# A COMPARATIVE STUDY OF THE ACADEMIC BEHAVIOUR IN HYPEROPIC AND MYOPIC SCHOOL CHILDREN

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**UNIVERSITY OF BENIN**

**BENIN CITY.**

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**A RESEARCH THESIS SUBMITTED TO THE DEPARTMENT OF OPTOMETRY IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF DOCTOR OF OPTOMETRY (O.D.) IN THE FACULTY OF LIFE SCIENCES, UNIVERSITY OF BENIN, BENIN CITY, NIGERIA.**

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## CERTIFICATION

## DEDICATION

This work is dedicated to God almighty who has enabled me come this far.

## ACKNOWLEDGMENT

My special thanks go to my amazing parents Mr. and Mrs Peter Ayovunefe for their invaluable support and contribution to my career, physically, spiritually and financially. I pray the good lord bless you endlessly.

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## ABSTRACT

The study was aimed at comparing the academic behaviour in myopic and hyperopic school children. One hundred and sixteen (116) school children were examined which comprised of seventy-seven (77) myopes and thirty-nine (39) hyperopes, drawn from two (2) secondary schools in Ugbowo, Benin city. The academic behaviour was categorised into reading duration, ability to see the board from the back of the classroom, ability to focus while studying, ability to study without experiencing headache, ability to study without experiencing blurry vision, ability to study without experiencing strain and academic performance in percentage (%). The result of the comparison of the academic behviour using the independent t-test showed no significant difference in the academic behaviour of myopic and hyperopic school children, except in their ability to see the board from the back. Thus, we conclude by saying that myopic and hyperopic school children exhibit similar behaviour except in their ability to see the board from the back.

# CHAPTER ONE

## 1.0 INTRODUCTION

Academic behaviour is referred to as students' attitude towards their studies. Academic behaviour can also be referred to as how students deal with their studies and how they cope or accomplish different task given to them by their teachers. Behaviour is the aggregate of the responses or reactions or movements made by someone in any situation. Therefore, study behaviour has been shown to be a good predictor of academic performance (Owolabi, 1996, Salami, 2004, Whilhite, 1990). When students are proficient in how to study effectively, how to take notes at all lectures, how to prepare for and how to take examination, it is very likely that they will perform well in their academic work.

Far-sightedness, also known as long-sightedness, hypermetropia, or hyperopia, is a condition of the eye where distant objects are seen clearly but near objects appear blurred. This blurred effect is due to incoming light being focused behind, instead of on, the retina wall due to insufficient accommodation by the lens. Minor hypermetropia in young patients is usually corrected by their accommodation, without any defects in vision. But, due to this accommodative effort for distant vision, people may complain of eye strain during prolonged reading. Some hypermetropes can see clear at distance, but near vision may be blurred due to insufficient accommodation. For this reason, this defect is referred as far-sightedness. If the hypermetropia is high, there will be defective vision for both distance and near. People may also experience accommodative dysfunction, binocular dysfunction, amblyopia, and strabismus. Newborns are almost invariably hypermetropic, but it gradually decreases as the newborn gets older (Wikipedia). In hyperopia, parallel light rays coming from the infinity are focused behind the neurosensory retina, after

refraction through the ocular media, when accommodation is at rest. The spontaneous accommodative effort of the human eye, by increasing the anterior curvature and converging power of the crystalline lens, usually tries to overcome this situation. So, accommodative rest is mandatory to elicit total hyperopia, specifically in young individuals. (Victor *et al.,* 2015)

Myopia, also called near or shortsightedness, refers to the refractive state of the eye whereby the images of distant objects are focused in front of the retina when the accommodation system is relaxed. Increased eye length, particularly vitreous chamber elongation, is the main correlate of human myopia. Uncorrected myopia prevents the individual from seeing distant objects clearly. However, myopia is still a significant public health problem, not only because of its high prevalence, but also because it is a high-risk factor of vision-threatening conditions (e.g retinal detachment and glaucoma) due to the changes produced in the posterior part of the eye caused by the increase in axial length. In addition, myopia may restrict the individual's vocational options. Myopia typically develops during the school years, progressing until adulthood. (Fuensanta, 2010). Although genetics can contribute to myopia development, environmental and lifestyle factors are more likely to be to blame for the condition's sharp rise in prevalence (Holden *et al.*, 2016). Certain races and societies with a higher level of technological development are more prone to this refractive error.

In myopia, distant objects appear blurry while close objects appear normal. Other symptoms may include headaches and eye strain. The underlying mechanism involves the length of the eyeball growing too long or less commonly the lens being too strong. Diagnosis is by eye examination. Tentative evidence indicates that the risk of near-sightedness can be decreased by having young children spend more time outside. This decrease in risk may be related to natural light exposure.

Near-sightedness can be corrected with eyeglasses, contact lenses, or a refractive surgery. Eyeglasses are the easiest and safest method of correction. Contact lenses can provide a wider field of vision, but are associated with a risk of infection. Refractive surgery permanently changes the shape of the cornea. Near-sightedness is the most common eye problem and is estimated to affect 1.5 billion people (22% of the world population). Rates vary significantly in different areas of the world. Rates among adults are between 15% to 49%. Among children, it affects 1% of rural Nepalese, 4% of South Africans, 12% of people in the US, and 37% in some large Chinese cities. In China the proportion of girls is slightly higher than boys. Rates have increased since the 1950s. Uncorrected near-sightedness is one of the most common causes of vision impairment globally along with cataracts, macular degeneration, and vitamin A deficiency. (Wikipedia, 2022.)

According to the Collins dictionary, school children are children who attends either a primary or a secondary school.

