children who have visual problems. The present study investigated the utilisation of a vision checklist as a vision screening tool by teachers to identify learners with common vision disorders.

Aim: To evaluate the efficacy of using a vision checklist as a vision screening tool by Grade R to Grade 3 teachers to identify common vision disorders in learners.

Setting: The study was conducted in the teachers' respective classrooms in the low socioeconomic status (Quintile 1) schools in Bloemfontein.

Methods: A quantitative, analytical, cross-sectional research study was utilized. Thirty-six teachers used an adapted vision checklist with 15 items as a visual screening tool for Grade R to Grade 3 learners. Two schools were randomly selected, where the research team conducted a vision screening to validate the teachers' vision checklist results. Diagnostic test statistics namely sensitivity, specificity, positive and negative predictive values and likelihood ratios were calculated and described by means of 95% confidence intervals.

Results: The number of learners screened by both the teachers and the research team was 221. The research team results indicated that 102 learners failed the screening, thus, the prevalence of vision disorders was 46% (95% CI: 39% – 53%). Twenty (19.61%) learners were identified by both the teachers and the research team as having failed the screening. Thus, the sensitivity was 19.61% (95% CI: 12% – 29%) and specificity was 83.19% (95% CI: 75% – 89%).

Conclusion: The vision checklist used in this study was found not to be a good vision screening tool to detect common vision problems in learners. However, there is still more research to be done on whether the adapted school vision checklist can be used by South African teachers.

Keywords: Vision screening; Vision screening Tool; Vision Checklist; Vision Disorders; Grade R to Grade 3 learners; Teachers

TEACHERS USING A VISION CHECKLIST AS A SCREENING TOOL TO DETECT VISUAL PROBLEMS AMONG LEARNERS

INTRODUCTION

Vision plays a significant role in the learning processes of children at school. Visual factors such as visual acuity, refractive error, ocular motilities, vergence, accommodation, visual perceptual skills and ocular health have a significant impact on academic performance (Kulp & Schmidt, 1997; Kulp, 1999; Maples, 2003; Scheiman & Rouse, 2006). An impairment of vision has been linked to poor academic performance, personal-social maladjustments, emotional difficulties and the reduced quality of life in general (Snow, 1983; Zaba, 2001; Scheiman & Rouse, 2006; Wang *et al*., 2011; Zaba, 2011; White *et al*., 2017). Early detection and management can reduce the prevalence of visual problems and improve the quality of life in learners. Vision screening is used as a tool to detect visual problems among children and help in the early treatment and management of those visual problems. White *et al*. (2017) provided evidence that children who were referred following a vision screening had significantly reduced academic achievement levels than their peers who were not referred. This evidence highlights the importance of vision screening in identifying children at risk of underachieving in the classroom. This was the approach followed by the researcher in this study that early detection and treatment of children's vision disorders optimise learning and academic development and is also based on the researcher's practical experiences in the clinical setting.

Most states in the United States of America (USA) have preschool and school vision policies and guidelines for school screening. It is mandatory in most states that each child should have a vision screening done before starting formal schooling and during the schooling years (Ciner *et al*., 1999). Vision screening is done by either optometrists, school health nurses or teachers depending on the state. In the United Kingdom (UK), the school entry vision screening is done by orthoptists (Toufeeq & Oram, 2014). South Africa introduced a South African Integrated School Health Policy (SAISHP) in 2012 to screen learners for medical conditions, including vision (ISHP, 2012). The SAISHP aims to provide a more comprehensive package of services, which addresses not only barriers to learning but also other conditions that contribute to morbidity and mortality amongst learners during both early childhood and adolescence. The SAISHP requires that every learner should be assessed once during each of the four educational phases namely, foundation (Grade R to Grade 3), intermediate (Grade 4 to Grade 6), senior (Grade 7 to Grade 9) and further

education and training (Grade 10 to Grade 12). The school health nurses are responsible for the screening and referral of the learners who fail the screening. However, there are few school health nurses available (Dibakwane & Peu, 2018) and it becomes impossible to screen all schools and all Grade R, Grade 1, Grade 4, and Grade 8 children as directed by the SAISHP. There are also 3879 registered optometrists and 4 orthoptists in South Africa (HPCSA, 2020), with a task to screen over 12 million learners in South Africa (DOE, 2016). This is a mammoth task, hence the need to enlist teachers as vision screeners in the classrooms.

Teachers spend more time with learners in the classrooms, and it can be speculated that a vision checklist, as used in the USA can supplement the school health nurse's work in visual screening. Previous studies have shown the training of teachers to be good vision screeners in a classroom setting if the teachers are educated about the common vision disorders and trained on how to identify the visual disorders (Krumholtz, 2004; Tabansi *et al*., 2009; Wedner *et al*., 2000; Lattorre-Arteaga *et al*., 2014; Saxena *et al*., 2015; Juggernath & Knight, 2015; Omar *et al*., 2018; Panda *et al*., 2018). However, studies have shown that teachers are not good screeners because of high false rate even after they have been trained (Concannon & Robinson, 1997; Sudhan *et al.,* 2009; Muralidhar & Vijayalakshmi, 2016). Comparing these studies would be challenging as the screening methods used by teachers for screening differed from study to study; ranging from questionnaires with three questions to teachers taking visual acuities and to observe the common eye diseases. Visual acuity taking is an easy technique for trained health professionals but cannot be mastered over one or two training sessions by non-health professionals. The current study utilised the vision checklist as a screening tool that was adapted from the vision checklist used by teachers in the USA (Texas School for the blind and visually impaired, 2000; Kansas Department of Health & Environment, 2004; Colorado Department of Education, 2006; Missouri Department of Health, 2009; New York State Education Department, 2014).

The vision checklist can be used in a classroom setting as a screening tool. It is easy to understand for the teachers and it is time-saving as compared to visual acuities. The vision checklist in this study had items on signs and symptoms; 15 items on the appearance of the learner's eyes, 10 items on behaviour of the learner in class when doing distance and near tasks and 11 items on learner's eye complaints or teacher's observation. The teacher's task was to indicate the presence or absence of the signs and symptoms for each learner by ticking "Yes" or "No" on the vision checklist. Even though the vision checklist has been used in the USA, there is no published study on the effectiveness of the vision checklist as

a screening tool. This is the first study to assess the use of a vision checklist as a vision screening tool by Grade R to Grade 3 teachers in Quintile 1 schools in South Africa and globally. The study was conducted in three phases. In the first phase, the researchers educated the teachers about the common visual disorders and trained them on how to complete the vision checklists. In the second phase of the study, the teachers screened the learners in their classrooms using the vision checklist. In the third phase, the research team screened learners from the two randomly selected schools using the optometric vision screening tests to validate the screening results of the teachers.

RESEARCH METHODS AND DESIGN

Study design

A quantitative, analytical, cross-sectional research study was conducted. Analytical studies encompass cross-sectional studies, which measure exposure and outcome at the same time and compare variables between groups (Alexander *et al.*, 2015) as it was with the current study where the results from the teachers' screening were compared and validated by the research team's screening results.

Setting

The study was conducted at Quintile 1 schools by teachers in their respective Grade 1 to Grade 3 classes in Bloemfontein, South Africa. The research team conducted the optometric screening in the two participating Quintile 1 schools. Quintile 1 schools are the most impoverished public schools based on the income and literacy of the community within the school's catchment area (Van Dyk & White, 2019).

Study population and sampling strategy

There are 88 primary schools in Bloemfontein, and only 12 primary schools fell under Quintile 1 classification (FSDOE, 2018). Of these 12 primary schools, 11 had Grade R classes and participants were drawn from all Foundation Phase teachers and learners. The total number of teachers teaching Grade R to Grade 3 in the 11 schools was 41, and the total number of learners in Grade R to Grade 3 was 1360. Two schools, namely School A and School B were randomly selected to represent all the Quintile 1 teachers and learners for the validation of the screening results of the teachers by the research team. The two schools

had eight teachers and 261 Grade R to Grade 3 learners. Convenience sampling was utilized to obtain teachers and learners as study participants.

Data collection

The researcher presented a 45 minutes PowerPoint interactive presentation to the participating teachers on the common visual problems among children. The participants were encouraged to ask questions and discuss the presentation. Immediately after the presentation and discussion, participants were trained on how to complete the checklist. During the session, the knowledge of participants about the common eye problems was also assessed before and after the presentation and after the presentation using questionnaires. The assessments were to ensure that the participants understand the common visual problems before they screen the learners in their classrooms. Each participant was then given the vision checklists according to the number of learners in their classes. The participants were given a month to complete the vision checklists for each of their learners in their classes. The completed vision checklists were enclosed in a closed box with a slit and collected after a month by the researcher. The research team which consisted of the researcher and two trained research assistants (optometrists) conducted a vision screening among Grade R to Grade 3 learners who were screened by the participating teachers at School A and School B. The optometry vision screening consisted of the distance visual acuity (VA) test using the crowded LEA Symbols Cards at 3m, near VA at 40cm using the Massachusetts Visual Acuity Test, a latent hyperopia test using +2.00D test for participants who had VA of 6/6 or better in each eye, cover test at distance and near, near the point of convergence (NPC), refraction using an autorefractor, colour vision testing using the Hardy-Rand-Rittler (HRR) pseudoisochromatic test and ocular health examination using an ophthalmoscope. The research process is illustrated in Figure 1.

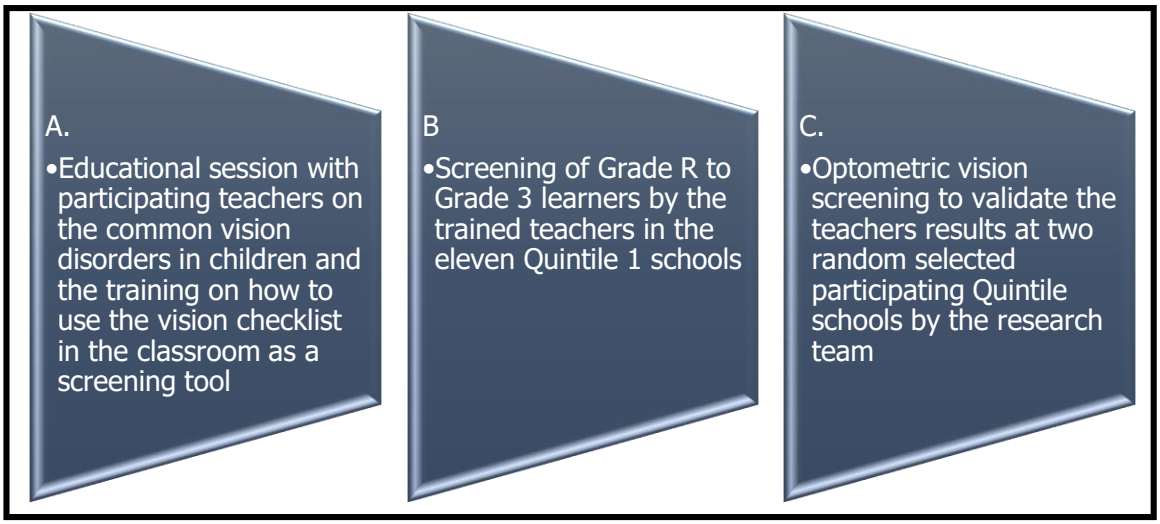

Figure 1: The process followed in this study from educating and training participating teachers to optometric vision screening by the research team

Table 1. Failure criteria for the optometric vision screening

Test	Failure criteria
Distance VA	Worse than 6/9 in either eye
Near VA	Worse than 6/9 in either eye
+2.00D VA test	VA of 6/9 and better
Distance cover test	Tropia
	Greater than 1 prism dioptre esophoria
	Greater than 3 prism dioptres exophoria
NPC	Break of more than 7cm and recovery of more than 10cm
Refraction	Hyperopia of +1.00DS and higher,
	Myopia of - 1.00DS and higher
	Astigmatism of -1.00DC and higher
Colour vision	Participant fails to correctly identify the 6 colour vision screening plates.
Ophthalmoscopy	Any ocular abnormality

Data management and analysis

The overall results for each learner were assessed by checking the vision checklist for any question that the teacher answered with a "Yes", or a "No". If there was any "Yes" response, the learner failed the screening. In the optometric screening, the learner failed the screening if any test was failed according to failure criteria in Table 1. All data from the teachers' vision checklists and the research team were captured on an excel spreadsheet. The data analysis was generated using SAS software. Copyright, SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or

trademarks of SAS Institute Inc., Cary, NC, USA. The Department of Biostatistics at the University of the Free State conducted the analysis. The descriptive statistics namely medians and percentiles for numerical variables and frequencies and percentages for categorical variables were calculated per group. The groups were compared by means of 95% confidence intervals and statistical tests, namely Chi-square or Fisher's exact test for categorical data, Kruskal-Wallis test for numerical data and McNemar's test for paired data comparison. Diagnostic test statistics namely sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV), positive and negative likelihood ratios were calculated and described by means of 95% confidence intervals. A *p*-value of less than 0.05 was considered to indicate statistical significance.

Ethical consideration

Ethical approval to conduct this study was obtained from the Health Sciences Research Ethics Committee of the University of the Free State (clearance number: UFS-HSD2017/0985). Permission to conduct the study in the schools was obtained from the Free State Department of Education and the principals of schools. Written consent to participate in the study was obtained from the teachers and parents of the learners after a verbal and written explanation of the study. The learners signed assent forms before participating in the Optometric vision screening. The study adhered to the general principles outlined in the Declaration of Helsinki.

RESULTS

Teacher demographics

Thirty-six female teachers participated in this study. The majority of the participants (72.22%) were in the age group of 36 years and older, and there were two participants (5.56%) who were younger than 33 years. Most of the participants (44.44 %) had been teaching for more than ten years while 22.22% had been teaching between 6 and 10 years. Most participants (27.78%) had an Advanced Certificate in Education. The highest qualifications attained by the participants (5.56%) was Bachelor of Education Honours (B.Ed. Hons) followed by Postgraduate Certificate in Education (19.44%) and Bachelor of Education (5.56%). The lowest qualification was a primary teacher certificate. There were eight participating teachers from the two random selected schools where the optometric screening was done. Of the eight participating teachers, six were in the age group of 36

years and older and two were between 33 and 35 years. Five participating teachers had been teaching for more than ten years while two had been teaching between three and five years and one participating teacher with less than two years' teaching experience. The highest qualification attained by participating teachers was Bachelor of Education Honours (B.Ed. Hons) by one participant, followed by two participants with a Postgraduate Certificate in Education. One participant with a Bachelor of Education degree and lastly three participating teachers had an Advanced Certificate in Education. All participants had adequate knowledge about the common vision disorders after the educational session.

Overall results of the vision checklist screening by the teachers

A total number of 1360 Grade R to Grade 3 learners were screened by the 36 teachers using the vision checklist. Five hundred and forty (39.71%) failed the screening and 60.29% passed the screening.

Vision checklist results by the teachers from the two random selected schools

Two hundred and sixty-one learners who were screened by the eight teachers using the vision checklist. One hundred and twelve (42.91%) learners were from School A and 149 (57.09%) from School B. There were more children from Grade 1 (n=82) followed by Grade 2 (n=67), Grade 3 (n=57) and Grade R (n=55). The screening results showed that 219 (83.91%) learners passed the screening and 42 (16.09%) failed the screening.

Table 2. Number of learners per grade screened by teachers from School A and B

Grade	Frequency n	Percentage %
R	55	21.07
1	82	31.42
2	67	25.67
3	57	21.84
TOTAL	**261**	**100**

Research team screening results

The research team screened 238 learners, with 104 from School A and 134 from School B. The ages ranged from five to thirteen years old with a median of eight years (The lower

quartile value was seven years, and the upper quartile value was nine years). All the learners were tested without spectacles as none had spectacles or contact lenses. One hundred and ten children (46.22%) failed the screening (Table 3).

Table 3. Number of learners screened by the research team per age and those who failed the screening

Age (years)	Number of learners screened		Number of learners failing the optometry vision screening	
	n	%	N	%
5	25	10.50	11	10.00
6	34	14.29	18	16.36
7	52	21.85	28	25.45
8	56	23.53	24	21.82
9	44	18.49	17	15.45
10	17	7.14	7	6.36
11	5	2.10	2	1.82
12	3	1.26	2	1.82
13	2	0.84	1	0.91
Total	**238**	**100**	**110**	**100**

The total number of learners tested by both the teachers and the research team was 221 which was 84.67% of the total amount of 261 learners from the two schools. Forty failed the teachers' screening and 102 failed the optometry screening (Table 4). Thus, the prevalence of visual problems was 46% (95% CI: 39% – 53%). The true positive rate was 19.61, false-negative rate was 80.39%, the true negative rate was 83.19%, resulting in the vision checklist having a sensitivity of 19.61% (95% CI: 12% – 29%) and specificity of 83.19% (95% CI: 75% – 89%). The PPV and NPV values were 50% (95% CI: 34% – 66%) and 54.70% (95% CI: 47% – 62%), respectively. The positive and negative likelihood ratios were 1.17 (95% CI: 0.67 – 2.04 and (95% CI: 0.85 – 1.10).