## 1.1 BACKGROUND INFORMATION

Uncorrected refractive errors continue to remain a public health problem among different population groups. Among school children, it has a considerable impact on learning and academic behavior. School children are usually affected by refractive errors with the most commonly occuring ones being hyperopia and myopia. Their response to their refractive errors are usually not the same which can be evidently seen in the attitude they give off academically.

The number of people globally with refractive errors that have not been corrected was estimated at 660 million (10 per 100 people) in 2013. Refractive errors are the first common cause of visual Impairment and second most common cause of visual loss.

The number of people globally with significant refractive errors has been estimated at one to two billion. Rates vary between regions of the world with about 25% of Europeans and 80% of Asians affected. Near-sightedness is one of the most prevalent disorders of the eye. Rates among adults are between 15-49% while rates among children are between 1.2-42%. Far-sightedness more commonly affects young children, whose eyes have yet to grow to their full length, and the elderly, who have lost the ability to compensate with their accommodation system. Presbyopia affects most people over the age of 35, and nearly 100% of people by the ages of 55-65. Uncorrected refractive error is responsible for visual impairment and disability for many people worldwide. It is one of the most common causes of vision loss along with cataracts, macular degeneration, and vitamin A deficiency. (Wikipedia, 2022.)

### 1.1.1 MYOPIA

Myopia is a refractive error that makes far-away objects look blurry. It happens when the shape of the eye makes light focus in front of the retina (a light sensitive layer of tissue in the back of your eye), instead of on it.

Causes of myopia:

Nearsightedness happens when the eyeball grows too long from front to back, or when there are problems with the shape of the cornea (clear front layer of the eye) or lens (an inner part of the eye that helps the eye focus).

These problems make light focus in front of the retina instead of on it, and that makes far-away objects look blurry.

**Symptoms of myopia:**

- Distant objects are blurred.
- Headaches
- Squinting
- Eye strain
- Eye fatigue when you try to see objects more than a few feet away
- with myopia often have trouble reading the blackboard at school.

**Diagnosis of myopia:**

Myopia is diagnosed by a basic eye exam called the Visual acquity test. A visual acuity test checks how sharp a person's vision is at a distance. One eye is covered, and the patient is asked to read an eye chart with different sized letters or symbols. Then the same for the other eye. Special charts are designed for very young children.

**Treatment of myopia:**

The standard goal of treating myopia is to improve vision by helping focus light on the retina through the use of corrective lenses or refractive surgery. Managing myopia also includes regular monitoring for complications of the condition, including glaucoma, cataracts and retinal detachment.

**Prescription lenses**

Wearing corrective lenses treats myopia by counteracting the increased curve of the cornea or the increased length of the eye. Types of prescription lenses include:

- Eyeglasses: This is a simple, safe way to sharpen vision caused by myopia. Eyeglass lenses also can be designed to correct a combination of refractive errors, such as myopia, astigmatism and presbyopia.
- Contact lenses: Contact lenses are small, plastic disks placed directly on the cornea. A single contact lens may correct more than one refractive error. There are a variety of materials and care requirements. The eye care specialist usually recommends contact lenses that are most suitable for your prescription and lifestyle.

**Refractive surgery**

Refractive surgery reduces the need for eyeglasses and contact lenses. The eye surgeon uses a laser to reshape the cornea, which results in a decreased need for myopia prescription lenses. Even after surgery, the patient may need to use eyeglasses some of the time.

- **Laser-assisted in situ keratomileusis (LASIK)**: With this procedure, the eye surgeon makes a thin, hinged flap into the cornea. He or she then uses a laser to remove corneal tissue to flatten its domed shape. Recovery from LASIK surgery is usually more rapid and causes less discomfort than other corneal surgeries.
- **Laser-assisted subepithelial keratectomy (LASEK)**: The surgeon creates an ultrathin flap only in the cornea's outer protective cover (epithelium). He or she then uses a laser to reshape the cornea, flattening its curve, and then replaces the epithelium.

- **Photorefractive keratectomy (PRK)**: This procedure is similar to LASEK, except the surgeon completely removes the epithelium, then uses the laser to reshape the cornea. A temporary, protective contact lens covers the cornea until the epithelium grows back naturally, conforming to the cornea's new shape.

Small incision lenticule extraction (SMILE): In this procedure, there is no flap or removal of the epithelium. Instead, a laser is used to cut a small disk-shaped piece of the cornea (lenticule), which is then removed through a small corneal incision.

Surgical treatments are not an option for everyone with nearsightedness. Surgery is recommended only when nearsightedness is no longer progressing. Your surgeon will explain the benefits and risks of surgical treatment options.

### 1.1.2 HYPEROPIA

Hyperopia is a refractive error that makes nearby objects look blurry. It happens when the shape of the eye makes light focus behind the retina (a light sensitive layer of tissue at the back of your eye), instead of on it.

Children who have mild to moderate farsightedness can see both close and far away without glasses because the muscles and lenses in their eyes can squint very well and overcome the farsightedness.

**Causes of hyperopia:**

Hyperopia happens when the eyeball grows too short from front to back, or when there are problems with the shape of the cornea (clear front layer of the eye) or lens (an inner part of the eye that helps the eye focus).

These problems make light focus behind the retina, instead of on it — and that makes nearby objects look blurry.

Most people who are farsighted are born with it, but it may not cause vision problems until they get older. A person is more likely to be hyperopic if other members of his/her family are farsighted too.

Symptoms of hyperopia:

- Trouble seeing things up close
- Eye strain (when the eyes feel tired or sore)
- Headaches — especially when reading
- Blurry vision
- Eye fatique

**Diagnosis of hyperopia:**

All it takes to diagnose farsightedness is a basic eye exam. The doctor will have the patient read the visual acquity chart across the room. The examiner then utilize a retinoscope or an automated refractor-objective refraction; or trial lenses in a trial frame or a phoropter to obtain a subjective examination. Ancillary tests for abnormal structures and physiology can be made using the slit lamp test, which examines the cornea, conjunctiva, anterior chamber, and iris.

severe cases of hyperopia from birth, the brain has difficulty in merging the images that each individual eye sees. This is because the images the brain receives from each eye are always blurred. A child with severe hyperopia can never see objects in detail. If the brain never learns to see objects in detail, then there is a high chance of one eye becoming dominant. The result is that the brain will block the impulses of the non-dominant eye.