Table 4. A 2x2 table comparing the researchers' results (Gold Standard) and teachers' results

		Research team's screening		
		Failed screening (Presence of vision disorder)	**Passed screening (Absence of vision disorder)**	**Total**
Teachers screening	**Failed screening** (Presence of vision disorder)	n=20 (TP) 50.00% 19.61%	n=20 (FPv) 50.00% 16.81%	40
	Passed screening (Absence of vision disorder)	n=82 (FN) 45.30% 80.39%	n=99 (TN) 54.70% 83.19%	181
Total		**102**	**119**	**221**

TP =True Positive is the number of learners that failed teachers' screening and optometry screenings; FPv= False Positive is the number of learners that failed the teachers screening and pass the optometric screening; FN = false-negative which is a number of learners who passed the teachers screening while failing the optometry screening and TN = True Negative is the number of learners who passed both the teachers and optometric screenings.

DISCUSSION

The current study results showed that the teachers were able to detect about 19.61% of Grade R to Grade 3 learners with visual problems when using the vision checklist compared to the research team that used the basic Optometric vision screening tests. The false-negative rate was high, thus, the screening tool used by the teachers missed 80.39% of the learners with visual problems. The sensitivity found in this study is comparable to those found in Concannon and Robinson (1997), Muralidhar and Vijayalakshmi (2016) and OstadiMoghaddam *et al*. (2011) studies. Concannon and Robinson (1997) found the primary school teachers in Australia detected 18.2% of primary school children with visual problems using a questionnaire with three simple questions even though the teachers were educated on visual problems before completing the questionnaires in their classrooms. Muralidhar and Vijayalakshmi (2016) found a sensitivity of 24.8% for teachers screening using visual acuity charts in India and OstadiMoghaddam *et al*. (2011) found the sensitivity of 37.5% using the visual acuity charts as the screening tool among primary school children. The sensitivity in this study is low compared to the high sensitivity found in Wedner *et al*.,

(2000), Sudhan *et al.* (2009), Saxena *et al*. (2015) Omar *et al*. (2018) and Panda *et al*. (2018). Wedner *et al*., (2000) trained six primary teachers to assess visual acuity and administer a three-question questionnaire to primary school children in Tanzania and found that the teachers could correctly identify 80% of children with poor vision and when using the VA screening alone, the teachers could identify 70% of children with poor vision. In Sudhan *et al*. (2009) study, the teachers could identify 94% of grade 5th to 12th school children with a visual problem using the visual acuity charts and observation in India. Saxena *et al*. (2015) found the sensitivity of 79.2% for teachers using the VA cut-off of 6/9.5 and sensitivity of 77.0% using the 6/12 VA cut-off. Omar *et al*. (2018) found that Malaysian preschool teachers who were given comprehensive training on preschool vision screening were able to detect 67.7% of children who had vision impairment when using visual acuity assessment as the vision screening tool. Panda *et al*. (2018) found that the sensitivity of Indian teachers in identifying visual problem using the visual acuity charts was 80.51%. However, the same study agrees with the current study concerning low sensitivity obtained in detecting ocular disorders where the teachers made observations.

The specificity obtained in this study was high (83.19%), which indicated that the Grade 1 to Grade 3 teachers were able to identify learners who do not have vision disorders. The specificity obtained in this study was comparable to those found in studies by Concannon and Robinson (1997), Wedner *et al*., (2000), Tabansi *et al*. (2009), OstadiMoghaddam *et al*. (2011), Saxena *et al*. (2015), Muralidhar and Vijayalakshmi (2016), Lattorre-Arteaga *et al*. (2014), Saxena *et al*. (2015) and Omar *et al*. (2018).

The PPV was 50%, thus the 50% of the learners who failed the screening had visual problems and the other 50% who failed the screening did not have visual problems. The NPV was 55% which implied that the teachers were able to identify learners with no visual problem with the accuracy of 55%. It should be noted that the PPV and NPV are related to the prevalence of the disease or visual problem (Last, 2001). The prevalence of the visual problems was 46%, and thus it will be futile to compare the PPV and NPV of previous studies where the prevalence of the visual problems was not indicated.

The current vision checklist that was used in this study has been adapted from the USA screening programmes where the teachers observe the learners in their classrooms and complete the checklists. The vision checklist forms part of the screening program in which the screening team that consists of optometrists and ophthalmologists conduct various vision tests. There is no published study to show its effectiveness as a screening tool. It is

speculated that the teachers in the USA are educated and trained on the vision checklist which is mandatory in different states, hence it may be effective in the USA as compared to South Africa where the teachers are not required to screen the learners for any visual problems. It was noted in this study during the education and training session that teachers alluded to the fact that they were already overwhelmed with the existing workload as some of them taught more than one grade. The other reason for low sensitivity is this study was the attitude and motivation of the teachers. It was observed that some of the teachers completed the checklists on the day of collection of the completed checklist. It can be speculated that the checklists items were not thoroughly read leading to incorrect completion of the checklist and also the learners were not thoroughly screened as the vision checklist was assessing the behaviour of the child and complaints during a visual task. These factors could have led to a high false-negative rate of 80.39% and low sensitivity of 20%. Even though all the teachers were knowledgeable about the visual problems after the educational session, the commitment of teachers in identifying learners with visual problems plays a very important role. Thus, it can be speculated that commitment, motivation, work overload could have affected the teachers' responses in completing the vision checklist's. Factors such as qualification, age and teaching experience does not seem to have played an important role as most of them had advanced certificate in education as their highest qualification, six teachers in the age group of 36 years and older and most had been teaching for more than 10 years.

LIMITATIONS

The study was only conducted in low socioeconomic status (Quantile 1) schools and only in the foundation phase. Thus, the results cannot be inferred to all educational phases and other quantile schools because the teaching environment is different and other quantiles' teachers have access to technology and there are few learners in their classrooms compared to the Quintile 1 schools.

The validation of the teachers screening was done in only two schools which may not represent the ability of all the Grade R to Grade 3 teachers that attended the educational session and were trained in how to use the vision checklist.

RECOMMENDATIONS

- The educators can play a very important role in the visual health of the learners if the

basic health education is included in the continuing education of the professional development of teachers.

- Although the vision checklist has been used successfully in other countries and was adapted for the current study, the researcher will also look at reducing the checklist items to minimise time spent by teachers on screening and hopefully more time allocated to check the vision disorders on children.

- The future studies could be done in other socioeconomic status schools. Teachers and all grades have to be included. A qualitative study should be conducted to determine the attitudes and practices of teachers about vision problems among learners.

CONCLUSION

The sensitivity of Grade R to Grade 3 teachers' vision screening using the vision checklist is low and the PPV and NPV are moderate. Thus, this study shows that the vision checklist is not a good tool to be used by Grade R to Grade 3 Quintile 1 teachers to identify vision disorders in learners even though the teachers' knowledge about visual problems was adequate and were also trained in how to use the vision checklist.

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CHAPTER 6

CONCLUSION

6.1 INTRODUCTION

The main purpose of this quantitative study was to investigate the use of a vision checklist as a screening tool by Grade R to Grade 3 teachers to detect visual problems among learners in Bloemfontein. The motivation behind this study was firstly based on the need to reach out and have more children screened for vision disorders especially those who do not have access to basic primary healthcare, and secondly to identify children who have or are at risk of developing conditions that may lead to visual impairment. Teachers are the best to perform vision screening as they spend more time with learners in their classrooms.

The objectives of this study were to determine Grade R to Grade 3 teachers' knowledge of children's vision before an educational session on common visual disorders affecting children was presented to them. To educate Grade R to Grade 3 teachers on children's vision by giving them a PowerPoint presentation on common vision problems that affect children and reassessing their knowledge of common visual problems after the educational session. To implement the vision checklist as a screening tool for visual problems among Grade R to Grade 3 children by teachers. To validate Grade R to Grade 3 teacher's vision screening results by the researcher conducting vision screening among learners that have been screened by the teacher.

6.2 CONCLUDING REMARKS RELATED TO OBJECTIVES OF THE STUDY

6.2.1 Objectives 1 and 2

These objectives are to determine the Grade 1 to Grade 3 teachers' knowledge about common visual disorders affecting children's vision before and after an educational session was presented to them. Thirty-six Grade R to Grade 3 teachers from the 11 Quintile 1 schools participated in this study. Thirty-four participants (94.44%) had obtained the overall score of seven and higher and two participants (5.56%) obtained the total score of less than seven before the educational session. All participants obtained a score of seven and higher after the educational session. There was a significant difference between the

baseline knowledge (before the educational session) and knowledge after the educational session (p <.0001). This is an indication that the teachers understood the material presented and discussed regarding children vision disorders. The goal of equipping the teachers with knowledge on common vision disorders in children was to increase the teachers' awareness of common vision disorders so that the teachers can identify learners with vision disorders and refer them to an optometrist or ophthalmologist for a full eye examination.

6.2.2 Objectives 3 and 4

Objectives 3 and 4 are to implement the vision checklist as a vision screening tool among Grade R to Grade 3 learners by teachers and the validation of the teachers' results by the research team

The current study results showed that the teachers were able to detect about 19.61% of Grade R to Grade 3 learners with visual problems when using the vision checklist compared to the research team that used the basic optometric vision screening tests. The false-negative rate was high, thus, the screening tool used by the teachers missed 80.39% of the learners with visual problems. The specificity obtained in this study was high (83.19%), which indicated that the Grade 1 to Grade 3 teachers were able to identify learners who do not have vision disorders.

The PPV was 50%, thus the 50% of the learners who failed the screening had the visual problems and the other 50% who failed the screening did not have visual problems. The NPV was 55% which implied that the teachers were able to identify learners with no visual problem with the accuracy of 55%. The prevalence of the visual problems was 46%, and thus it will be futile to compare the PPV and NPV of previous studies where the prevalence of the visual problems was not indicated.

Even though there was prior teachers' education on vision problems and the fact that after the educational session, all the teachers were knowledgeable about the visual problems, the commitment of teachers in identifying learners with visual problems teachers plays a very important role.

It could be speculated that the factors such as qualification, age and teaching experience does not seem to have played an important role as most of them had advanced certificate

in education as their highest qualification, six teachers in the age group of 36 years and older and most had been teaching for more than 10 years.

6.3 LIMITATIONS OF THE WHOLE STUDY

6.3.1 During the educational and training session of teachers (Phase 1)

This study had 36 teachers which is a small sample from Quintile 1 schools and only Grade R to Grade 3 teachers and thus the results cannot be inferred to all the Grade R to Grade 3 teachers in all schools. The time given for the presentation which was 45 minutes after school was not sufficient, more time allocated to do the presentation of common vision disorders in children, could result in teachers being aware of more conditions in detail.

6.3.2 During the screening by teachers (Phase 2)

The study was only conducted in low socioeconomic status (Quantile 1) schools and only in the foundation phase. Thus, the results cannot be inferred to all educational phases and other quantile schools because the teaching environment is different and other quantiles' teachers have access to technology and there are few learners in their classrooms compared to the Quintile 1 schools.

6.3.3 During the screening by the research team (Phase 3)

The validation of the teachers screening was done in only two schools which may not represent the ability of all the Grade R to Grade 3 teachers that attended the educational session and were trained in how to use the vision checklist.

6.4 RECOMMENDATIONS

- It is recommended that the study be done in other Quintile schools and include teachers from other grades.

- The study could involve a large sample of teachers whereby a qualitative survey on the attitudes and practices of teachers about vision disorders is conducted to find reasons why some teachers did not improve their knowledge and their interest in visual disorders in children.

- The educators can play a very important role in the visual health of the learners if the basic health education is included in the continuing education of the professional development of teachers.

- Although the vision checklist has been used successfully in other countries and was adapted for the current study, the researcher will also look at reducing the checklist items to minimise time spent by teachers on screening the learners.

6.5 CONCLUSION

This study indicated that the Grade 1 to Grade 3 Quintile 1 teachers in Bloemfontein had adequate knowledge about the common visual disorders among learners. The educational session on common vision disorders was beneficial as the teachers demonstrated significant improvement in their knowledge. Therefore, teachers can play a pivotal role in identifying learners with visual difficulties and assist in detecting early signs and symptoms of some eye problems among the learners. Their understanding and knowledge of the common vision disorders can further assist in referring those learners in need of full eye-examinations.

The sensitivity of Grade R to Grade 3 teachers' vision screening using the vision checklist is low and the PPV and NPV are moderate. Thus this study shows that the vision checklist is not a good tool to be used by Grade R to Grade 3 Quintile 1 teachers to identify vision disorders in learners even though the teachers' knowledge about visual problems was adequate and were also trained in how to use the vision checklist.

APPENDICES

Appendix A:

HSREC Approval letter

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA

UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

Health Sciences Research Ethics Committee

05-Apr-2018

Dear **Mrs Boitumelo Ramantsi**

Ethics Clearance: **A VISION CHECKLIST AS A VISION SCREENING TOOL BY GRADE R TO GRADE 3 TEACHERS IN QUINTILE 1 SCHOOLS**

Principal Investigator: **Mrs Boitumelo Ramantsi**

Department: **Optometry (Bloemfontein Campus)**

APPLICATION APPROVED

Please ensure that you read the whole document

With reference to your application for ethical clearance with the Faculty of Health Sciences, I am pleased to inform you on behalf of the Health Sciences Research Ethics Committee that you have been granted ethical clearance for your project.

Your ethical clearance number, to be used in all correspondence is:**UFS-HSD2017/0985**

The ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension.

We request that any changes that may take place during the course of your research project be submitted to the HSREC for approval to ensure we are kept up to date with your progress and any ethical implications that may arise. This includes any serious adverse events and/or termination of the study.

A progress report should be submitted within one year of approval, and annually for long term studies. A final report should be submitted at the completion of the study.

The HSREC functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act. No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human Research Protections 45 CFR 461 (for non-exempt research with human participants conducted or supported by the US Department of Health and Human Services- (HHS), 21 CFR 50, 21 CFR 56; CIOMS; ICH-GCP-E6 Sections 1-4; The International Conference on Harmonization and Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH Tripartite), Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines, Constitution of the HSREC of the Faculty of Health Sciences.

For any questions or concerns, please feel free to contact HSREC Administration: 051-4017794/5 or email EthicsFHS@ufs.ac.za.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours Sincerely

Dr. SM Le Grange
Chair : Health Sciences Research Ethics Committee

Health Sciences Research Ethics Committee
Office of the Dean: Health Sciences
T: +27 (0)51 401 7795/7794 | E: ethicsfhs@ufs.ac.za
IRB 00006240; REC 230408-011; IORG0005187; FWA00012784
Block D, Dean's Division, Room D104 | P.O. Box/Posbus 339 (Internal Post Box G40) | Bloemfontein 9300 | South Africa

Appendix B:

Permission obtained from The Free State Department of Education

Enquiries: KK Motshumi
Ref: Research Permission: BML Ramantsi
Tel. 051 404 9283 / 9221 / 079 503 4943
Email: K.Motshumi@fseducation.gov.za

education
Department of Education
FREE STATE PROVINCE

24 Riethaan Drive
Woodland Hills
Bloemfontein, 9300

082 544 8338

Dear Mrs Ramantsi

APPROVAL TO CONDUCT RESEARCH IN THE FREE STATE DEPARTMENT OF EDUCATION SUPPORTED BY B JAN AND C MAYTHAM.

1. This letter serves as an acknowledgement of receipt of your request (supported by B Jan and C Maytham) to conduct research in the Free State Department of Education,

2. **Topic:** A vision checklist as a vision screening tool by Grade R to Grade 3 teachers in quintile 1 schools.

3. **Schools involved:** Arbeidsgenot, Ditlatse, Dr. Bethuel Setai, Eersteling, Kaalspruit, Kgotsofalo, Phuthanang, Semajan, Uitkoms, Waterbron and Willows Primary Schools.

4. **Target Population:** Teachers and learners in Grade R-3 from all schools mentioned above. The research methodology is three-pronged: The researcher tests the questionnaires and the optometrist checklist at Phuthanang and Waterbron Primary schools. At all of the schools, the researcher makes a presentation to educators on how to apply the vision checklist in the classroom. Educators are required to complete the checklist and questionnaire and return these to the researcher at a later stage.

5. **Period of research**: From 1 February 2018 until 30 September 2018. Please note the department does not allow any research to be conducted during the fourth term (quarter) of the academic year. Should you fall behind your schedule by three months to complete your research project in the approved period, you will need to apply for an extension.

6. The approval is subject to the following conditions:
   - The collection of data should not interfere with the normal tuition time or teaching process.
   - A bound copy of the research document or a CD, should be submitted to the Free State Department of Education, Room 319, 3rd Floor, Old CNA Building, Charlotte Maxeke Street, Bloemfontein.
   - You will be expected, on completion of your research study to make a presentation to the relevant stakeholders in the Department.
   - The attached ethics documents must be adhered to in the discourse of your study in our department.

7. Please note that costs relating to all the conditions mentioned above are your own responsibility.

Yours sincerely

DR JEM SEKOLANYANE
CHIEF FINANCIAL OFFICER

DATE: 14/12/2017

Appendix C:

Letter to the Principals

University of the Free State
P O Box 339
Bloemfontein
9300
Date:

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN YOUR SCHOOL

Dear Principal

My name is Boitumelo Ramantsi and I am a Master's degree student at the University of Free State. The research I wish to conduct for my master's involves using a vision checklist as a screening tool by Grade R to Grade 3 teachers in Quintile 1 schools. This project will be conducted under the supervision of Prof. T Rasengane.