**Classification:**

Hyperopia is typically classified according to clinical appearance, its severity, or how it relates to the eye's accommodative status.

**Clinical classification:**

There are three clinical categories of hyperopia;

- Simple hyperopia: Occurs naturally due to biological diversity.
- Pathological hyperopia: Caused by disease, trauma, or abnormal development.
- Functional hyperopia: Caused by paralysis that interferes eye's ability to accommodate.

**Classification according to severity:**

There are also three categories severity

- Low: Refractive error less than or equal to +2.00 diopters (D).
- Moderate: Refractive error greater than +2.00 D up to +5.00 D.
- High: Refractive error greater than +5.00 D.

**Classification according to accommodative status:**

- **Total hypermetropia**: It is the total amount of hyperopia which is obtained after complete relaxation of accommodation using cycloplegics like atropine.
- **Latent hyperopia**: It is the amount of hyperopia normally corrected by ciliary tone (approximately 1 diopter).
- **Manifest hyperopia**: It is the amount of hyperopia not corrected by ciliary tone. Manifest hyperopia is further classified into two, facultative and absolute.
- **Facultative hyperopia**: It is the part of hyperopia corrected by patient's accommodation.

- **Absolute hyperopia**: It is the residual part of hyperopia which causes blurring of vision for distance.

So, Total hyperopia= latent hyperopia + manifest hyperopia (facultative + absolute)

**Treatment of hyperopia:**

**Corrective lenses:**

The simplest form of treatment for hyperopia is the use of corrective lenses, i.e. eyeglasses or contact lenses. Eyeglasses used to correct hyperopia have convex lenses.

**Surgery:**

There are also surgical treatments for far-sightedness.

**Laser procedures:**

- Photorefractive keratectomy (PRK): This is a refractive technique that is done by removal of a minimal amount of the corneal surface. Hyperopic PRK has many complications like regression effect, astigmatism due to epithelial healing, and corneal haze. Post operative epithelial healing time is also more for PRK.
- Laser assisted in situ keratomileusis (LASIK): Laser eye surgery to reshape the cornea, so that glasses or contact lenses are no longer needed. Excimer laser LASIK can correct hypermetropia up to +6 diopters. LASIK is contraindicated in patients with lupus and rheumatoid arthritis.
- Laser epithelial keratomileusis (LASEK): Resembles PRK, but uses alcohol to loosen the corneal surface.

- Epi-LASIK: Epi-LASIK is also used to correct hyperopia. In this procedure, use of epikeratome eliminates the use of alcohol.
- Laser thermal keratoplasty (LTK): Laser thermal keratoplasty is a laser based non-destructive refractive procedure used to correct hyperopia and presbyopia. It uses Thallium-Holmium-Chromium (THC): YAG laser.

**IOL implantation:**

- Aphakia correction: High degree hypermetropia due to absence of lens (aphakia) is best corrected using intraocular lens implantation. [citation needed]
- Refractive lens exchange (RLE): A variation of cataract surgery where the natural crystalline lens is replaced with an artificial intraocular lens; the difference is the existence of abnormal ocular anatomy which causes a high refractive error.
- Phakic IOL: Phakic intraocular lens are lenses that implanted inside eye without removing the normal crystalline lens. Phakic IOLs can be used to correct hypermetropia up to +20 diopters.

**Non laser procedures:**

- Conductive keratoplasty (CK): Conductive keratoplasty is a non-laser refractive procedure used to correct presbyopia and low hypermetropia (+0.75D to +3.25D) with or without astigmatism (up to 0.75D). It uses radiofrequency energy to heat and shrink corneal collagen tissue. CK is contraindicated in pregnant/breastfeeding women, central corneal dystrophies and scarring, history of herpetic keratitis, type 1 diabetes etc.
- Automated lamellar keratoplasty (ALK): Hyperopic automated lamellar keratoplasty (H-ALK) and Homoplastic ALK are ALK procedures that corrects low to moderate

hyperopia. Poor predictability and the risk of complications limits usefulness of these procedures.

- Keratophakia and epi-keratophakia are another two non laser surgical procedures used to correct hypermetropia. Keratophakia is a surgical technique developed by Barraquer for treating high hypermetropia and aphakia. Poor predictability and induced irregular astigmatism are complications of these procedures

### 1.1.3 ACADEMIC BEHAVIOR

Academic behaviors are the most proximal cognitive and non-cognitive factors related to student performance. Academic behaviors directly influence grades because grades often measure products of academic behaviors and they are malleable. Academic behaviors such as study habits and active classroom participation directly and indirectly affect overall academic performance.

Students with behavioural problems such as psychological distress, social problem, emotional, vocational, academic/intellectual behavioural problem are less likely to complete their academic task (Barday, 2004).

**Types of academic behaviour**

There are two major groups, the positive and the negative academic behaviour. The positive academic behaviour include: students' interest in studies, reading relevant books, doing assignment, attending extra lessons, punctuality to school, paying attention in class, avoiding bad company, etc.

Factors that encourage positive academic behaviour are:

- Parental Attention: Payment of school fees, buying of books, positive interest in students academics
- Peer Influence: Academic support from peers indeed indirectly contribute to students' academics through influencing their academic behaviour, the strengthening of peer socialization is the drive for acceptance that encourages students to initiate their peers and join groups, students want to belong somewhere. Evidence suggests that it is peers not parents who have the greatest influence on school age students (Harris, 1998). If the peers of student is to improve the achievement of such students, then academic success must be attain.
- Learning Environment: is the place and setting where learning occurs, it is not limited to a physical classroom alone, it also includes the characteristics of the setting.
- Availability of Study Aids: Study aids help someone to get a firm grasp on certain concepts or to sure up any gaps in knowledge.