The Provincial Department of Education has approved to approach schools for my research. A copy of their approval is contained with this letter. I invite you to consider taking part in this research. This study will meet the requirements of the Health Sciences Research and Ethics Committee of the University of Free State

The research aims to investigate the effectiveness of using a vision checklist as a screening tool by Grade R to 3 teachers to detect visual problems among learners in Bloemfontein.

The research is significant in that teachers will be more informed about visual disorders prevalent in children and will be able to utilise the vision checklist to screen for those children with visual difficulties and they will be referred to an optometrist or ophthalmologist for a complete eye examination.

Grade R to Grade 3 was selected because the earlier the visual problem is detected and treated in this foundation stage, the better will be the prognosis of the visual conditions and not retard the process of learning.

Permission will be sought from the learners and their parents before they participate in the research. Only those who consent and whose parents consent will participate.

Once I have received your consent to approach learners to participate in the study, I will:

- arrange for informed consent to be obtained from participants 'parents
- arrange a time with your school for data collection to take place
- obtain informed consent from participants

Attached for your information are copies of the Parent Information and Consent Form and also the Participant Information Statement and Consent Form.

If you would like your school to participate in this research, please complete and return the attached form.

Thank you for taking the time to read this information.

BML RAMANTSI (Researcher) Prof TA RASENGANE (Supervisor)

Appendix D1:

Consent form for teachers enrolled in the study (English)

You have been asked to participate in a research study.
You have been informed about the study by BML RAMANTSI
You may contact BML RAMANTSI at 082 5448 338 any time if you have questions about the research or if you are injured as a result of the research.

You may contact the Secretary of the Health Sciences Research and Ethics Committee of the University of Free State at telephone number (051) 4052812 if you have questions about your rights as a research subject.

Your participation in this research is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to terminate participation.

If you agree to participate, you will be given a signed copy of this document as well as the participant information sheet, which is a written summary of the research.

The research study, including the above information has been verbally described to me. I understand what my involvement in the study means and I voluntarily agree to participate.

_____ _____

Signature of Participant Date

Appendix D2:

Consent form for teachers enrolled in the study (Afrikaans)

Jy is gevra om deel te neem aan ’n navorsingstudie.
Jy is oor die studie ingelig deur BML RAMANTSI
Jy mag BML RAMANTSI te enige tyd skakel by 082 5448 338 indien jy enige vrae oor die navorsing het of as jy as gevolg van die navorsing beseer is.

Jy mag die sekretariaat van die Etiekkomitee van die Fakulteit Gesondheidswetenskappe, UV (Health Sciences Research and Ethics Committee of the University of Free State) kontak by telefoonnommer (051) 405 2812 indien jy vrae het oor jou regte as ’n navorsingsonderwerp.

Jou deelname aan die navorsing is vrywillig en jy sal geensins gepenaliseer word of voordele verloor indien jy weier om deel te neem of jou deelname staak.

Indien jy instem om deel te neem sal jy ’n getekende afskrif van hierdie dokument sowel as ’n deelnemerinligtingsblad ontvang, wat ’n geskrewe opsomming bevat van die navorsing.

Die navorsingstudie, ingesluit die inligting hierbo, is mondelings aan by verduidelik. Ek verstaan wat my betrokkenheid by die studie behels en ek stem vrywillig in om daaraan deel te neem.

_____ _____

Handtekening van deelnemer Datum

Appendix D3:

Consent form for teachers enrolled in the study (Sesotho)

O kopilwe ho ba le seabo thutong ya diphuputso.
O tsebisitswe ka thuto ena ke BML RAMANTSI
O ka ikopanya le BML RAMANTSI ho 082 5448 338 ka nako efe kapa efe haeba o na le dipotso mabapi le diphuputso kaa haeba o tswile kotsi ka lebaka la diphuputso.

O ka ikopanya le Mongodi wa Komiti ya Boitshwaro (Secretary of the Ethics Committee) ho Fakhalthi ya Mahlale a Bophelo bo bottle. *Health Sciences Research Ethics Committee (HSREC)* nomorong ya mohala ya (051) 4052812 haeba o na le dipotso mabapi le ditokelo tsa hao jwaloka moamehi diphuputsong tsena.

Ho ba le seabo ha hao diphuputsong tsena ke boithaopo, mme o ke ke wa ahlolwa kapa wa lahlehelwa ke menyetla haeba o hana ho ba le seabo kapa o etsa qeto ya ho emisa ka ho ba le seabo ha hao.

Haeba o dumela ho ba le seabo, o tla fuwa khopi e saennweng ya tokomane ena esita le leqephe la dintlha ho monkakarolo, e leng kgutsufatso e ngotsweng ya diphuputso.

Thuto ena ya diphuputso, hammoho le dintlha tse ka hodimo ke di hlaloseditswe ka molomo. Ke utlwisisa seo ho ba le seabo ha ka thutong ena ya diphuputso se se bolelang mme ke ithaopa ho ba le seabo.

_____ _____

Tshwaeno ya Monkakarolo Letsatsi

Appendix E1:

Consent Form: Parents / Guardians (English)

By signing this consent form, I confirm that I have read and understood the information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

_____	_____	_____
Name of Participant	Signature	Date
_____	_____	_____
Researcher's name	Signature	Date

Appendix E2:

Consent form: Parents / Guardians (Afrikaans)

Deur hierdie toestemmingsvorm te onderteken bevestig ek dat ek die inligting gelees en begryp het en die geleentheid gebied is om vrae te vra. Ek verstaan dat my deelname vrywillig is en dat ek vry is om te enige tyd te onttrek sonder om redes te verstrek en sonder enige koste. Ek verstaan dat ek ’n kopie van hierdie toestemmingsvorm sal ontvang. Ek stem vrywillig in om deel te neem aan die studie.

_____ _____

Naam en Handtekening van deelnemer Datum

_____ _____

Navorser se naam en handtekening Datum

Appendix E3:

Consent form: Parents / Guardians (Sesotho)

Ka ho saena foromo ena ya tumello, ke tiisa mona hore ke badile le ho utlwisisa dintlha mme ke bile le monyetIa wa ho botsa dipotso. Ke utlwisisa hore ho ba le seab ha ka ke boithaopo le hore ke lokolohile ho ka ikgula ka nako efe kapa efe, ka ntle le ho fana ka lebaka le ka ntle ho ditshenyehelo tsa letho. Ke utliwisisa hore ke tla fuwa khopi ya foromo ena ya tumello. Ke dumela ka ho ithaopa ho ba le seabo thutong ena ya diphuputso.

_____	_____	_____
Lebitso la Monkakarolo	Tshaeno	Letsatsi
_____	_____	_____
Lebitso la Mofuputsi	Tshaeno	Letsatsi

Appendix F1:

Child information document and assent form (English)

The information about this study has been explained to me. I understand that I will be asked to name shapes and light will be shone into my eyes in order to check how well do I see.

http://www.allaboutvision.com/eye-exam/children.htm

http://www.stuff.co.nz/the-press/national/health/90492243/Essilor-Vision-Foundation-provides-free-eye-screening-for-Manurewa-school-children

I have not been forced into agreeing to participate in this study. I have been told that I will not be harmed and that I may leave or say that I do not want to participate anymore from the study at any point in time.

I confirm that I have agreed to participate freely and on my own.

http://brightoneye.net/services/pediatric-eye-care.html

Print name of child _____
Signature of child: _____

Date: _____
Day/month/year

I have accurately read or witnessed the accurate reading of the assent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given assent freely.

Name of researcher_____
Signature of researcher_____
Date_____
Day/month/year

Appendix F2:

Child information document and assent form (Afrikaans)

Die inligting oor hierdie studie is aan my verduidelik. Ek verstaan dat ek gevra word om vorms te noem en lig sal in my oë geskyn word om te kyk hoe goed sien ek.

http://www.allaboutvision.com/eye-exam/children.htm

http://www.stuff.co.nz/the-press/national/health/90492243/Essilor-Vision-Foundation-provides-free-eye-screening-for-Manurewa-school-children

Ek het nie gedwing om toestemming te gee aan hierdie studie nie. Ek het gesê dat ek nie benadeel sal word nie, en dat ek enige tyd van die studie kan onttrek.

Ek bevestig dat die toestemming vrywillig en vrylik verskaf is.

http://brightoneye.net/services/pediatric-eye-care.html

Naam van kind in drukskrif _____
Handtekening van kind: _____
Datum: _____
Dag/maand/jaar

Ek het noukeurig die toestemmingsvorm gelees of toegesien dat die vorm aan die potensiële pasiënt voorgelees is, en die individu het die geleentheid gehad om vrae te vra. Ek bevestig dat die individu vrywillig toestemming gegee het.

Naam van navorser _____
Handtekening van navorser _____
Datum_____
Dag/maand/jaar

Appendix F3:

Child information document and assent form (Sesotho)

Dintlha tsa thuto ena ya diphuputso ke di hlalositswe hantle ka nepo. Ke utlwisisa hore ke tla kotswa ho reha mabitso mme lesedi le tla kgantsiwa ka mahlong a ka ho bona hore pono ya mahlo a ka e ntle jwang.

http://www.allaboutvision.com/eye-exam/children.htm

http://www.stuff.co.nz/the-press/national/health/90492243/Essilor-Vision-Foundation-provides-free-eye-screening-for-Manurewa-school-children

Ke tiisa hore ha ke a qobellwa ho fana ka tumello ya dithuto tsena. Ke hlaloseditswe hore ha ho na dikotsi mme ke dumeletswe ho ka sebe dithutong tsena ha eba kena le mabaka. Ke tiisa hore tumello e fanwe ka bolokolohi le ka boithaopo.

http://brightoneye.net/services/pediatric-eye-care.html

Tlanya lebitso la ngwana _____

Tshaeno ya ngwana: _____

Letsatsi: _____

Letsatsi/kgwedi/selemo

Ke badile ka nepo kapa ka ba le bopaki ho balwa ka nepo ha foromo ya kananelo ho motho eo e ka bang monkakarolo, mme motho eo o bile le monyetla wa ho botsa dipotso. Ke tiisa hore motho eo o fane ka tumello ka bolokolohi.

Lebitso la mofuputsi _____

Tshaeno ya mofuputsi _____

Letsatsi_____

Letsatsi/kgwedi/selemo

Appendix G1:

Information document for teachers (English)

STUDY TITLE: A VISION CHECKLIST AS A SCREENING TOOL BY GRADE R TO GRADE 3 TEACHERS IN QUINTILE 1 SCHOOLS

RESEARCHER: BML RAMANTSI

Introduction:
Vision and learning are intimately related as most of what a child learns at school is presented visually good vision is essential for students of all ages to reach their full academic potential. To assess children's vision at school, a vision screening is done. The main goal of vision screening is to identify children who have or are at risk of developing conditions that can lead to visual impairment and thereby referring them to an optometrist or ophthalmologist for a full examination when any abnormalities are detected, so good vision is essential for students of all ages to reach their full academic potential.

In this study, we want to learn how effective is a vision checklist used as a screening tool by teachers in Grade R to Grade 3.

Invitation to participate: We are asking/inviting you to participate in a research study

What is involved in the study – Teachers will be given a presentation on common visual problems in children and the effects of those problems in children. The vision checklist that teachers are going to use as a screening tool will also be discussed. The checklist consists of symptoms and signs to look out for in school children. After the presentation, teachers will be given the vision checklist and requested to complete it at school for each child in his/her classroom. The completed vision checklists will be collected within a month. After the completion of the checklist, the researchers will conduct vision screening whereby the results thereof will be compared to those done by the teachers with the vision checklist.

Risks of being involved in the study: There will be no risks involved in the study.

Benefits of being in the study – You will be able to understand visual problems and to be aware of and to identify the symptoms of visual problems among your pupils in your class. Your participation will be of importance especially to the school children as those who will be identified to have visual problems will be referred to an optometrist for a full eye examination and thereby helping them in their learning journey.

Participation is voluntary, and refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits.

Confidentiality: Efforts will be made to keep personal information confidential. Absolute confidentiality cannot be guaranteed. Personal information may be disclosed if required by law.

Researchers will come back to the schools and participating teachers with the results and outcome of the study
Should you have any questions about the research or any related matters, please contact the researcher at 082 5448 338 during regular business hours.
For questions about your rights as a research participant or for reporting of complaints, contact the Secretary of the Health Sciences Research and Ethics Committee of the University of Free State at 051 401 7795 / (051) 4052812.

Contact details of researcher: BML RAMANTSI 082 5448 338

Appendix G2:

Information document for teachers (Afrikaans)

TITEL VAN STUDIE: ′N AFTIKLYSIE AS SIFTINGSTOETS VIR VISIE BY DIE SKOOL DEUR GRAAD 0 TOT GRAAD 3-ONDERWYSERS IN KWINTIEL 1 SKOLE

NAVORSER: **BML RAMANTSI**

Inleiding:
Sig en geleerdheid is nou aan mekaar verbonde aangesien die meeste van die dinge wat ’n kind by die skool leer op ’n visuele wyse voorgestel word. Om kinders se sig by die skool te assesseer word ’n siftingstoets gedoen. Die hoofdoel van die sifting is om kinders te identifiseer wat die risiko loop om toestande te ontwikkel wat kan lei tot visuele inperking, of dit reeds het, en hulle te verwys na ’n optometris of oftalmoloog vir ’n volledige ondersoek wanneer enige abnormaliteite raakgesien word, aangesien goeie sig noodsaaklik is vir leerders van alle ouderdomme om hulle volle akademiese potensiaal te bereik. In hierdie studie wil ons die effektiwiteit van ’n aftiklysie as sig-siftingstoets vir onderwysers in Graad 0 tot Graad 3 ondersoek.

Uitnodiging om deel te neem: Ons nooi jou uit om deel te neem aan ’n navorsingstudie.

Wat word verstaan onder die studie - Onderwysers kyk na ’n aanbieding oor algemene visuele probleme by kinders en die effek van hierdie probleme by kinders. Die aftiklysie wat onderwysers as ’n siftingsinstrument sal gebruik, word ook bespreek. Die aftiklysie bestaan uit simptome en tekens waarvoor opgelet moet word by skoolkinders. Na die aanbieding kry onderwysers die aftiklysie en word gevra om dit by die skool te voltooi vir elke kind in sy/haar klas. Die voltooide aftiklysies word binne ’n maand ingesamel. Na voltooiing van die aftiklysie sal die navorsers sigtoetse uitvoer waarvan die resultate vergelyk sal word met die waar die onderwysers die aftiklysie ingevul het.

Risiko’s om betrokke te wees by die studie: Daar is geen risiko’s verbonde aan deelname aan hierdie studie nie.

Voordele om deel te neem aan die studie - Jy sal visuele probleme verstaan en bewus wees van, en in staat om die simptome van visuele probleme onder die leerlinge in jou klas te identifiseer. Jou deelname is van belang veral vir die skoolkinders wat geïdentifiseer word met visuele probleme en verwys word na ’n optometris vir ’n volledige oogondersoek aangesien dit hulle gaan help op die pad tot suksesvolle leer.

Deelname is vrywillig, en weiering om deel te neem sal geen boete of verlies van voordele waarop jy andersins geregtig sou wees beteken nie. Jy mag te enige tyd deelname staak sonder benadeling of verlies van voordele.

Vertroulikheid: Moeite word gedoen om persoonlike inligting vertroulik te hou. Absolute vertroulikheid kan nie gewaarborg word nie. Persoonlike inligting mag openbaar gemaak word indien die wet dit vereis.

Navorsers sal terugkom na die skool en deelnemende onderwysers met die resultate en uitkomste van die studie. Indien jy enige vrae oor die navorsing of enige verwante sake het, kontak asseblief die navorser by 082 5448 338 gedurende normale kantoorure.

Vir vrae oor jou regte as ’n deelnemer aan navorser of om enige klagtes te rapporteer, kontak die Sekretariaat van die Etiekkomitee van die Fakulteit Gesondheidswetenskappe, Universiteit van die Vrystaat (Health Sciences Research and Ethics Committee of the University of Free State) by 051 401 7795 / 051 405 2812.

Kontakbesonderhede van die navorser: **BML RAMANTSI 082 5448 338**

Appendix G3:

Information document for teachers (Sesotho)

SEHLOOHO SA THUTO: LENANE LA TEKOLO JWALOKA SESEBEDISWA SE TEKOLO YA PONO YA MATITJHERE A KEREITI YA R HO ISA YA 3 DIKOLONG TSA QUINTILE 1

MOFUPUTSI: BML RAMANTSI

Selelekela:

Pono le ho ithuta di a amana ka hore bongata ba dintho tseo ngwana a ithutang tsona sekolong di hlahiswa ka pono. Ho hlahloba pono ya bana sekolong, ho etswa tekolo ya pono. Sepheo se seholo sa tekolo ya pono ke ho hlwaya bana ba nang le mathata kapa ba ka bang le kotsi ya ho ba le ho kula ho ka lebisang ho bolwetse ba pono mme ebe ba fetisetswa ho dingaka tsa mahlo e leng *optometrist* kapa *ophthalmologist* bakeng sa ho hlahlojwa ka botlalo haeba ho na le bofokodi bo hlwailweng, ka tsela e jwalo pono e lokileng ke ya bohlokwa bakeng sa baithuti ba dilemo tsohle e le ho fihlella bokgoni ba bona bo phethahetseng dithutong tsa bona. Thutong ena re rata ho batlisisa bohlwahlwa ba lenane lena la tekolo ya pono jwaloka sesebediswa sa tekolo ya pono ya matitjhere a Kereiti ya R ho isa Kereiti ya 3.

Memo ya ho ba le seabo: Re o kopa /mema ho ba le seabo thutong ena ya diphuputso Se amehang ka hara thuto ena ya diphuputso – Matitjhere a tla fuwa thuto ya tlhahiso ya mathata a tlwaelehileng a pono ho bana esita le ditlamorao tsa mathata ao ho bana. Lenane la tekolo leo matitjhere a tla le sebedisa e le sesebediswa sa tekolo le tla hlahlojwa ho buisanwe ka lona. Lenane lena la tekolo le na le matshwao ao o lokelang ho a tadima ho bana. Kamora thuto ena ya tlhahiso, matitjhere a tla fuwa lenane lena la tekolo mme ba kotjwe ho le tlatsa bakeng sa ngwana ka mong phaposing ya borutelo. Manane a tekolo a tlatsitsweng a tla bokellwa nakong ya kgwedi. Kamora ho tlatswa ha lenane la tekolo, bafuputsi ba tla etsa tekolo ya pono moo diphetho tsa teng di tla bapiswa le tseo tse entsweng ke matitjhere a nang le lenane la tekolo**.**

Kgonahalao ya dikotsi tsa ho ba le seabo thutong ena ya diphuputso: Ha ho na ba le kgonahalo ya dikotsi tse tla ba teng thutong ena ya diphuputso.

Menyetla ya ho ba le seabo thutong ena ya diphuputso – O tla ba le hona ho tseba ka mathata a pono le ho hlokomela esita le ho hlwaya matshwao a mathata a pono ho bana ka hara phaposi ya hao ya borutelo. Ho ba le seabo ha hao ho tla ba molemo haholoholo ho bana ba sekolo ka hobane bao ba tla hlwauwa hore ba na le mathata a pono ba tla fetisetswa ho ngaka ya mahlo (optometrist) bakeng sa tlhahlobo e phethahetseng ya mahlo le ho ba thusa leetong la bona la ho ithuta.

Ho ba le seabo ke boithaopo, mme ha o hana ho ba le seabo ha o na ahlolwa ka ho lefiswa letho kapa yona tahlehelo ya menyetla e o tshwanelang. O ka nna wa emisa ka ho ba le seabo ka nako efe kapa efe ka ntle le ho ahlolwa kapa ho lahlehelwa ke menyetla.

Sephiri: Ho tla etswa mekutu yohle ho boloka dintlha tsa botho ba hao e le sephiri kapa lekunutu. Ho ba le sephiri se phethahetseng ka hohlehohle ha se ntho e ka tiiswang. Dintlha tsa botho di ka pepeswa haeba di batleha ka molao. Bafuputsi ba tla kgutlela dikolong le matitjhere a nang le seabo ka diphetho le qetello ya thuto ena ya diphuputso.

Haeba o na le dipotso dife kapa dife mabapi le diphuputso tsena kapa dintlha dife kapa dife tse amehang, ka kopo ikopanye le mofuputsi ho 082 5448 338 nakong ya during dihora tsa kamehla tsa tshebetso. Bakeng sa dipotso mabapi le ditokelo tsa hao jwaloka motho ya nang le seabo diphuputsong kapa bakeng sa ho tsebisa ka ditletlebo, ikopanye le Mongodi wa Komiti ya Boitshwaro *(Secretary of the Ethics committee)* Fakhalthi ya Mahlale a Bopheo bo bottle. *Health Sciences Research Ethics Committee (HSREC)* ho 051 401 7795 / (051) 4052812.

Dintlha tsa boikopanyo tsa mofuputsi kapa mofuputsi: BML RAMANTSI
082 5448 338

Appendix H1:

Information document for parents /guardians (English)

STUDY TITLE: A VISION CHECKLIST AS A SCREENING TOOL BY GRADE R TO GRADE 3 TEACHERS IN QUINTILE 1 SCHOOLS

RESEARCHER: BML RAMANTSI

Dear Parent / Guardian

I am writing to ask your permission for your child to participate in the University of Free State research project on checking how helpful will a vision checklist be to teachers to identify children with eyesight problems in their classrooms. This project will be conducted at school over the next several months.

We are interested in identifying those children with eyesight problems so that they can get help from an optometrist and therefore make their learning process easier. An optometrist will also visit the school to conduct a vision screening on all those children that were identified by teachers to have visual difficulties.

Please note that vision screening does not replace a full eye examination done by an optometrist but simply assist to identify those children with visual difficulties.

The vision checklist by teachers will be completed in class, during school hours while the children are busy with their usual tasks and not after school hours, and this will also be the same for the screening by the optometrists.

Vision screening by an optometrist will entail checking how well the children can see at both distance (on the board) and near (when reading), checking their eye muscles, checking if there's an indication for a full examination for spectacle lenses, checking if they are able to recognise colours and checking the overall health of the eyes. None of these tests are invasive.

All the names of the children will be kept confidential for the research and the results will not be used for any other purpose but for this project.

I would like to assure you that this study has been reviewed and approved by the Health Sciences Research and Ethics Committee of the University of Free State. In addition, it has the support of the principal at your child's school. However, the final decision about the participation is yours. Should you have any concerns or comments resulting from your child's participation in this study, please contact The Secretary of the Health Sciences Research and Ethics Committee of the University of Free State at telephone number (051) 405281

Appendix H2:

Information document for parents /guardians (Afrikaans)

TITEL VAN STUDIE: ’n AFTIKLYSIE AS ’n SIG-SIFTINGSTOETS BY DIE SKOOL DEUR GRAAD 0 TOT GRAAD 3-ONDERWYSERS IN KWINTIEL 1 SKOLE

Navorser: BML RAMANTSI

Beste Ouer/ Voog

Ek skryf om toestemming te vra vir jou kind om deel te neem aan die Universiteit van die Vrystaat navorsingsprojek oor hoe nuttig dit vir onderwysers om ’n aftiklysie te gebruik om kinders met oogprobleme in hul klaskamers te identifiseer. Hierdie projek sal oor die volgende aantal maande by die skool uitgevoer word.

Ons stel belang om daardie kinders te identifiseer wat oogprobleme het sodat hulle hulp van ’n optometris kan kry en sodoende hul leerproses makliker te maak. ’n Optometris sal die skool besoek om ’n siftingstoets vir sig uit te voer op al die kinders wat deur die onderwysers geidentifiseer is as die met visuele probleme.

Let asseblief daarop dat die siftingstoets nie ’n volledige oogtoets wat deur ’n optometris gedoen word vervang nie, maar slegs bedoel is om die kinders met visuele probleme te identifiseer.

Die aftiklysie sal deur onderwysers in die klas in gewone skoolure ingevul word terwyl die kinders besig is met hul gewone opdragte en nie na skoolure nie, en dieselfde geld vir die siftingstoetse deur die optometris.

Sfitingstoetse vir sig wat uitgevoer word deur ’n optometris sal behels dat dit vasgestel word hoe goed die kinders kan sien, beide op ’n afstand (op die bord) en naby (wanneer hy lees), hul oogspiere sal getoets word, toets of daar aanduidings is vir ’n volledige oogtoets of vir kontaklense, en toets of hulle kleure kan onderskei en die algehele gesondheid van die oë. Geeneen van hierdie toetse is indringend nie.

Die name van al die kinders sal vertroulik gehou word vir navorsing en die resultate sal nie gebruik word vir enige ander doel buiten hierdie projek nie.

Ek wil jou graag verseker dat die studie nagegaan en goedgekeur is deur die Geneeskundige Navorsingsetiekkomitee van die Universiteit van die Vrystaat (Health Sciences Research and Ethics Committee of the University of Free State). Daarbenewens word dit ondersteun deur die hoof van jou kind se skool. Nietemin berus die finale besluit oor deelname by jou. Indien jy enige bekommernisse of kommentaar het met betrekking tot jou kind se deelname aan die studie, moet jy asseblief die sekretariaat van die Geneeskundige Navorsingsetiekkomitee van die Universiteit van die Vrystaat (Health Sciences Research and Ethics Committee of the University of Free State) kontak by tel nr (051) 405 2812.

Appendix H3:

Information document for parents /guardians (Sesotho)

SEHLOOHO SA THUTO: LENANE LA TEKOLO JWALOKA SESEBEDISWA SE TEKOLO YA PONO YA MATITJHERE A KEREITI YA R HO ISA YA 3 DIKOLONG TSA QUINTILE 1

MOFUPUTSI: BML RAMANTSI

Motswadi / Mohlokomedi ya ratehang

Ke o ngolla ho kopa tumello ya hao bakeng sa ngwana wa hao ho ba le seabo tshebetsong ya diphuputso tsa Yunivesithi ya Freistata e le ho hlahloba hore hore lenane la tekolo ya pono le tla ba le molemo hakae ho matitjhere ho hlwaya bana ba nang le mathata a pono ka hara diphaposi tsa bona tsa borutelo. Projeke kapa tshebetso ena e tla etswa sekolong dikgweding tse latelang tse mmalwa.

Re thahasella ho hlwaya bana ba nang le mathata a pono e le hore ba fumane thuso ho ngaka ya mahlo *(optometrist)* mme ka tsela e jwalo ba etse hore tshebetso ya bona ya ho ithuta e be bobebe haholwanyane. Ngaka ena ya mahlo *(optometrist)* le yena o tla etela sekolong e le ho etsa tekolo ya pono ho bana bohle ba hlwailweng ke matitjhere hore ba na le mathata a pono.

Ka kopo hlokomela hore tekolo ya pono ha e nke sebaka sa tlhahlobo e phethahetseng ya mahlo e etswang ke ngaka ya mahlo *(optometrist)* empa e thusa feela ho hlwaya bana ba nang le mathata a pono.

Lenane la tekolo la matitjhere le tla tlatswa hona ka phaposing ya borutelo, nakong ya dihora tsa sekolo ha bana ba nmahlolotse ba etsa mesebetsi ya bona e tlwaelehileng eseng kamora dihora tsa nako ya sekolo, mme hona ho tla tshwana le tekolo ha e etswa ke dingaka tsa mahlo *(optometrists).* Tekolo ya pono ka ngaka ya mahlo (optometrist) e tla kenyeletsa ho lekola kamoo bana ba ka bonang hantle ka teng ho bohole ba boto esita le haufi (ha ba bala), ho hlahloba mesifa ya mahlo, ho hlahloba hore na ho na le sesupo sa tlhahlobo e phethahetseng bakeng sa dilense tsa diborele, ho hlahloba hore na ba ka bona mebala le ho hlahloba ka kakaretso bophelo ba mahlo. Ha ho diteko dife kapa dife tse ka bang kotsi.

Mabitso ohle a bana a tla bolokwa e le sephiri bakeng sa diphuputso mme diphetho ha di na sebediswa bakeng sa morero ofe kapa ofe ha e se wa projeke kapa tshebetso ena.

Ke rata ho o nnetefaletsa hore thuto ena ya diphuputso e lekotswe botjha le ho dumellwa ke Komiti ya tsa Boitshwaro Diphuputsong (Research Ethics Committee) ya Yunivesithi ya Freistata. Ho feta mona, e tsheheditswe ke mosuwehlooho sekolong sa ngwana wa hao. Leha ho le jwalo, qeto ya ho qetela mabapi le ho ba le seabo ke ya hao. Haeba o na le ditletlebo kapa ditlhahiso mabapi le ho ba le seabo ha hao thutong ena ya diphuputso, ka kopo ikopanye le Mongodi wa Komiti ya Boitshwaro (The Secretary of the Ethics Committee) Fakhalthi ya Mahlale a Bophelo bo botle (Faculty of Health Sciences), UFS nomorong ya mohala ya (051) 4052812

Appendix I1:

Questionnaire on teachers' knowledge about children's vision (Before – Educational Session) (English)

Teachers spend more time with children than parents do, they assist children in acquiring skills for learning and many of those learning related skills are visual skills. As a teacher, you are in a position to detect the symptoms of learning related vision problems in your school children**.**

STUDY NUMBER			

SECTION A: DEMOGRAPHICS

Mark the appropriate block(s) with an X which correspond to the correct answer

1. Name of School

Arbeidsgenot (1)
Ditlatse (2)
Dr Bethuel Setai (3)
Eersteling (4)
Kaalspruit (5)
Kgotsofalo (6)
Phuthanang (7)
Semajan (8)
Uitkoms (9)
Waterbron (10)
Willows (11)

2. Gender

Female (1)	Male (2)

3. Age range

22-26 years (1)
27-32 years (2)
33-35 years (3)
36 and older years (4)

4. How long have you been a teacher?

0-2 years (1)
3-5 years (2)
6-10 years (3)
11 years and more (4)

5. Highest qualifications in education (Check all that apply)

Matric (0)
Advanced Certificate in Education(ACE) (1)
Postgraduate Certificate in Education(PGCE) (2)
Bachelor of Education(B.Ed.) (3)
Bachelor of Education Honours(B.Ed.) (4)
Master's in Education (M.Ed.) (5)
Other (6), specify

SECTION B: CHILDREN VISION

1.	If a child in your school/class has a white pupil (centre of the eye is whitish as opposed to being black), does the child need to be referred for an eye examination?	*YES*	*NO*
2.	Will a child with one or both eyes squinting need to be referred for an eye examination?	*YES*	*NO*
3.	Is it a concern when a child has red, swollen eyes that they be referred for an eye examination?	*YES*	*NO*
4.	If a child complains of itchy and painful eyes, should the child be referred for an eye examination?	*YES*	*NO*
5.	Is it a concern when a child complains that they struggle to see at distance or at near that they be referred for an eye examination?	*YES*	*NO*
6.	If a child complains of seeing double, should that child be referred for an eye examination?	*YES*	*NO*
7.	If a child skips lines when reading, should that child be referred for an eye examination?	*YES*	*NO*
8.	If a child needs to use a finger to keep track of their reading material, should that child be referred for an eye examination?	*YES*	*NO*
9.	If a child closes or covers one eye when doing distance or near tasks, should that child be referred for an eye examination?	*YES*	*NO*

Appendix I2:

Questionnaire on teachers' knowledge about children's vision (Before – Educational Session) (Afrikaans)

Onderwysers spandeer meer tyd met kinders as hul ouers; hulle help kinders om leervaardighede te verwerf en baie van die leerverwante vaardighede is sigvaardighede. As onderwyser jy is in 'n posisie om die simptome van leerverwante sigprobleme by jou leerders te ontdek.

STUDIENOMMER

AFDELING A: DEMOGRAFIESE INLIGTING

Merk die toepaslike blokkie(s) wat met die korrekte antwoord ooreenstem met n X.