While the negative academic behaviour include; Truancy, lack of interest, negative peer influence, low self-efficacy, academic/intellectual behaviour problem, social problem, emotional problem, etc.

Factors that causes negative academic behaviour. Some factors that affect students academic performance negatively are as follows:

- Lack of Maturity and Discipline: Some students are just not disciplined and lack good organisational skills. They often fall under the pressure of their peers rather than using good discretion, when they really should be attending to their studies.

- Lack of Passion: Successful students work out of passion, they love what they want to do and recognise the importance of the benefit it will to others as well as themselves. Without passion, study becomes a chore and not a method for achieving clearly defined goals.
- No Vision: Some students do not have a clearly articulated picture of the future they intend to create for themselves. Thus, they may take programmes of study without a clear career goal or objective. In essence, they choose the wrong major.
- Lack of Personal/Work/School/Family Balance: Whatever is going on in a student's personal life will inevitably affect what is going on in school and whatever is happening in school will affect what is going on in their personal life. A student needs time to be in class and appropriate time for study. However, there must be time for family, friends, social activities and time to just be alone. The key is keeping proper balance.

**Academic Performance**

Academic performance is referred to as students' level of academic achievement, success is measured by academic performance or how well as students meets the standards set out by the institution. As career competition grows ever fiercer in the working world, the importance of students doing well in school will aught the attention of parents.

Although education is not the only road to success in the working world, much effort is made to identify, evaluate and encourage the progress of students in schools. Parents care about their child's academic performance because they believe good academic results will provide more career choices and jobs security. School, though invested in fostering good academic habits for the same reason are also often influenced by concerns about the school reputation and the

possibility of monetary aid from institution which can hinges on the overall academic performance of the school. State and federal department of education are charged with improving school and so device methods of measuring success in order to create plans for improvement. Study behaviour has been shown to be a good predictor of academic performance (Owolabi, 1996, Salami, 2004 Wilhite, 1990).

Academic performance is measured by the students performance in examinations and continuous assessment.

**Factor that affect academic performance**

These are: parental factors, peers influence, learning environment, personality factors, availability of study AIDS, etc.

The relationship between academic behaviour and academic performance.

Understanding the relationship between academic behaviour and academic performance is not only of theoretical importance but may also have implications for devising counselling interventions directed at the affect of academic behaviour on students learning outcomes. Although clear links between academic behaviour and academic performance are yet to be established. Much is not known about the psychological determinant of academic performance (Barackney and Karabenik, 2005). Most previous researcher found non-significant relationship between psychological distress and academic performance. Despite the effort of persons concern with education, the problems still persist of much concern in this study in the relationship between academic behaviour and academic performance among secondary school student which had be established non-systematicaly investigated in Nigeria. (Asonibaru and Oloyone 1997, Okwilagwe, 2001).

What influences this two variables is engagement in school (academic work) and perceived academic competence on student achievement. Academic behaviour is the study attitude toward academic work while academic performance is the level of success measured by student performance in examinations and continuous assessment.

## 1.2 STATEMENT OF PROBLEM

Hyperopic and myopic school children differ in their specific visual needs. This study is set to find out those peculiar differences as it relates to academic behavior.

## 1.3 AIM AND OBJECTIVES OF STUDY

The study is aimed at investigating the differences in academic behavior between hyperopic and myopic school children.

The objectives of the study are;

1. To investigate the distribution of hyperopia in school children
2. To investigate the distribution of myopia in school children
3. To compare the distribution of myopia and hyperopia in school children
4. To compare the academic behavior between myopic and hyperopic school children

## 1.4 HYPOTHESIS

These hypotheses were drawn from the research statement of problem above;

Null hypotheses (Ho): There is no significant difference in academic behavior of hyperopic and myopic school children.

## 1.5 SIGNIFICANCE OF STUDY

- It would give us an idea of the distribution of hyperopia in school children.
- It would give us an idea of the distribution of myopia in school children.
- It would give us an idea of the difference in distribution of myopia and hyperopia in school children.
- It would help us compare the academic behavior in myopic and hyperopic school children.
- It would help us better understand the visual peculiarities of hyperopic and myopic school children and then meet their needs in ways that will suit them best.

## 1.6 DEFINITION OF TERMS

**Academic behavior:** Academic behaviour is referred to as students' attitude towards their studies. Academic behaviour can also be referred to how students deal with their studies and how they cope or accomplish different task given to them by their teachers.

**Hyperopia:** Hyperopia, also known as long-sightedness or hypermetropia, is a condition of the eye where distant objects are seen clearly but near objects appear blurred

**Myopia:** Myopia, also known as short-sightedness, is an eye disease where light focuses in front of, instead of on, the retina. As a result, distant objects appear blurry while close objects appear normal.

# CHAPTER TWO

## 2.0 LITERATURE REVIEW

Herbert *et al.,* (1988) reported a meta-analysis of studies of the relation of vision anomalies to reading skill. Meta-analysis is a quantitative technique for combining the results of multiple studies that reduces the subjectivity of literature reviews. The results of the analysis of 34 studies of vision anomalies and reading skill that met the criteria for inclusion in the meta-analysis showed that hyperopia, exophoria at near, vertical phoria, anisometropia, and aniseikonia are associated with below average reading performance. Myopia and esophoria and esophoria at far are associated with average and above average reading performance. Reduced visual acuity, astigmatism, esophoria at near, fusional convergence and divergence, strabismus, nearpoint of convergence, and stereopsis were not found to be associated with reading performance.

Yahan *et al.,* (2021) carried out a study on a total of 32,360 school children with or without myopia. Cross-sectional cohort analyses showed that the prevalence of hyperopia was with lower academic scores, whereas the prevalence of myopia was associated with higher academic scores. Longitudinal analysis showed that in Shenzhen, faster myopia development was associated with better scores in all grades.

Ajai *et al.,* (2015) published a study in Singapore evaluated the relationship between myopia and high intelligence in a group of 1204 Chinese school children aged between 10 and 12 years. Intelligence was assessed using the nonverbal Raven Standard Progressive Matrix test and factors controlled included the participant's age and gender, parental myopia, father's level of education, and books read per week. This study produced similarly cogent results, with the prevalence of myopia amongst those students in the highest quartile for IQ found to be 67.9%,

some 30 percentage points higher than the prevalence of myopia amongst those students in the lowest IQ quartile. Remarkably, the results of this study also showed that a statistically significant result was obtained for the odds-ratio of a child with higher intelligence also having myopia. This ratio was 2.4 (with a 95% confidence interval of 1.7–3.4). Such a result highlights that those participants with higher intelligence are between roughly two to three times more likely to have a myopic defect, compounding the notion of a correlation between these two characteristics. These results were replicated in a similar study of 994 Chinese schoolchildren undertaken by the same authors in 2007.

Sumithira *et al.,* (2015) conducted a study to investigate the impact of simulated hyperopia and sustained near work on children's ability to perform a range of academic-related tasks and found out that relatively low level of simulated bilateral hyperopia impaired children's performance on a range of academic-related outcome measures, with sustained near work further exacerbating this effect.

Williams *et al.,* (2005) conducted a study on the relationship between hyperopia and education test results in a cohort of school children. A total of 1298 children, aged 8 years, were screened for hyperopia. School test results were compared between groups categorised by refractive error.The results of this study provide further evidence for a link between hyperopia and impaired literacy standards in children.

Seang-Mei *et al.,* (2007) in his study on the association between school performance and myopia in Singapore children, found out that School grades, a possible indicator of either cumulative

engagement in near work activity or intelligence, were positively associated with myopia in Singapore children.

Myopia can hinder a child's academic achievement if it is left untreated (Maples, 2003). According to a recent prediction, the prevalence of visual impairment among preschoolers would rise by 26% by the year 2060, with uncorrected refractive error accounting for 69% of cases (Varma *et al*., 2017)

Previous research have shown a connection between near-work activities including studying, reading, and screen use among kids and myopia, (Saw *et al.*, 2002)

Amanda *et al.*, (2009) carried out a study to determine whether children with hyperopic refractive errors, both corrected and uncorrected, follow different patterns of everyday activity to children without any significant refractive error. Twelve (12) years old children attending randomly-selected high schools across Sydney were used. All children had a comprehensive eye examination; including cycloplegic auto-refraction (cyclopentolate 1%, Canon RK-F1). A questionnaire, completed by parents and children, provided information on daily activities, both on school days and weekends and non-school periods. Clinically significant hyperopia was present in 55 children (2.41%), and of these 33.9% (n=19) wore glasses. The mean SE (SD) of children with hyperopia who wore glasses was significantly greater than among children with hyperopia who did not wear glasses (+3.44 ±1.45 vs +2.79 ± 0.98 respectively; p=<.0001). Children with hyperopia who did not wear glasses, spent significantly less time engaging in close work (mean 19.3 hrs per week) than children with no refractive error (mean 23.6 hrs, p=0.0117), and also read significantly fewer books per week (mean 1.7) than the emmetropic group (mean 2.9, p=0.0010). Children with hyperopia who wore glasses did not significantly differ from

those with no refractive error for either of these activities (near work, p=0.7591; books read, p= 0.7985) or in a range of other indoor and outdoor activities including playing outdoor sport (p=0.1468) or watching TV and using computers (p=0.5861).

Donald *et al*., ( 2002) carried out a study to quantify the degree of association between juvenile myopia and parental myopia, near work, and school achievement. Refractive error, parental refractive status, current level of near activities (assumed working distance-weighted hours per week spent studying, reading for pleasure, watching television, playing video games or working on the computer), hours per week spent playing sports, and level of school achievement (scores on the Iowa Tests of Basic Skills [ITBS]) were assessed in 366 eighth grade children who participated in the Orinda Longitudinal Study of Myopia. The results showed that children with myopia were more likely to spend significantly more time studying, more time reading, and less time playing sports; and to score higher on the ITBS Reading and Total Language subtests than emmetropic and hyperopic children.

Rosner and Belkin (1987) conducted a nationwide study of the relationship among refractive error, intelligence scores, and years of schooling in 157 748 males aged 17 to 19 years. They found a strong association of myopia with both intelligence and years of school attendance. The prevalence of myopia was found to be significantly higher in the more intelligent and more educated groups. By fitting models of logistic regressions, they worked out a formula expressing the relationship among the rate of myopia, years of schooling, and intelligence level. They found that years of schooling and intelligence weigh equally in the relationship with myopia.

Sheila *et al.*, (1988) carried out a study on children from a population sample whose cycloplegic refractive errors included myopia, pre-myopia and hypermetropia and they'll were compared on measures of IQ and reading with a group of children without significance refractive errors. At age 11 both those with myopia and with pre-myopia had increased verbal and performance IQ, while those with hypermetropia had slightly reduced verbal and performance IQ, in comparison with the children without refractive errors.

Czepita *et al.*, (2008) did a literature review to find out if children with myopia were more intelligent, they decided to present and discuss the latest results of the clinical studies on that subject. it was reported that myopic children regardless of their IQ gain better school achievements. It was also observed that school children with hyperopia have a lower IQ and gain worse school achievements.