1. Naam van Skool

Arbeidsgenot (1)
Ditlatse (2)
Dr Bethuel Setai (3)
Eersteling (4)
Kaalspruit (5)
Kgotsofalo (6)
Phuthanang (7)
Semajan (8)
Uitkoms (9)
Waterbron (10)
Willows (11)

2. Geslag

Vroulik (1)	Manlik (2)

3. Ouderdomsreikwydte

22-26 jaar (1)
27-32 jaar (2)
33-35 jaar (3)
36 jaar en ouer (4)

4. Hoe lank is jy al 'n onderwyser?

0-2 jaar (1)
3-5 jaar (2)
6-10 jaar (3)
11 jaar en langer (4)

5. Hoogste onderwyskwalifikasies (merk almal wat van toepassing is)

Matriek (0)
Gevorderde Onderwyssertifikaat (ACE) (1)
Nagraadse Onderwyssertifikaat (NGOS) (2)
Baccalaureus in Opvoedkunde (B.Ed) (3)
Baccalaureus in Opvoedkunde Honneurs (B.Ed) (4)
Magistergraad in Opvoedkunde (5)
Ander (6), spesifiseer asseblief_____

AFDELING B: **KINDERSIG**

1.	As 'n kind in jou skool/klas 'n wit pupil het (die middel van die oog is witterig en nie swart nie), is dit nodig om die kind vir 'n oogtoets te verwys?	*JA*	*NEE*
2.	Sal dit nodig wees om 'n kind met een of albei skeel oë te verwys vir 'n oogtoets?	*JA*	*NEE*
3.	Is dit genoeg rede tot kommer as 'n kind rooi, geswelde oë het om hom vir 'n oogtoets te verwys?	*JA*	*NEE*
4.	As 'n kind kla van jeukerige, seer oë, moet hy verwys word vir 'n oogtoets?	*JA*	*NEE*
5.	Is dit genoeg rede tot kommer as 'n kind kla dat hy naby/ver sukkel om te sien om hom te verwys vir 'n oogtoets?	*JA*	*NEE*
6.	As 'n kind kla dat hy dubbeld sien, moet daardie kind verwys word vir 'n oogtoets?	*JA*	*NEE*
7.	As 'n kind lyntjies oorslaan wanneer hy lees, moet die kind verwys word vir 'n oogtoets?	*JA*	*NEE*
8.	As 'n kind sy vinger gebruik om sy plek te hou wanneer hy lees, moet daardie kind verwys word vir 'n oogtoets?	*JA*	*NEE*
9.	As 'n kind een oog toemaak of bedek wanneer hy ver/ naby opdragte uitvoer, moet daardie kind verwys word vir 'n oogtoets?	*JA*	*NEE*

Appendix I3:

Questionnaire on teachers' knowledge about children's vision (Before – Educational Session) (Sesotho)

Matitjhere a nka nako e ngata le bana ho feta batswadi, ba thusa bana ho fumana tsebo ya ho ithuta mme tsebo e ngata e amanang le ho ithuta hona ha bona ke bokgoni ba ho bona. Jwaloka titjhere o boemong ba ho hlwaya matshwao a ho ithuta a amanang le mathata a pono ho barutwana ba hao**.**

NOMORO YA THUTO			

KAROLO YA A: TIKOLOHO E HAUFI

Tshwaya lesakana kapa masakana ka X le amanang le karabo e nepahetseng

1.Lebitso la Sekolo

Arbeidsgenot (1)
Ditlatse (2)
Dr Bethuel Setai (3)
Eersteling (4)
Kaalspruit (5)
Kgotsofalo (6)
Phuthanang (7)
Semajan (8)
Uitkoms (9)
Waterbron (10)
Willows (11)

2. Bong

Motshehadi (1)	Motona (2)

3. Tatelano ya dilemo

22-26 dilemo (1)
27-32 dilemo (2)
33-35 dilemo (3)
36 dilemo le ho feta (4)

4. Ke nako e kae o le titjhere?

0-2 dilemo (1)
3-5 dilemo (2)
6-10 dilemo (3)
11 dilemo le ho vision feta (4)

5. Maemo a phahameng ka ho fetisisa a thuto (Hlahloba tsohle tse tshwanelehang)

Materiki (0)
Advanced Certificate in Education(ACE) (1)
Postgraduate Certificate in Education(PGCE) (2)
Bachelor of Education(B.Ed.) (3)
Bachelor of Education Honours(B.Ed.) (4)
Master's in Education (M.Ed.) (5)
Tse ding (6), di bolele

KAROLO YA B: PONO YA BANA

1.	Haeba ngwana sekolong sa heno / sehlopheng a na le *pupil* (bohare ba leihlo bo bosweunyana ho fapana le ho ba motsho), na ngwana eo o lokela ho fetisetswa tlhahlobong ya mahlo?	*E*	*Tjhe*
2.	Na ngwana ya nang le leilhlo le le leng kapa mahlo ka bobedi a pelekaneng o lokela ho fetisetswa tlhahlobong ya mahlo?	*E*	*Tjhe*
3.	Na ke taba e ngongorehisang ha ngwana a na le mahlo a mafubedu, a topileng/ruruhileng hore a fetisetswe tlhahlobong ya mahlo?	*E*	*Tjhe*
4.	Haeba ngwana a tletleba ka mahlo a hlohlonang a bile a le bohloko, na ngwana o lokela ho fetisetswa tlhahlobong ya mahlo?	*E*	*Tjhe*
5.	Na ke ntho e ngongorehisang ha ngwana a tletleba ka hore o sokola ho bona holenyana kapa haufi hore a fetisetswe tlhahlobong ya mahlo?	*E*	*Tjhe*
6.	Haeba ngwana a tletleba ka ho bona dintho eka di pedi, na ngwana eo o lokela ho fetisetswa tlhahlobong ya mahlo?	*E*	*Tjhe*
7.	Haeba ngwana a tlola mela ha a bala, na ngwana eo o lokela ho fetisetswa tlhahlobong ya mahlo?	*E*	*Tjhe*
8.	Haeba ngwana a lokela ho sebedisa monwana ho hlokomela moo a balang, na ngwana eo o lokela ho fetisetswa tllahlobong ya mahlo?	*E*	*Tjhe*
9.	Haeba ngwana a kwala kapa a kupetsa leihlo le le leng ha a etsa mesebetsi e hole kapa e haufi, na ngwana eo o lokela ho fetisetswa tllahlobong ya mahlo?	*E*	*Tjhe*

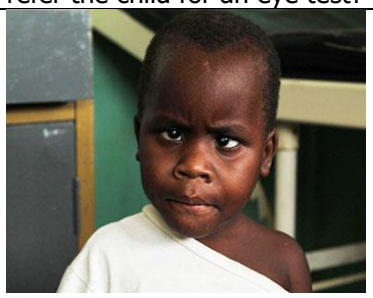
Appendix I4:

Questionnaire on teachers' knowledge about children's vision (After-Educational Session) (English)

Teachers spend more time with children than parents do, they assist children in acquiring skills for learning and many of those learning related skills are visual skills. As a teacher, you are in a position to detect the symptoms of learning related vision problems in your school children**.**

STUDY NUMBER | | | |

Mark the appropriate block(s) with an X which correspond to the correct answer

1.	If a child in your school/class has the condition in Figure 1, will you refer the child for an eye test?	*Yes*	*No*
	 Figure 1 www.millionmiracles.org/screening-children-cataract-uganda		
2.	Will you refer the child in Figure 2 for an eye examination?	*Yes*	*No*
	 Figure 2 www.cehjournal.org/article/understanding-detecting-and-managing-strabismus		
3.	Will you refer the child in Figure 3 for an eye examination?	*Yes*	*No*
	 Figure 3 www.webmd.com/eye-health/ss/slideshow-pinkeye		
4.	Will you refer a child complaining of itchy and painful eyes for an eye examination?	*Yes*	*No*
5.	Will you refer a child in Figure 4 for an eye examination?	*Yes*	*No*
	 Figure 4 www.webmd.com/eye-health/ss/slideshow-pinkeye		

6.	Will you refer a child who holds a book very close to his/her face for an eye examination?	*Yes*	*No*
7.	Will you refer a child who skips lines when reading for an eye examination?	*Yes*	*No*
8.	Will you refer a child who tilts his/her head when reading for an eye examination?	*Yes*	*No*
9.	Will you refer a child who closes or covers one eye looking at the board or reading for an eye examination?	*Yes*	*No*

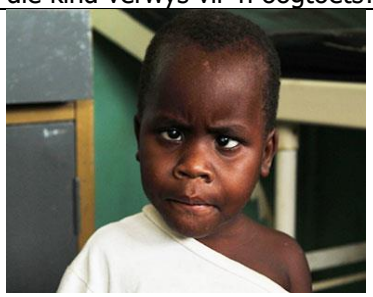
Appendix I5:

Questionnaire on teachers' knowledge about children's vision (After-Educational Session) (Afrikaans)

Onderwysers spandeer meer tyd met kinders as hul ouers; hulle help kinders om leervaardighede te verwerf en baie van die leerverwante vaardighede is sigvaardighede. As onderwyser is jy in 'n posisie om die simptome van leerverwante sigprobleme by jou leerders te ontdek.

STUDIENOMMER

Merk die toepaslike blokkie(s) wat met die korrekte antwoord ooreenstem met 'n X.

1.	As 'n kind in jou skool/klas die toestand het soos in Figuur 1, sal jy die kind verwys vir 'n oogtoets?	*Ja*	*Nee*
	 Figuur 1 www.millionmiracles.org/screening-children-cataract-uganda		
2.	Sal jy die kind in Figuur 2 verwys vir 'n oogtoets?	*Ja*	*Nee*
	 Figuur 2 www.cehjournal.org/article/understanding-detecting-and-managing-strabismus		
3.	Sal jy die kind in Figuur 3 verwys vir 'n oogtoets?	*Ja*	*Nee*
	 Figuur 3 www.webmd.com/eye-health/ss/slideshow-pinkeye		
4.	Sal jy 'n kind wat kla van krapperige en seer oë verwys vir 'n oogtoets?	*Ja*	*Nee*
5.	Sal jy die kind in Figuur 4 verwys vir 'n oogtoets?	*Ja*	*Nee*
	 Figuur 4 www.webmd.com/eye-health/ss/slideshow-pinkeye		

6.	Sal jy 'n kind wat die boek baie naby aan sy gesig hou verwys vir 'n oogtoets?	*Ja*	*Nee*
7.	Sal jy 'n kind wat lyntjies oorslaan wanneer hy lees verwys vir 'n oogtoets?	*Ja*	*Nee*
8.	Sal jy 'n kind wat sy kop kantel wanneer hy lees verwys vir 'n oogtoets?	*Ja*	*Nee*
9.	Sal jy 'n kind wat een oog toemaak of bedek wanneer hy na die bord kyk of lees verwys vir 'n oogtoets?	*Ja*	*Nee*

Appendix I6:

Questionnaire on teachers' knowledge about children's vision (After-Educational Session) (Sesotho)

Matitjhere a nka nako e ngata le bana ho feta batswadi, ba thusa bana ho fumana tsebo ya ho ithuta mme tsebo e ngata e amanang le ho ithuta hona ha bona ke bokgoni ba ho bona. Jwaloka titjhere o boemong ba ho hlwaya matshwao a ho ithuta a amanang le mathata a pono ho barutwana ba hao**.**

NOMORO YA THUTO | | | |

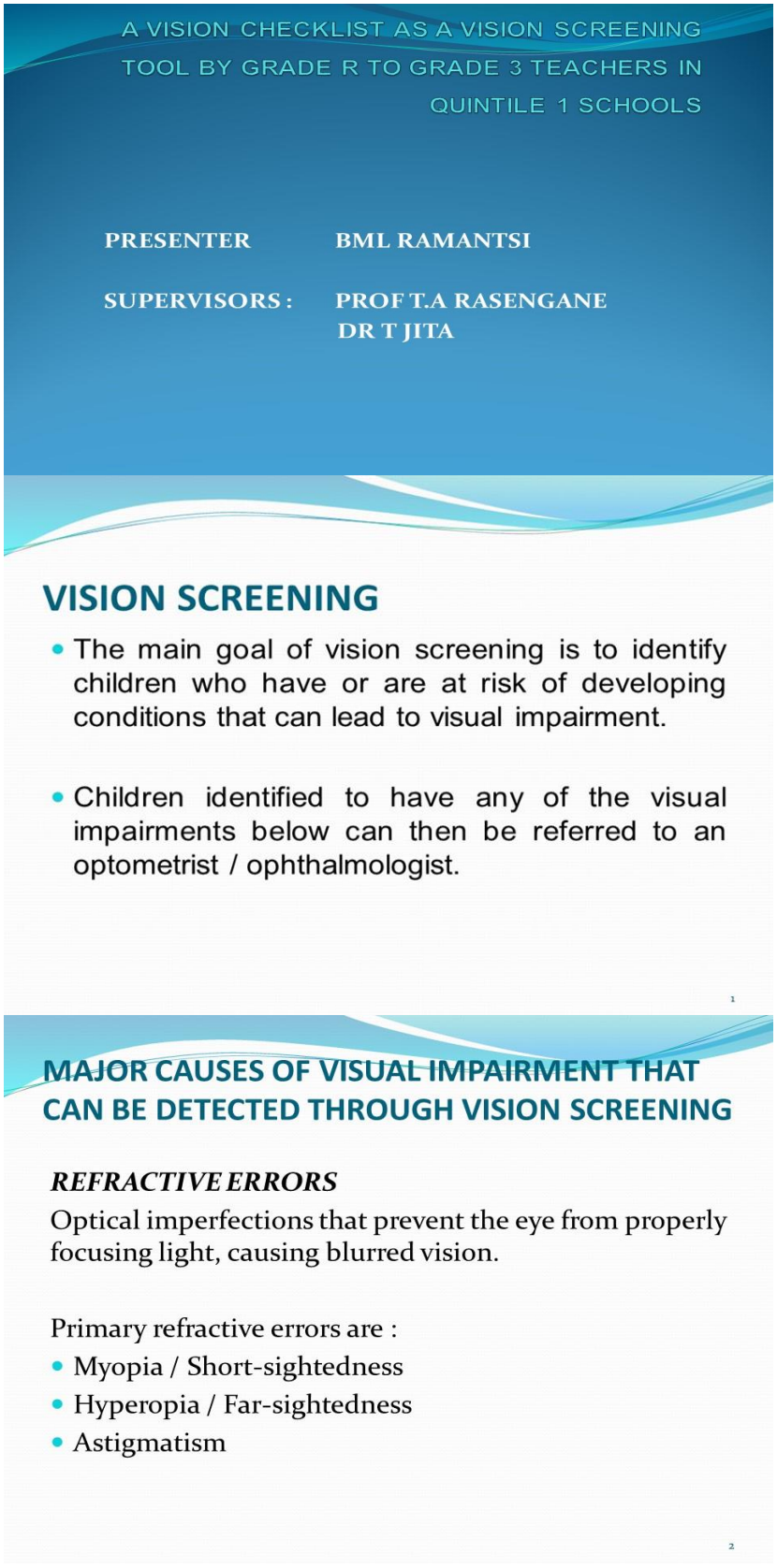
Tshwaya lesakana (kapa masakana) ka X le amanang le karabo e nepahetseng

1.	Haeba ngwana sekolong sa heno / sehlopheng a na le bolwetse ba Setshwantsho sa 1, na o tla fetisetsa ngwana tekong ya mahlo?	*E*	*Tjhe*
	 Figure 1 www.millionmiracles.org/screening-children-cataract-uganda		
2.	Na o tla fetisetsa ngwana ya Setshwatshong sa 2 bakeng sa tlhahlobo ya mahlo?	*E*	*Tjhe*
	 Figure 2 www.cehjournal.org/article/understanding-detecting-and-managing-strabismus		
3.	Na o tla fetisetsa ngwana wa Setshwantsho sa 3 bakeng sa tlhahlobo ya mahlo?	*E*	*Tjhe*
	 Figure 3 www.webmd.com/eye-health/ss/slideshow-pinkeye		
4.	Na o tla fetisetsa ngwana ya tletlebang ka mahlo a hlohlonang kapa a bohloko tlhahlobong a mahlo?	*E*	*Tjhe*
5.	Na o tla fetisetsa ngwana wa Setshwantsho sa 4 tlhahlobong ya mahlo?	*E*	*Tjhe*
	 Figure 4 www.webmd.com/eye-health/ss/slideshow-pinkeye		

6.	Na o tla fetisetsa ngwana ya tshwarelang buka haufi le sefahleho sa hae tlhahlobong ya mahlo?	*E*	*Tjhe*
7.	Na o tla fetisetsa ngwana ya tlolang mela ha a bala tlhahlobong ya mahlo?	*Ja*	*Nee*
8.	Na o tla fetisetsa ngwana ya sekamisang hlooho haholo ha a bala tlhahlobong ya mahlo?	*Ja*	*Nee*
9.	Na o tla fetisetsa ngwana ya kwalang kapa ya kupetsang leihlo le leng ha a sheba letlapeng kapa a bala tlhahlobong ya mahlo?	*Ja*	*Nee*

Appendix J1:

Presentation to teachers on common vision disorders in children (English)



MYOPIA / SHORT-SIGHTEDNESS

- Is a vision condition where people can see close objects clearly but objects at distance appear blurry

- http://www.rebuildyourvision.com

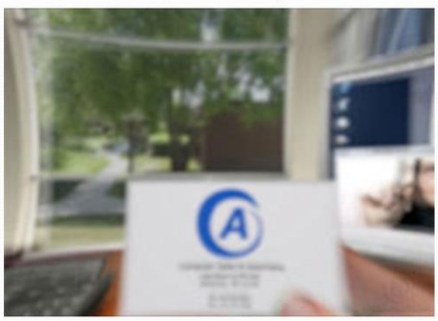
HYPEROPIA / FAR-SIGHTEDNESS

- A vision condition in which distant objects are seen clearly, but close objects are blurred.

http://www.allaboutvision.com/parents/schoolage.htm

ASTIGMATISM

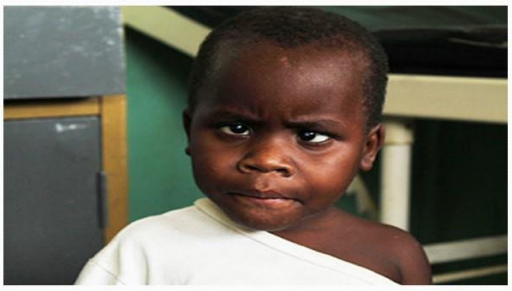
- A vision condition that causes blurred vision due either to the irregular shape of the cornea (the clear front cover of the eye) or sometimes the curvature of the lens inside the eye.



http://www.aoa.org/

CATARACT

- A cloudy area in the normally clear lens of the eye , will appear whitish in the centre of the eye.



www.millionmiracles.org/screening-children-cataract-uganda

GLAUCOMA

- Eye condition in which the fluid pressure inside the eye rises to a level higher than healthy for that eye. If untreated, it may damage the optic nerve, causing the loss of vision or even blindness. Usually present with tunnel vision.