Mavi *et al*., (2022) conducted a study on the impact of hyperopia on academic performance among children. The study was to to assess the impact of uncorrected hyperopia and hyperopic spectacle correction on children's academic performance. Evidence indicates that uncorrected hyperopia is associated with poor academic performance. Given the limitations of current methodologies, further research is needed to evaluate the impact on academic performance of providing hyperopic correction.

Narayanasamy *et al*., (2015) conducted a study to investigate the impact of simulated hyperopia and sustained near work on children’s ability to perform a range of academic-related tasks. Fifteen visually normal children (mean [±SD] age, 10.9 [±0.8] years; 10 male and 5 female) were recruited. Performance on a range of standardized academic-related outcome measures was assessed with and without 2.50 diopters of simulated bilateral hyperopia (administered in a

randomized order), before and after 20 minutes of sustained near work, at two separate testing sessions. Academic-related measures included a standardized reading test (the Neale Analysis of Reading Ability), visual information processing tests (the Coding and Symbol Search subtests from the Wechsler Intelligence Scale for Children), and a reading-related eye movement test (the Developmental Eye Movement test). Simulated bilateral hyperopia and sustained near work each independently impaired reading, visual information processing, and reading-related eye movement performance ($p < 0.001$). A significant interaction was also demonstrated between these factors ($p < 0.05$), with the greatest decrement in performance observed when simulated hyperopia was combined with sustained near work. This combination resulted in performance reductions of between 5 and 24% across the range of academic-related measures. A significant moderate correlation was also found between the change in horizontal near heterophoria and the change in several of the academic-related outcome measures, after the addition of simulated hyperopia.

Efrain *et al*., (2019) conducted a study to investigate the association between the refractive errors in children and their academic performance on standardized English Language and Arts test. Students from fifth, eight, nine and tenth grade (n=1053) from Pomona Unified School District California USA were screened for refractive errors using auto-refractor during the years of 2010-2013. Their official scores for English Language Arts test were provided by the school district superintendent. The student population was grouped according to their mean spherical equivalent (SphEq) refractive errors as follows: not clinically significant refractive error $\leq \pm 1.00$D, hyperopia, SphEq value $\geq +1.0$ diopters (D) or greater; myopia, SphEq value of $\geq -1.0$ D or less; and astigmatism, cylinder of $\geq 1.0$ D. Comparing the groups of refractive error, we find that the

academic performance by students with hyperopia tends to be poorer than the students with myopia. Hyperopic groups have 38% of students above basic level whereas the myopic group has 62% of students above basic levels. Hyperopic groups have 26% of students below basic level whereas the myopic group has 16% of students below basic levels.

Fulk *et al*., (2001) conducted a study that consider considers how school performance, as evaluated by the teacher, is related to refractive error. 276 students (aged 4–15 yrs) at two rural elementary schools were given a vision screening that included automated refraction without cycloplegia. Based on teacher evaluations, the school performance of each student was categorized as upper 25%, middle 50%, or lower 25%. Chi square was used to compare the percentages of hyperopes, myopes, and emmetropes in each school performance category. 34% percent of the 32 hyperopes fell into the lowest level of school performance, compared to 14% of the 202 emmetropes and 12% of the 32 myopes. The probability that the observed inequality of the proportions being due to chance was very small ($P = 0.015$). The authors conclude that hyperopes are more likely to perform poorly in school than myopes or emmetropes.

Grosvenor (1970), conducted an experiment with 707 intermediate school European and Maori children, and found out that myopes had higher mean scores than hypermetropes on both the Otis Self-Administered Test and the Raven Progressive Matrices test. Myopes also occurred in significantly greater numbers in high ability than in low ability classrooms. Results are discussed in terms of 4 hypotheses, previously suggested by M. J. Hirsch in his experiment with 554 school children given the fact that (a) myopia is an overdevelopment of the eye just as hypermetropia is an underdevelopment; (b) intelligence test scores may be influenced by the amount of reading a child does; (c) the more intelligent child may read more and thus become more myopic; and (d)

in taking the test, a premium is placed upon the ability to perceive fine detail efficiently, thus giving the myope an advantage.

Young et al., (1970) conducted a study on the relationship between refractive errors and various measures of reading and school achievement on two hundred and four (204) third (3rd) - sixth (6th) grade Eskimo students at Barrow, Alaska. Comparisons were made with the Caucasian population of school children at Pullman, Washington, using the Betts II Level Reading Test and the California Achievement Test as measures. Results show the same relationships in both groups between reading performance, achievement test performance, and refractive error. The more myopic Ss tended to score higher on reading and achievement tests.

Yahan *et al*., (2021) carried out a study to assess associations of high academic performance with ametropia prevalence and myopia development in Chinese school children. The observational study was performed in Guangdong, China. They first performed a cross-sectional cohort analysis of students in grades 1 to 9 from Yangjiang to evaluate the relationship between academic performance and refractive status on a yearly basis. They also performed longitudinal analyses of students in Shenzhen to evaluate the trend of academic performance with refractive changes over a period of 33 months. All refractive statuses were measured using noncycloplegic autorefractors. A total of 32,360 children with or without myopia were recruited in this study (mean age 10.08 years, 18,360 males and 14,000 females). Cross-sectional cohort analyses in Yangjiang showed that the prevalence of hyperopia was associated with lower academic scores in grade one, the year students entered primary school ($\beta=-0.04$, $P=0.01$), whereas the prevalence of myopia was associated with higher academic scores in grade six and grade eight,

the years in which students were about to take entrance examinations for junior high school or senior high school.

# CHAPTER THREE

# MATERIALS AND METHODS

## 3.0 METHOD

## 3.1 RESEARCH DESIGN

This is a descriptive cross-sectional study designed to compare the academic behaviour in hyperopic and myopic school children.