www.medicalnewstoday.com/articles/9710.ph

PTOSIS

- is a condition that causes drooping eyelids

www.cehjournal.org/article/understanding-detecting-and-managing-strabismus

STRABISMUS

- also called crossed eyes, is a condition in which the eyes do not properly align with each other when looking at an object

www.cehjournal.org/article/understanding-detecting-and-managing-strabismus

ABC Checklist for vision observation

Crusty eyelids

www.webmd.com/eyehealth/ss/slideshow-pinkeye

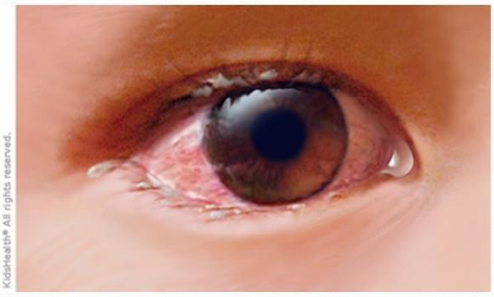
SWELLING OF EYELIDS

www.webmd.com/eye-health/ss/slideshow-pinkeye

GROWTHS ON EYES / EYELIDS

www.allaboutvision.com/conditions/how-to-get-rid-of-a-stye.htm

RED – TEARY EYE



kidshealth.org/en/kids/conjunctivitis.html

INCORRECT POSTURE – READING & WRITING

www.americasangel.org/parent-resources/ready-to-read/

USES FINGER TO KEEP PLACE WHEN READING

www.allaboutvision.com/conditions/amblyopia.htm

15

GLOSSARY

- **Acuity** – Sharpness of vision.
- **Amblyopia (lazy eye)** – Vision is reduced in one eye and is not able to be corrected with glasses or contact lenses. Vision therapy may help if begun early enough.
- **Astigmatism** – An irregularity in the shape of the cornea, lens, or in rare conditions, retina. Light rays entering the eye fail to focus at a single point but rather focus at two distinct retinal points. Both far and near objects appear blurry.
- **Binocular** – The term used to describe simultaneous use of the two eyes in the act of vision.
- **Cataract** – Opacification in various degrees of the crystalline lens substance or capsule which can diminish visual acuity from normal to bare light perception. It may be congenital or caused by metabolic derangement or by trauma. Vision is re-established by the surgical removal of the lens and capsule.
- **Contact Lens** – A thin plastic shell shaped like the front of the eyeball which is held in position by the suction of a thin layer of tears. This lens is used to correct refractive errors including: irregularly shaped cornea, as a cosmetic lens to change iris color or to cover unsightly scars.
- **Esotropia** – One eye pointing nasally while the other eye fixates straight ahead.
- **Exotropia** – One eye pointing temporally while the other eye fixates straight ahead.

16

GLOSSARY

- **Glaucoma -** is a disease of the eye in which fluid pressure within the eye rises - if left untreated the patient may lose vision, and even become blind. The disease generally affects both eyes, although one may have more severe signs and symptoms than the other.
- **Hyperopia (far-sightedness)** – Light rays focus after hitting the retina causing blurred near vision or better far sight. Inability to clearly see close objects.
- **Iris** – The colored part of the eye that helps control the amount of light entering the eye by regulating the diameter of the pupil.
- **Myopia (short-sightedness)** – Light rays focus before hitting the retina causing blurred distance vision or better near sight. Inability to clearly see distant objects.
- **Ophthalmologist** – A medical doctor specializing in treatment and surgery of the eye.
- **Optometrist** – State licensed healthcare professionals specifically trained to examine, detect, diagnose, treat and manage diseases and disorders of the visual system, the eye and associated structures, as well as to diagnose related systemic conditions.
- **Strabismus (crossed-eyes)** – A condition whereby one or both eyes turn in, out, up, or down.

17

Appendix J2:

Presentation to teachers on common vision disorders in children (Afrikaans)

N AFTIKLYSIE AS SIFTINGSTOETS VIR VISIE BY DIE SKOOL DEUR GRAAD R TOT GRAAD 3-ONDERWYSERS IN KWINTIEL 1 SKOLE

PRESENTER BML RAMANTSI

SUPERVISORS : PROF T.A RASENGANE
DR T JITA

SIFTINGSTOETSE VIR SIG

- Die hoofdoel van siftingstoetse vir sig is om kinders te identifiseer wat óf n risiko loop om toestande te ontwikkel wat kan lei tot visuele inperking, óf dit reeds het.
- Kinders wat geïdentifiseer is met enige van die onderstaande visuele inperkings kan dan na 'n optometris/oftalmoloog verwys word.

1

HOOFOORSAKE VAN VISUELE INPERKING KAN OPGESPOOR WORD DEUR SIFTINGSTOETSE VIR SIG

Refraktiewe afwykings is optiese onvolmaakthede wat die oog daarvan weerhou om lig behoorlik te fokus, en dit veroorsaak dowwe sig.

Primêre refraktiewe afwykings:

- Miopie / bysiendheid
- Hiperopie / vêrsiendheid
- Astigmatisme

2

MIOPIE / BYSIENDHEID

- Is 'n sigtoestand waar naby voorwerpe duidelik gesien kan word maar voorwerpe op 'n afstand wasig voorkom.

http://www.rebuildyourvision.com

3

HIPEROPIE / VERSIENDHEID

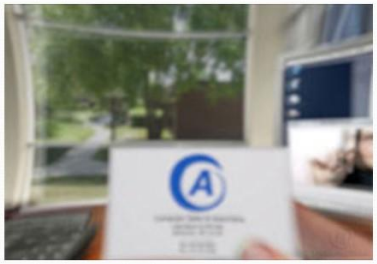
- 'n Sigtoestand waarin voorwerpe op 'n afstand duidelik gesien kan word, maar naby voorwerpe wasig voorkom.

http://www.allaboutvision.com/parents/schoolage.htm

4

ASTIGMATISME

- 'n Sigtoestand wat dowwe sig veroorsaak, óf as gevolg van die onreëlmatige vorm van die kornea (die deursigtige voorste bedekking van die oog) óf somtyds die kurwe van die lens binne-in die oog.

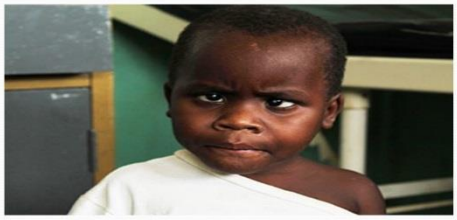


http://www.aoa.org/

5

KATARAK

- 'n Wolkerige area in die lens van die oog (wat normaalweg helder is) wat witterig voorkom in die middel van die oog.



www.millionmiracles.org/screening-children-cataract-uganda

6

GLOUKOOM

- Oogtoestand waarin die vloeistofdruk binne die oog so hoog styg dat dit ongesond is vir daardie oog. Indien nie behandel, kan dit die oogsenuwee beskadig, wat verlies aan sig of selfs blindheid veroorsaak. Gewoonlik teenwoordig by tonnelvisie.

www.medicalnewstoday.com/articles/9710.ph

7

PTOSE

- is 'n toestand wat hangende ooglede veroorsaak.

www.cehjournal.org/article/understanding-detecting-and-managing-strabismus

8

STRABISMUS (SKEELOË)

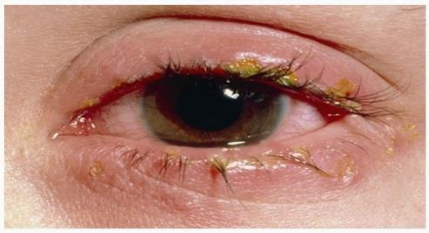
- Ook bekend as skeelheid; 'n toestand waarin die oë nie behoorlik met mekaar saamwerk nie wanneer na 'n voorwerp gekyk word.

www.cehjournal.org/article/understanding-detecting-and-managing-strabismus

9

AFTIKLYSE VIR WAARNEMING VAN SIG

Draagsel op die ooglede



www.webmd.com/eyehealth/ss/slideshow-pinkeye

10

SWELSEL OP DIE OOGLEDE

www.webmd.com/eye-health/ss/slideshow-pinkeye

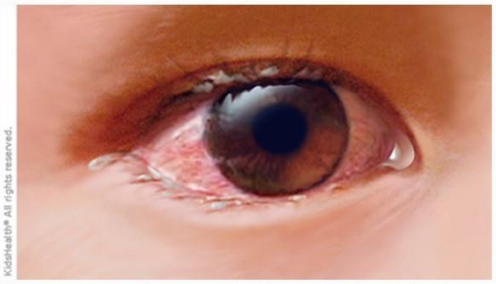
11

GROEISEL OP OË/ OOGLEDE

www.allaboutvision.com/conditions/how-to-get-rid-of-a-stye.htm

12

ROOI, TRANERIGE OOG



kidshealth.org/en/kids/conjunctivitis.html

13

VERKEERDE POSTUUR - LEES EN SKRYF

www.americasangel.org/parent-resources/ready-to-read/

14

GEBRUIK VINGER OM PLEK TE HOU WANNEER HY LEES

www.allaboutvision.com/conditions/amblyopia.htm

15

OOGWOORDELYS

- **Akuïteit** - skerpte van sig
- **Ambliopie (lui oog)** - sig is verminder in een oog en kan nie reggestel word met 'n bril of kontaklens nie. Sigterapie mag help indien daarmee vroeg genoeg begin word.
- **Astigmatisme** – 'n onreëlmatigheid in die vorm van die kornea, lens, of in seldsame gevalle, die retina. Ligstrale wat die oog binnegaan fokus nie op 'n enkele punt nie, maar eerder op twee onderskeie retinapunte. Beide ver en naby voorwerpe lyk dof.
- **Binokulêr** - Die term wat gebruik word om die gelyktydige gebruik van die twee oë te beskryf in die aksie van sig.
- **Eksotropie** - een oog wys na die oor en die ander staar reguit vorentoe.
- **Esotropie** - een oog wys na die neus en die ander staar reguit vorentoe.
- **Gloukoom** – 'n oogsiekte waarin vloeistofdruk binne die oog verhoog - indien onbehandel kan die pasiënt sy sig verloor en selfs blind word. Die siekte tas gewoonlik albei oë aan, alhoewel een oog ernstiger tekens en simptome mag hê as die ander.
- **Hiperopie** - versiendheid - Ligstrale fokus nadat dit die retina getref het en veroorsaak dowwe nabysig, of beter afstandsig. Onvermoë om naby voorwerpe duidelik te sien.
- **Iris** - die gekleurde deel van die oog wat die hoeveelheid lig wat die oog binnegaan beheer deurdat dit die omtrek van die pupil beheer.

16

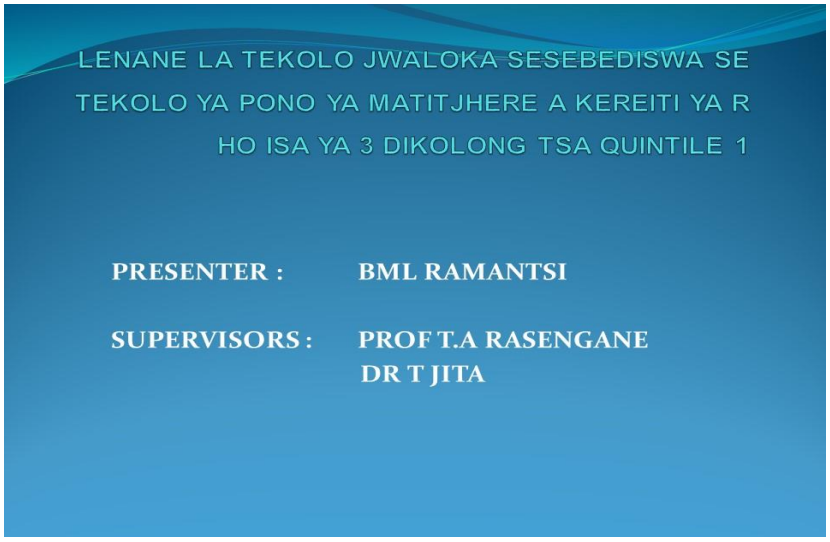
OOGWOORDELYS

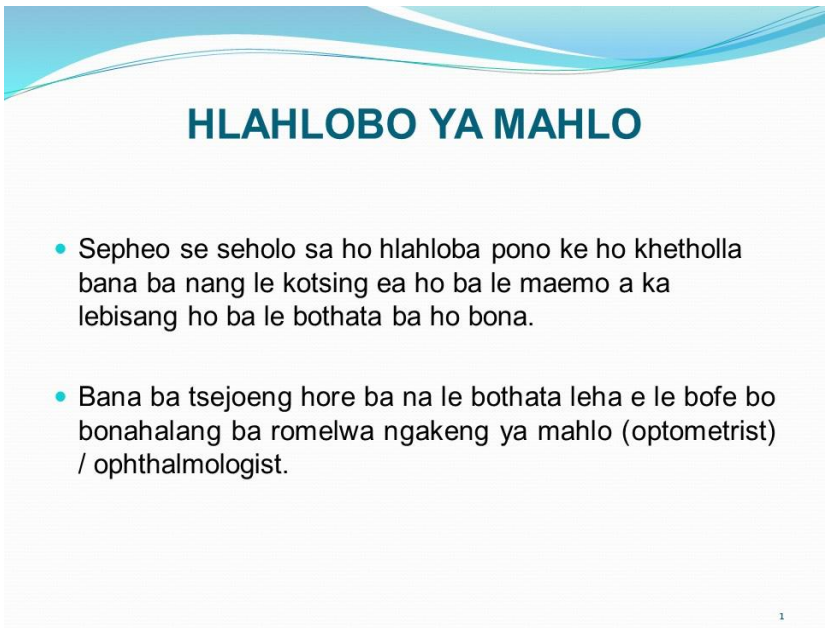
- **Katarak** - Die kristalagtige lensmateriaal of kapsel word ondeursigtig in verskeie grade wat visuele skerpte kan verminder, van normaal tot skaars waarneembare ligpersepsie. Dit kan aangebore wees of veroorsaak word deur metaboliese versteuring of trouma. Sig word herstel deur die chirurgiese verwydering van die lens en kapsel.
- **Kontaklens** – 'n Dun plastiekdoppie wat die vorm het van die voorkant van die oogbal en wat in plek gehou word deur die suigkrag van 'n dun lagie trane. Hierdie lens word gebruik om refraktiewe afwykings reg te stel, waaronder onreëlmatig gevormde kornea, as 'n kosmetiese lens om oogkleur te verander, of om onooglike littekens te verberg.
- **Miopie** - bysiendheid - ligstrale fokus voordat die retina getref word en veroorsaak dowwe afstandsig, of beter nabysig. Onvermoë om voorwerpe op 'n afstand duidelik te sien.
- **Oftalmoloog** – 'n mediese dokter wat spesialiseer in die behandeling en chirurgie van die oog.
- **Optometris** - Professionele gesondheidswerker met 'n staatsgoedgekeurde kwalifikasie wat spesifiek opgelei is om siektes en toestande van die visuele stelsel, die oog en verwante strukture te ondersoek, op te spoor, te behandel en te bestuur asook om verwante sistemiese toestande te diagnoseer.
- **Retinoblastoom** – 'n aangebore kwaadaardige tumor wat uit die retina ontstaan.
- **Stereopsis** - dieptepersepsie
- **Strabismus (skeeloë)** - 'n Toestand waarin een of albei van die oë na buite, na bo of na onder draai.