## 3.2 STUDY POPULATION

The research was carried out on one hundred and sixteen (116) school children attending selected secondary schools in Ugbowo, between the age of nine(9) and eighteen (18).

The inclusion criteria for the research are as follows;

- School children currently in secondary schools within the ages of nine(9) to eighteen (18) years.
- School children that will be able to cooperate with the procedures.
- Children without any ocular pathology.

## 3.3 MATERIALS

1. Trial lenses

2. Trial lens frame

3. Distance visual acuity chart

4. Retinoscope

5. Batteries

6. Penlight

### 3.4 DESCRIPTION OF PROCEDURE

Ethical clearance was obtained from the Department of Optometry and consent was obtained from the participant's parents or guardian, the following tests were performed;

- The visual acuity measurement was taken using the Snellen's visual acuity chart for distance acuities. The distance visual acuity was measured separately for each eye and then with both eyes together. Children not able to see the 3/60 optotype were checked for hand movement and perception of light.
- Retinoscopy was done to objectively measure the patient's refractive status using the keeler retinoscope, the trial lens frame and the trial lenses in the trial lens box
- External examination of the anterior segment was done using a penlight.
- Information about the child's academic behavior was gotten with the aid of a questionnaire.

### 3.5 STATISTICAL PACKAGE USED

The data obtained from the study was analyzed using Statistical Package for Social Sciences (SPSS) version 22.0.

## 3.6 LIMITATIONS OF STUDY

Some of the limitations experienced in this study are as follows;

- Some of the school children couldn't get their consent form signed by their parents and they were excluded for this study.

# CHAPTER FOUR

## 4.0 RESULTS

This research was carried out on one hundred and sixteen (116) school children. Data was collected from the school children on their academic behaviour and refractive state of each eye.

The refractive state of each eye was compared with different academic behaviours exhibited by each of the school child.

The data obtained is presented in a tabular form, containing frequency distribtion and comparison between the various refractive status.

A bar chart is also used to analyse the data obtained.

Data obtained are represented below;

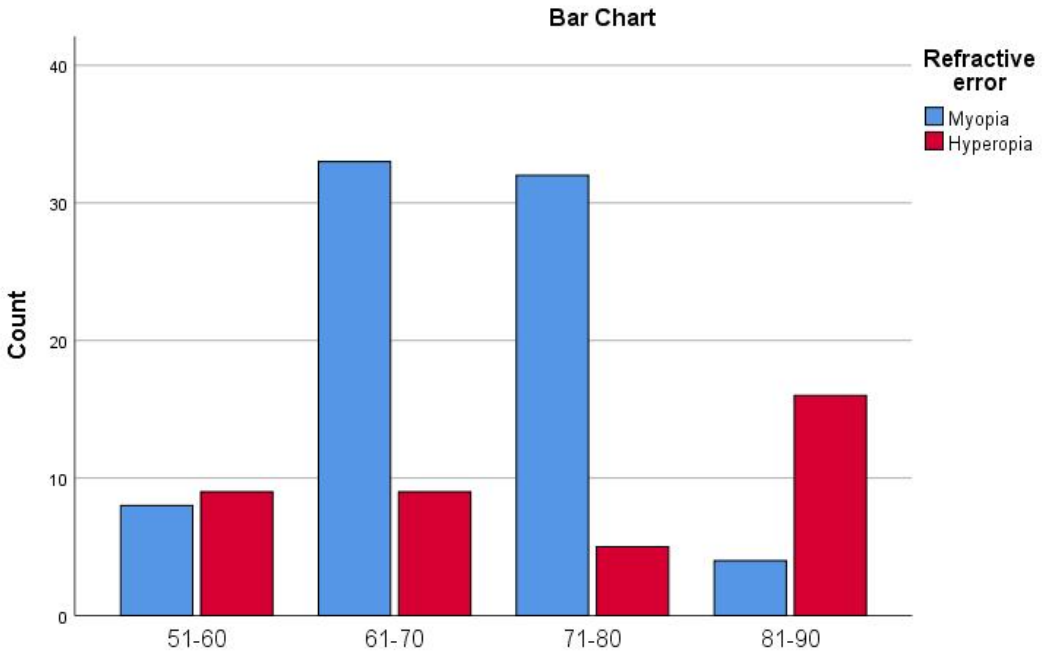


Figure 4.1: A bar chart comparing academic average (%) in myopic and hyperopic school children.