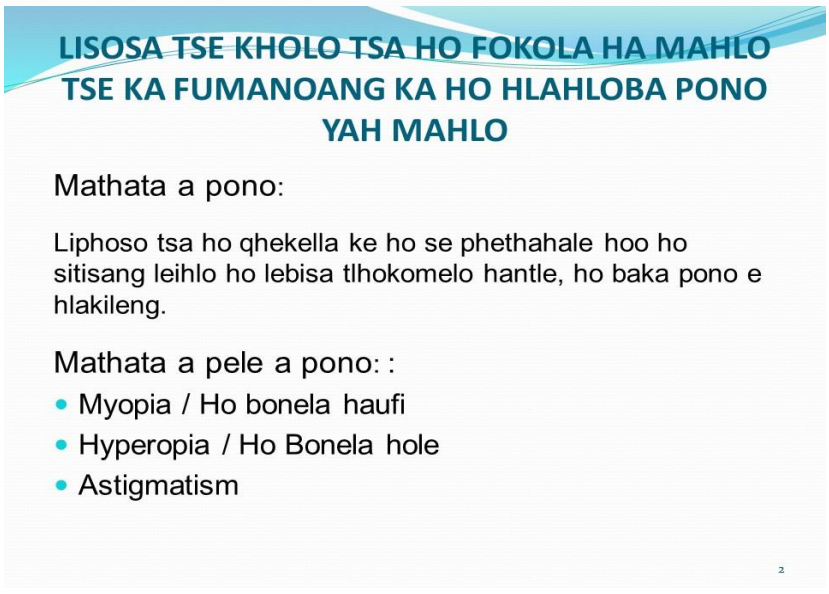
17

Appendix J3:

Presentation to teachers on common vision disorders in children (Sesotho)







MYOPIA / HO BONELA HAUFI

- Na boemo ke pono moo batho ba ka bonang lintho tse haufi ka ho hlaka empa lintho tse ka thōko li bonahala li fofa.

http://www.rebuildyourvision.com

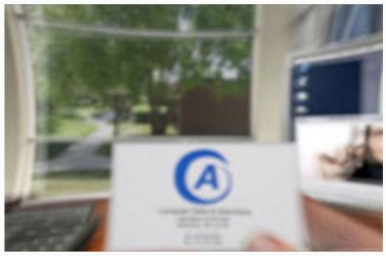
HYPEROPIA / HO BONELA HOLE

- Pono ea pono eo ho eona lintho tse hōle li bonoang ka mokhoa o hlakileng, empa lintho tse haufi li fofa

http://www.allaboutvision.com/parents/schoolage.htm

ASTIGMATISM

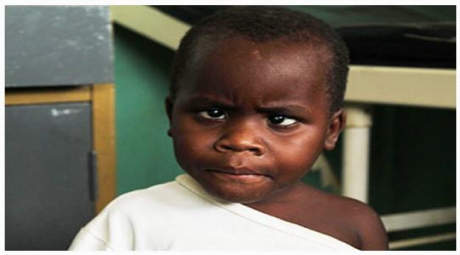
- Pono e sa hlakang ka lebaka la sebopeho se sa tloaelehang sa cornea (sekoahelo se hlakileng se ka pele sa leihlo) kapa ka linako tse ling sekhahla sa lens ka hare ho leihlo



http://www.aoa.org/

CATARACT / LERA LA LEIHLO

- Lense e tloaelehileng ea leihlong e ba le lera, le tla bonahala le le leputsoa bohareng ba leihlo.



www.millionmiracles.org/screening-children-cataract-uganda

GLAUCOMA

- Maemo a mahlo ao khatello ea metsi ka hare ho leihlong e leng holimo ho feta boemo bo botle bakeng sa leihlo leo. Ha a sa elellwe ka nako a fomana pheko a senya nerefe e kgolo ya mahlo mme re foufale. Pono e ba e kare o taneleng.

www.medicalnewstoday.com/articles/9710.ph

PTOSIS

- Ke boemo bo bakang mahlo a marotholi

www.cehjournal.org/article/understanding-detecting-and-managing-strabismus

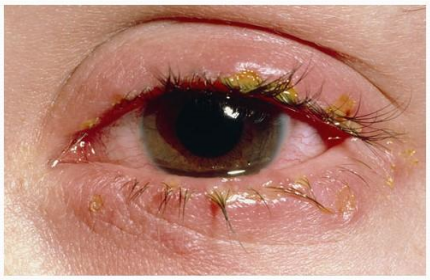
HO PELEKANA MAHLO

- E boetse e bitsoa sheba ntho

www.cehjournal.org/article/understanding-detecting-and-managing-strabismus

ABC LISTI YA HO HLAHLOBA MAHLO

Mahlo a naleng dithoko



www.webmd.com/eyehealth/ss/slideshow-pinkeye

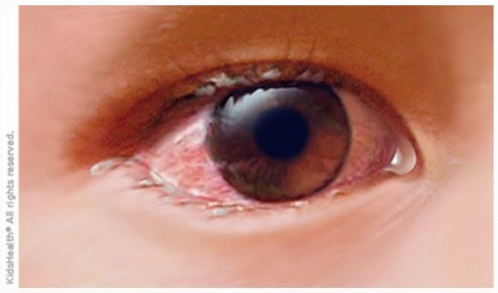
MAHLO A RURUHILENG

www.webmd.com/eye-health/ss/slideshow-pinkeye

MAHLO A HLAHILENG DISO

www.allaboutvision.com/conditions/how-to-get-rid-of-a-stye.htm

MAHLO A MAKHUBEDU – A TSWANG DIKELEDI



kidshealth.org/en/kids/conjunctivitis.html

HO SA DULE HANTLE – HO BALA LE HO NGOLA

www.americasangel.org/parent-resources/ready-to-read/

HO SEBEDISA MONOANA HO SELAHLEHE HA O BALA

www.allaboutvision.com/conditions/amblyopia.htm

GLOSSARY

- **Acuity** - Ponahalo e ntle
- **Amblyopia** (Leihlo le botswa) - Pono e fokotsoe ka leihlo le le leng 'me ha e khone ho lokisoa ka likhalase kapa di contact lense. Therapy ea thusa
- **Astigmatism** - Ho se natse ka sebōpeho sa cornea, lens, kapa maemo a sa tloaelehang, retina
- **Binocular** – ho sebedisa mahlo a le mabedi
- **Cataract** – Lera le hlotsweng ke lense, ngoana a ka hlaha ka yona kappa ho lemala. E tloswa ka surgery.
- **Contact lens** – Polastiki e e naleng lense e e kenywang ka leihlong. Re ka e thola e na le mmala e fapaneng
- **Esotropia-** ho pelekana ha leihlo le leleng le shebetse ka nkong.
- **Exotropia** –ho pelekana ha leihlo le le leng ka thoko.
- **Glaucoma** - Maemo a mahlo ao khatello ea metsi ka hare ho leihlong e leng holimo ho feta boemo bo botle bakeng sa leihlo leo
- **Hyperopia** – Ke ha lense ya leihlo e haellwa ke ho bona ntho tse haufi hantle.

GLOSSARY

- **Myopia –** Ke ha lense ya leihlo e haellwa ke ho bona ntho tse hole hantle
- **Ophthalmologist –** ngaka ya mahlo ya setsibi tsa di surgey tsa leihlo
- **Optometrist –** ngaka ya mahlo, ya koetliselitsoeng ho hlahloba, ho lemoha, ho hlahloba, ho tšoara le ho laola maloetse le mathata a tsamaiso ea mahlo, leihlo
- **Strabismus** - Boemo boo ho bona motho kapa mahlo a mabeli a kenang kapa a tsoang

Appendix K1:

Vision checklist (English)

Adapted from (Texas School for the blind and visually impaired, 2000; Kansas Department of Health and Environment, 2004; Colorado Department of Education, 2006; Missouri Department of Health, 2009; New York State Education Department, 2014)

It's as simple as A, B, C!

There are three common areas to look for when determining whether a child has a vision problem. A simple A for appearance, B for behaviour and C for complains checklist can help us along the way!
Let's all be our children's vision detectives and identify their vision problems early!
Kindly observe the child's eyes and activities and indicate by an (X) where applicable.

FOR OFFICE USE ONLY

STUDY NUMBER | | | | | | |

Name of School: _____

Grade: _____

A= APPEARANCE (Do the child's eyes look normal?)

1.	Eyes turn in or out	*YES*	*NO*
2.	Crusty or red eyelids	*YES*	*NO*
3.	Swelling of eyelids	*YES*	*NO*
4.	Drooping lid(s)	*YES*	*NO*
5.	Growths on eyes or eyelids	*YES*	*NO*
6.	Excessive tearing or watery eyes	*YES*	*NO*
7.	White eye (or pupil)	*YES*	*NO*
8.	Different size of eyes	*YES*	*NO*
9.	Red-eye	*YES*	*NO*
10.	Dancing eyes (eyes in constant movement)	*YES*	*NO*
11.	Squints, closes, or covers one eye	*YES*	*NO*
12.	Blinks excessively to "clear up" when looking from near to far or from far to near	*YES*	*NO*
13.	Closes one eye in bright light	*YES*	*NO*
14.	Any other observation about "eyes that just don't "look right"?	*YES*	*NO*
	Specify:		
15.	Eyes look normal	*YES*	*NO*

B = BEHAVIOUR OF THE CHILD

1.	Tilts head, covers or closes one eye for reading, writing or looking at the board	*YES*	*NO*
2.	Uses a finger to keep place while reading	*YES*	*NO*
3.	Omission of words or skipping of lines when reading	*YES*	*NO*
4.	Disinterested in activities involving reading	*YES*	*NO*
5.	Disinterested in activities involving writing	*YES*	*NO*
6.	Disinterested in activities involving copying, drawing or looking at the board	*YES*	*NO*
7.	Holds book closely to face or face close to the desktop	*YES*	*NO*
8.	Avoids all near/close tasks	*YES*	*NO*

9.	Holds printed material in unusual position such as tilting the book, holding book further away	*YES*	*NO*
10.	Other behaviours the child does that seem to indicate vision problems.	*YES*	*NO*
	Specify:		

C = COMPLAINTS

(Child's Statements or your observations that the child might be experiencing discomfort during visual tasks)

1.	Eyes hurt or blur while reading	*YES*	*NO*
2.	Headaches when reading	*YES*	*NO*
3.	Words move or jump about when reading	*YES*	*NO*
4.	Double vision	*YES*	*NO*
5.	Eye problem following a blow to the head or injury to the face	*YES*	*NO*
6.	Cannot see the chalkboard	*YES*	*NO*
7.	Eyes hurt or bother child when in bright lighting	*YES*	*NO*
8.	Cannot see well at night or in dark situations	*YES*	*NO*
9.	Print blurs after reading a short time	*YES*	*NO*
10.	Burning or itching eyes after reading or desk work	*YES*	*NO*
11.	Other complaints or observations that might mean a child is experiencing discomfort during visual tasks	*YES*	*NO*
	Specify:		

Appendix K2:

Vision checklist (Afrikaans)

(Texas School for the blind and visually impaired, 2000; Kansas Department of Health and Environment, 2004; Colorado Department of Education, 2006; Missouri Department of Health, 2009; New York State Education Department, 2014)

Dis so maklik soos A, B, C!

Daar is drie algemene areas wat ondersoek moet word wanneer 'n mens bepaal of 'n kind 'n sigprobleem het. 'n eenvoudige A vir voorkoms (*appearance*), B vir gedrag (*behaviour*) en C vir klagtes (*complaints*) kan ons al baie help!

Laat ons almal ons kinders se sigspeurders wees om hulle sigprobleme vroegtydig op te spoor!

Observeer die kind se oë en aktiwiteite asseblief en dui waar van toepassing aan met 'n X.

SLEGS VIR KANTOORGEBRUIK

STUDIENOMMER

Naam van Skool

Graad: _____

A= APPEARANCE (voorkoms) Lyk die kind se oë normaal?

1.	Oë draai na binne of buite	*JA*	*NEE*
2.	Korserige of rooi ooglede	*JA*	*NEE*
3.	Swelsel op die ooglede	*JA*	*NEE*
4.	Hangende ooglid/lede	*JA*	*NEE*
5.	Groeisel op oë/ ooglede	*JA*	*NEE*
6.	Uitermate tranerigheid of waterige oë	*JA*	*NEE*
7.	Wit oog (of pupil)	*JA*	*NEE*
8.	Grootte van oë verskil	*JA*	*NEE*
9.	Rooi oë	*JA*	*NEE*
10.	Oë spring rond (in voortdurende beweging)	*JA*	*NEE*
11.	Trek oë op skrefies, maak een oog toe of bedek een oog	*JA*	*NEE*
12.	Knip oë baiemaal om te "fokus" wanneer afstand van blik verander van naby na ver of ver na naby	*JA*	*NEE*
13.	Maak een oog toe in skerp lig	*JA*	*NEE*
14.	Enige ander observasie oor ogies "wat net nie reg lyk nie"?	*JA*	*NEE*
	Spesifiseer:		
15.	Oë kom normaal voor	*JA*	*NEE*

B = BEHAVIOUR (GEDRAG VAN DIE KIND)

1.	Kantel die kop, bedek of maak een oog toe wanneer hy lees, skryf of na die bord kyk	*JA*	*NEE*
2.	Gebruik vinger om plek te hou wanneer hy lees	*JA*	*NEE*
3.	Laat woorde uit of spring lyntjies wanneer hy lees	*JA*	*NEE*
4.	Ongeïnteresseerd in aktiwiteite waarby lees betrokke is	*JA*	*NEE*
5.	Ongeïnteresseerd in aktiwiteite waarby skryf betrokke is	*JA*	*NEE*
6.	Ongeïnteresseerd in aktiwiteite waarby natrek of teken betrokke is of om na die bord te kyk	*JA*	*NEE*

7.	Hou boek naby gesig of gesig naby aan tafeloppervlak	*JA*	*NEE*
8.	Vermy omtrent alle naby opdragte	*JA*	*NEE*
9.	Hou gedrukte materiaal in ongewone posisie soos om dit te kantel of om die boek verder weg te hou	*JA*	*NEE*
10.	Ander gedrag van die kind wat daarop kan dui dat die kind psigprobleme het.	*JA*	*NEE*
	Spesifiseer:		

C = *COMPLAINTS* (KLAGTES)
(Kind se bewerings of jou observasies dat die kind moontlik ongemak kan verduur tydens visuele opdragte)

1.	Ogies is seer of wasig wanneer gelees word	*JA*	*NEE*
2.	Hoofpyne wanneer gelees word	*JA*	*NEE*
3.	Woorde beweeg of spring rond wanneer gelees word	*JA*	*NEE*
4.	Dubbelvisie	*JA*	*NEE*
5.	Oogprobleem na ’n stamp aan die kop of gesigbesering	*JA*	*NEE*
6.	Kan die swartbord nie sien nie	*JA*	*NEE*
7.	Oë is seer of pla die kind in skerp lig	*JA*	*NEE*
8.	Kan nie goed in die nag of in donker omgewing sien nie	*JA*	*NEE*
9.	Na ’n kort rukkie se lees begin die drukwerk vervaag	*JA*	*NEE*
10.	Branderige of jeukende oë na leeswerk of lessenaarwerk	*JA*	*NEE*
11.	Ander klagtes of observasies wat kan beteken dat die kind ongemak verduur tydens visuele opdragte	*JA*	*NEE*
	Spesifiseer:		

Appendix K3:

Vision checklist (Sesotho)

LENANE LA TITJHERE LA TEKOLO LA *ABC* BAKENG SA TEMOHO YA PONO

(Sekolo sa Texas sa difofu le ba nang le mathata a pono, 2000; Kansas Lefapha la Bophelo le Tikoloho, 2004; *Colorado Department of Education, 2006; Missouri Department of Health, 2009; New York State Education Departmen*t, 2014)

Ho bobebe jwaloka A, B, C!
Ho na le dintlha tse tharo tse tlwaelehileng tseo o lokelang ho di hlokomela ha a batla ho tseba hore ngwaa o na le bothata ba pono. A e bolela ka bobebe feela A= appearance, B bakeng sa behaviour le C bakeng sa complains e le lenane la tekolo le ka re thusang kgabareng!
Ha kaofela ha rona re be mafokisi a pono ya bana ba rona mme re lemohe mathata a pono esale ka nako!
Ka kopo hlokomela mahlo a ngwana le mesebetsi mme o bontshe ka (X) moo ho tshwanelehang.

BAKENG SA TSHEBEDISO YA OFISI FEELA

NOMORO YA THUTO | | | | | | |

Lebitso la Sekolo: _____

Kereiti: _____

***A*= APPEARANCE (**na mahlo a ngwana a bonahala a phetse hantle?)

1.	Mahlo a kgohletse hare kapa a tswetse ka ntle	*E*	*TJHE*
2.	Dintshi tse kgubetswana	*E*	*TJHE*
3.	Ho ruruha dintshing	*E*	*TJHE*
4.	Dintshi tse boleya	*E*	*TJHE*
5.	Dinamanyana tse hlahang mahlong kapa dintshing	*E*	*TJHE*
6.	Dikeledi tse ngata kapa mahlo a tletseng metsi	*E*	*TJHE*
7.	Bohare bo bosweu ba leihlo (kapa *pupil*)	*E*	*TJHE*
8.	Boholo bo fapaneng ba mahlo	*E*	*TJHE*
9.	Leihlo le lefubedu	*E*	*TJHE*
10.	Mahlo a tlolatlolang (mahlo a nang le motsamao ka nako le nako)	*E*	*TJHE*
11.	Ho pelekana, ho kwala kapa ho kupetsa leihlo le leng	*E*	*TJHE*
12.	O panyapanya haholo ho "hlakisa" ha o sheba ho tloha haufi ho ya hole kapa ho tloha hole ho ya haufi	*E*	*TJHE*
13.	Okwala leihlo le leng leseding le fahlang	*E*	*TJHE*
14.	Temoho e nngwe efe kapa efe mabapi le "mahlo a sa bonahaleng a phetse hantle"?	*E*	*TJHE*
	Hlakisa:		
15.	Mahlo a bonahala a phetse hantle	*E*	*TJHE*

B = BOITSHWARO BA NGWANA

1.	Sekamisa hlooho, kupetsa kapa ho kwala leihlo le leng ha o bala, o ngola kapa o sheba letlapeng	*E*	*TJHE*
2.	Sebedisa monwana ho bona moo o balang	*E*	*TJHE*
3.	Ho tlola mantswe kapa ho tlola mela ha o bala	*E*	*TJHE*
4.	Ha o na thahasello mesebetsing e amang ho bala	*E*	*TJHE*
5.	Ha o na thahasello mmesebetsing e amang ho ngola	*E*	*TJHE*

6.	Ha o na thahasello mesebetsing e amang ho kopitsa, ho etsa ditshwantsho kapa ho sheba letlapeng	*E*	*TJHE*
7.	Tshwarella buka haufi le sefahleho kapa sefahleho haufi le desktop	*E*	*TJHE*
8.	Qoba mesebetsi yohle e haufi	*E*	*TJHE*
9.	Ho tshwara thepa ya kgatiso ka tsela e sa tlwaelehang jwaloka ho sekamisa buka, ho tshwarella buka hole	*E*	*TJHE*
10.	Diketso tse ding tseo ngwana a di etsang tse bontshang mathata a pono.	*E*	*TJHE*
	Hlakisa:		

C = DITLETLEBO

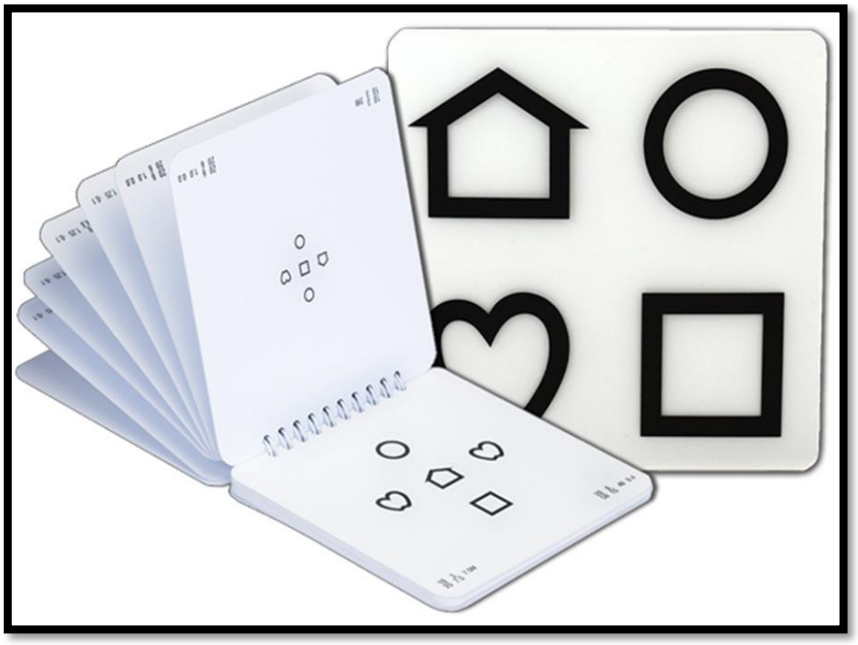
(Dipehelo ka ngwana kapa Ditemoho tsa hao tseo ngwana a ka bang le tsona ho ikutlwa a sa thabele mesebetsi ya pono)

1.	Mahlo a bohloko kapa a ba lerootho ha o bala	*E*	*TJHE*
2.	Ho opelwa ke hlooho ha o bala	*E*	*TJHE*
3.	Mantswe a tsamaya kapa a tlola ha o bala	*E*	*TJHE*
4.	Ho bona dintho eka di pedi	*E*	*TJHE*
5.	Bothata ba mahlo ho latela tsietsi hloohong kapa ho lemala sefahlehong	*E*	*TJHE*
6.	A ke ke a bona letlapa	*E*	*TJHE*
7.	Mahlo a bohloko kapa a tshwenya ngwana ha a le leseding le fahlang	*E*	*TJHE*
8.	Ha a bone hantle bosiu kapa dibakeng tse lefifi	*E*	*TJHE*
9.	Kgatiso e bonahala e sa hlaka kamora ho bala ka nako e kgutshwanyane	*E*	*TJHE*
10.	Mahlo a tjhesang kapa a hlohlonang kamora ho bala kapa ho sebetsa tafoleng	*E*	*TJHE*
11.	Ditletlebo tse ding kapa ditemoho tse ka bolelang hore ngwana o na le mathata a ho etsa mesebetsi ya pono	*E*	*TJHE*
	Hlakisa:		

Appendix L:

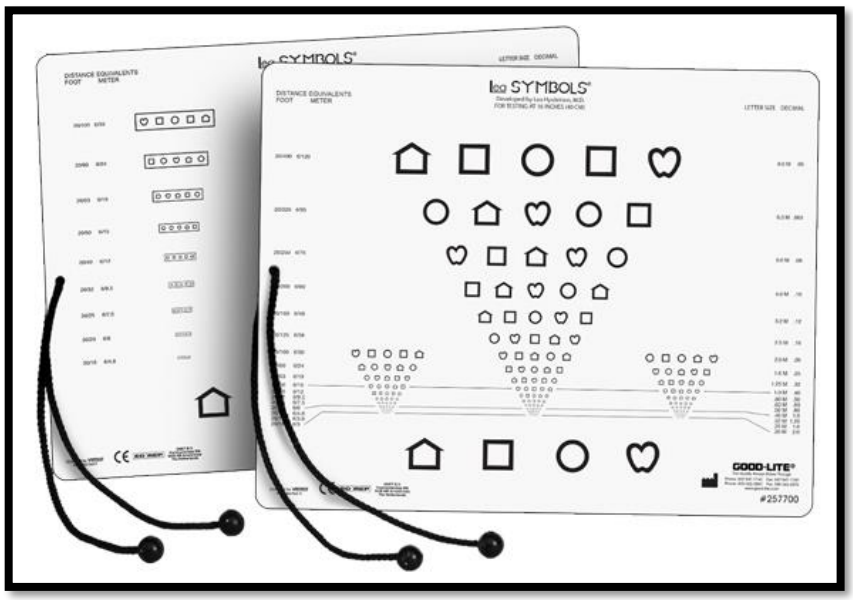
Examples of instruments used by the research team

1. LEA Symbols VA cards
   a) Crowded LEA Symbols - Distance Chart



https://www.good-lite.com/Details.cfm?ProdID=30&category=7&Secondary=37

   b) Massachusetts Near Vision Test (MVAT)



https://www.good-lite.com/Details.cfm?ProdID=31&category=2&Secondary=73

2. Hardy-Rand and Rittler (HRR) pseudoisochromatic test

https://www.bernell.com/product/RP396/Color_Vision_Test_Books

3. Spot Vision Screener

https://www.welchallyn.com/en/products/categories/physical-exam/eye-exam/vision-screeners/spot-vision-screener.html

Appendix M:

Optometric vision screening form

SCHOOLCHILD NUMBER:						

Grade: _____ Age: _____
School: _____

	Wears Spectacles / Contact Lenses:	*YES*	*NO*
	Tested with or without spectacles or contact lenses	*WITH*	*WITHOUT*

1. Visual Acuity

		OU	OD	OS		
	Distance: _____				*PASS*	*FAIL*
	Near: _____				*PASS*	*FAIL*
	+2.00				*PASS*	*FAIL*

2. Cover Test:

	Distance: _____	*PASS*	*FAIL*
	Near: _____	*PASS*	*FAIL*

3. NPC

	Break	Recovery		
			PASS	*FAIL*

4. Auto Refraction:

	R: _____	*PASS*	*FAIL*
	L: _____	*PASS*	*FAIL*

7. Colour Vision

	R: _____	*PASS*	*FAIL*
	L: _____	*PASS*	*FAIL*

8. Ocular Health

		R	**L**	*PASS*	*FAIL*
	Lids:				
	Pupils:				
	Lens:				
	Retina:				
	Optic Nerve:				
	Foveal Reflex:				

	REFERRAL FOR AN EYE EXAMINATION	*YES*	*NO*

Appendix N1:

Parent/Guardian Notification (English)

PARENT/GUARDIAN NOTIFICATION Date: _____

Dear Parent/Guardian:

I have completed the vision screening service provided as a part of the vision screening done on Grade R to Grade 3 pupils. I am informing you that your child has PASSED the school vision screening. This test is not a substitute for a comprehensive eye examination by an optometrist or ophthalmologist. Please feel free to contact the school or me if you have any questions.

Sincerely,

_____
Researcher

Appendix N2:

Parent/Guardian Notification (Afrikaans)

Naam _____ Oud _____ Geslag ____
Skool _____
Graad _____ Onderwyser_____

Beste Ouer/ Voog

Ek het die siftingstoets vir sig voltooi wat aangebied word as deel van die sigtoetse wat gedoen word op graad 0 tot graad 3 leerlinge. Ek laat weet dat jou kind die skool se siftingstoets vir sig GESLAAG het. Hierdie toets is nie ’n plaasvervanger vir ’n omvattende oogtoets deur ’n optometris of oftalmoloog nie. U is welkom om my of die skool te kontak indien u enige vrae het.

Vriendelike groete,

_____
Navorser

Appendix N3:

Parent/Guardian Notification (Sesotho)

Lebitso: _____Dilemo _____ Bong ____
Sekolo _____ Kereiti _____ Titjhere_____

Motswadi /Mohlokomedi ya ratehang:

Ke qetile tshebeletso ya tekolo ya pono e fanweng e le karolo ya tekolo ya pono e entsweng ho barutwana ba Kereiti ya R ho isa ho Kereiti ya 3. Ke o tsebisa hore ngwana wa hao O FETILE KA KATLEHO tekolo ya sekolo ya pono. Teko ena ha e kene sebakeng sa tlhahlobo e phethahetseng ya mahlo ka dingaka tsa mahlo *(optometrist)* kapa *(ophthalmologist)*. Ka kopo e ba le bolokolohi ba ho ikopanya le nna kapa sekolo haeba o na le dipotso dife kapa dife.

Ka botshepehi,

_____
Mofuputsi

Appendix O1:

Vision screening referral (English)

Name _____Age _____ Gender ____
Address_____
School _____ Grade _____ Teacher_____

Dear Parent/Guardian:

We have completed the vision screening service provided for Grade R to Grade 3. Results of your child's vision test indicate the need for an eye examination by an optometrist or ophthalmologist

_____
Researcher

Appendix O2:

Vision screening referral (Afrikaans)

Naam _____Oud _____ Geslag ____
Skool _____
Graad _____ Onderwyser_____

Beste Ouer/ Voog

Ek het die siftingstoets vir sig voltooi wat aangebied word as deel van die sigtoetse wat gedoen word op graad 0 tot graad 3 leerlinge. Die uitslae van die sigtoets wat op jou kind gedoen is, dui aan dat dit nodig is om jou kind se oë deur 'n optometris of oftalmoloog te toets.

_____
Navorser

Appendix O3:

Vision screening referral (Sesotho)

Lebitso: _____ Dilemo _____
Bong: ____
Sekolo: _____Kereiti_____
Titjhere: _____

Motswadi /Mohlokomedi ya ratehang:

Ke qetile tshebeletso ya tekolo ya pono e fanweng e le karolo ya tekolo ya pono e entsweng ho barutwana ba Kereiti ya R ho isa ho Kereiti ya 3. Diphetho tsa teko ya pono ya ngwana wa hao di bontsha hore ho hlokeha tlhahlobo ya mahlo ke ngaka ya mahlo *(optometrist)* kapa *(ophthalmologist)*.

_____
Mofuputsi

Journal Author Guidelines

AVEH | AFRICAN VISION AND EYE HEALTH

SUBMISSION GUIDELINES

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The author guidelines include information about the types of articles received for publication and preparing a manuscript for submission. Other relevant information about the journal's policies and the reviewing process can be found under the about section. The **compulsory cover letter** forms part of a submission and must be submitted together with all the required **forms.** All forms need to be completed in English.

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An original article provides an overview of innovative research in a particular field within or related to the focus and scope of the journal, presented according to a clear and well-structured format.

Word limit	5000-8000 words (excluding the structured abstract and references)
Structured abstract	250 words to cover a Background, Aim, Setting, Methods, Results and Conclusion
References	60 or less
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Ethical statement	should be included in the manuscript

Cover Letter

The format of the compulsory cover letter forms part of your submission. Kindly download and complete, in English, the provided **cover letter**.
Anyone that has made a significant contribution to the research and the paper must be listed as an author in your cover letter. Contributions that fall short of meeting the criteria as stipulated in our policy should rather be mentioned in the 'Acknowledgements' section of the manuscript.
Read our **authorship** guidelines and **author contribution** statement policies.

Original Research Article full structure

Title: The article's full title should contain a maximum of 95 characters (including spaces).

Abstract: The abstract, written in English, should be no longer than 250 words and must be written in the past tense. The abstract should give a succinct account of the objectives, methods, results and significance of the matter. The structured abstract for an Original Research article should consist of six paragraphs labelled Background, Aim, Setting, Methods, Results and Conclusion.

- Background: Summarise the social value (importance, relevance) and scientific value (knowledge gap) that your study addresses.
- Aim: State the overall aim of the study.
- Setting: State the setting for the study.
- Methods: Clearly express the basic design of the study, and name or briefly describe the methods used without going into excessive detail.
- Results: State the main findings.
- Conclusion: State your conclusion and any key implications or recommendations.

Do not cite references and do not use abbreviations excessively in the abstract.

Introduction: The introduction must contain your argument for the social and scientific value of the study, as well as the aim and objectives:

- Social value: The first part of the introduction should make a clear and logical argument for the importance or relevance of the study. Your argument should be supported by use of evidence from the literature.
- Scientific value: The second part of the introduction should make a clear and logical argument for the originality of the study. This should include a summary of what is already known about the research question or specific topic, and should clarify the knowledge gap that this study will address. Your argument should be supported by use of evidence from the literature.
- Conceptual framework: In some research articles, it will also be important to describe the underlying theoretical basis for the research and how these theories are linked together in a conceptual framework. The theoretical evidence used to construct the conceptual framework should be referenced from the literature.
- Aim and objectives: The introduction should conclude with a clear summary of the aim and objectives of this study.

Research methods and design: This must address the following:

- Study design: An outline of the type of study design.
- Setting: A description of the setting for the study; for example, the type of community from which the participants came or the nature of the health system and services in which the study is conducted.
- Study population and sampling strategy: Describe the study population and any inclusion or exclusion criteria. Describe the intended sample size and your sample size calculation or justification. Describe the sampling strategy used. Describe in practical terms how this was implemented.
- Intervention (if appropriate): If there were intervention and comparison groups, describe the intervention in detail and what happened to the comparison groups.
- Data collection: Define the data collection tools that were used and their validity. Describe in practical terms how data were collected and any key issues involved, e.g. language barriers.
- Data analysis: Describe how data were captured, checked and cleaned. Describe the analysis process, for example, the statistical tests used or steps followed in qualitative data analysis.
- Ethical considerations: Approval must have been obtained for all studies from the author's institution or other relevant ethics committee and the institution's name and permit numbers should be stated here.

Results: Present the results of your study in a logical sequence that addresses the aim and objectives of your study. Use tables and figures as required to present your findings. Use quotations as required to establish your interpretation of qualitative data. All units should conform to the **SI convention** and be abbreviated accordingly. Metric units and their international symbols are used throughout, as is the decimal point (not the decimal comma).

Discussion: The discussion section should address the following four elements:

- Key findings: Summarise the key findings without reiterating details of the results.
- Discussion of key findings: Explain how the key findings relate to previous research or to existing knowledge, practice or policy.
- Strengths and limitations: Describe the strengths and limitations of your methods and what the reader should take into account when interpreting your results.
- Implications or recommendations: State the implications of your study or recommendations for future research (questions that remain unanswered), policy or practice. Make sure that the recommendations flow directly from your findings.

Conclusion: Provide a brief conclusion that summarises the results and their meaning or significance in relation to each objective of the study.

Acknowledgements: Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution. Authors are responsible for ensuring that anyone named in the Acknowledgments agrees to be named. Refer to the acknowledgement structure guide on our *Formatting Requirements* page.

Also provide the following, each under their own heading:

- Competing interests: This section should list specific competing interests associated with any of the authors. If authors declare that no competing interests exist, the article will include a statement to this effect: *The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.* Read our **policy on competing interests**.
- Author contributions: All authors must meet the criteria for authorship as outlined in the **authorship** policy and **author contribution** statement policies.
- Funding: Provide information on funding if relevant
- Data availability: All research articles are encouraged to have a data availability statement.
- Disclaimer: A statement that the views expressed in the submitted article are his or her own and not an official position of the institution or funder.

References: Authors should provide direct references to original research sources whenever possible. References should not be used by authors, editors, or peer reviewers to promote self-interests. Refer to the journal referencing style downloadable on our *Formatting Requirements* page.

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Manuscripts should adhere to the author guidelines of the journal. There are restrictions on word count, number of figures, or amount of supporting information.

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Ensure that formatting for headings is consistent in the manuscript. Limit manuscript sections and sub-sections to four heading levels. To avoid confusion during the review and production process, ensure that the different heading levels used in your work are visually distinct from one another. The simplest way to achieve this is to use different font sizes and/or a combination of bold/italics for different heading levels.

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Identify eight keywords that represent the content of your manuscript and are specific to your field or sub-field. Test your keywords: when you enter your keywords into the various journal and academic databases like Google Scholar, do the results include papers similar to your topic? If not, revise the terms until they do.

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Manuscripts must be written in British English, according to the Oxford English Dictionary (avoid Americanisms [e.g. use 's' and not 'z' spellings], and set your version of Microsoft Word default language to UK English). Refer to the AOSIS house style guide for more information.

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Illustrations fall into two categories:

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- Tables and/or Boxes: Text and/or numbers arranged in orderly columns and rows.

Every time a Figure, Table and/or Box is presented in your manuscript, it should be referred to three times:

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