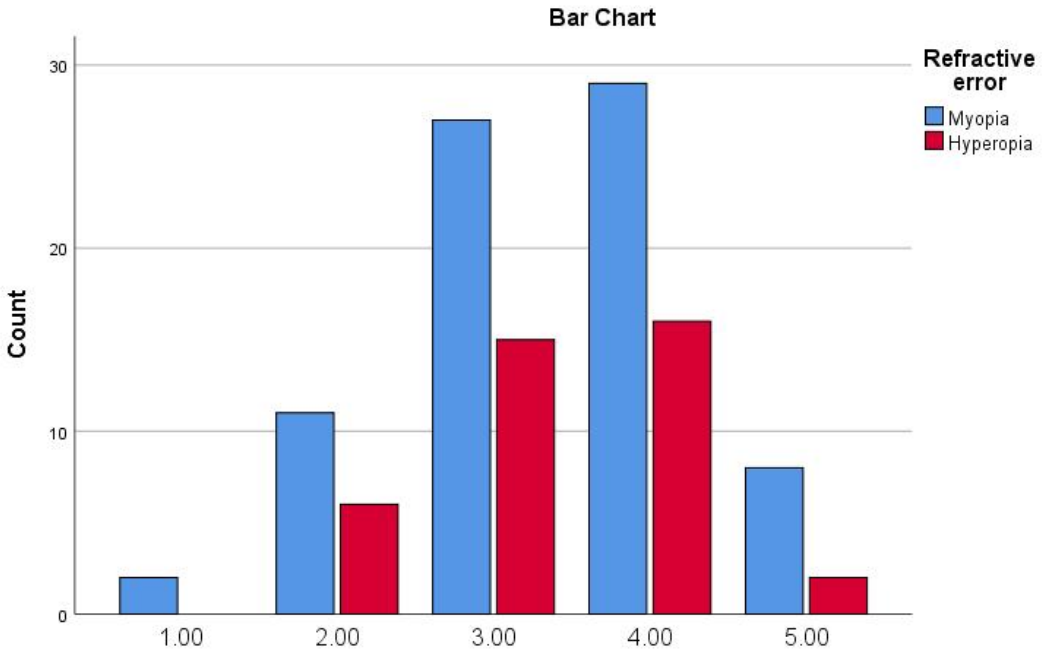


Figure 4.2: A bar chart comparing child's ability to study without blurry vision in myopic and hyperopic school children.

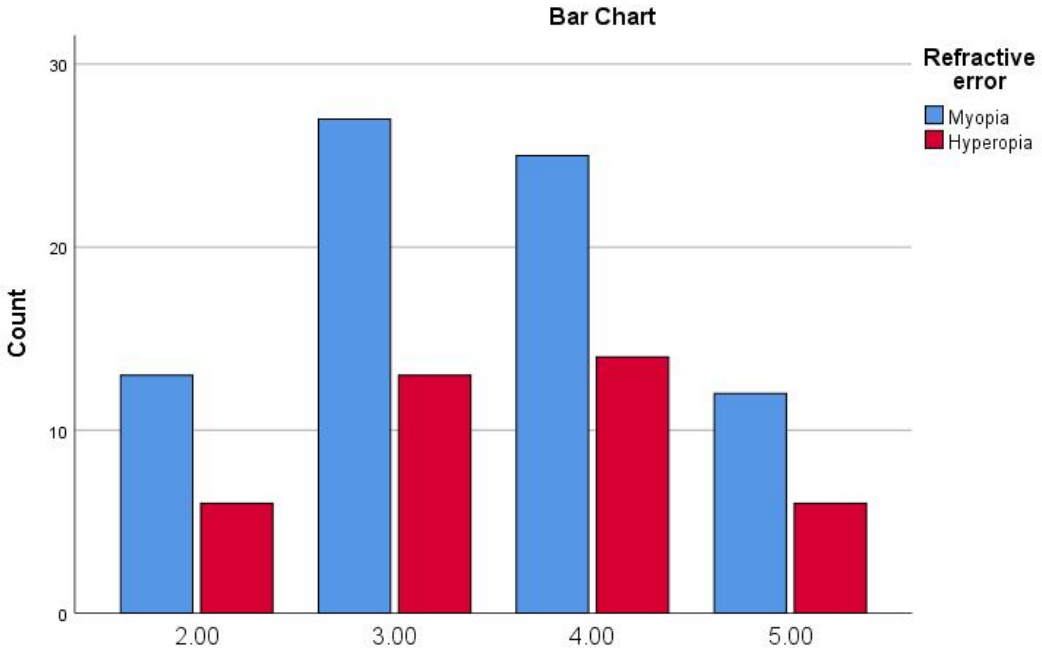


Figure 4.3: A bar chart comparing child's ability to study without headache in myopic and hyperopic school children.

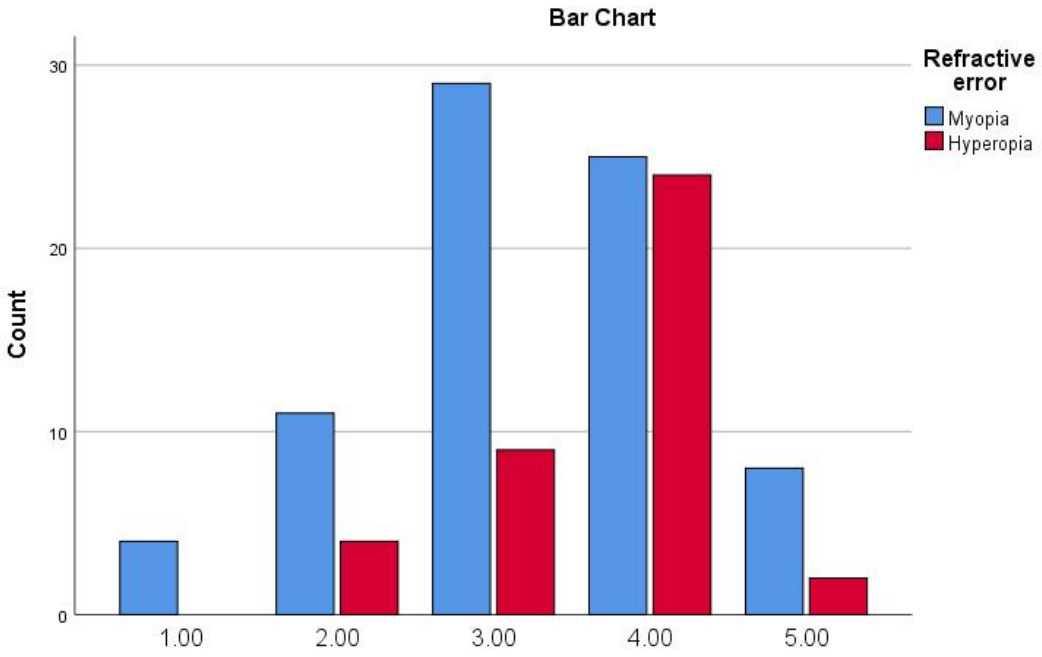


Figure 4.4: A bar chart comparing child's ability to focus while studying in myopic and hyperopic school children.

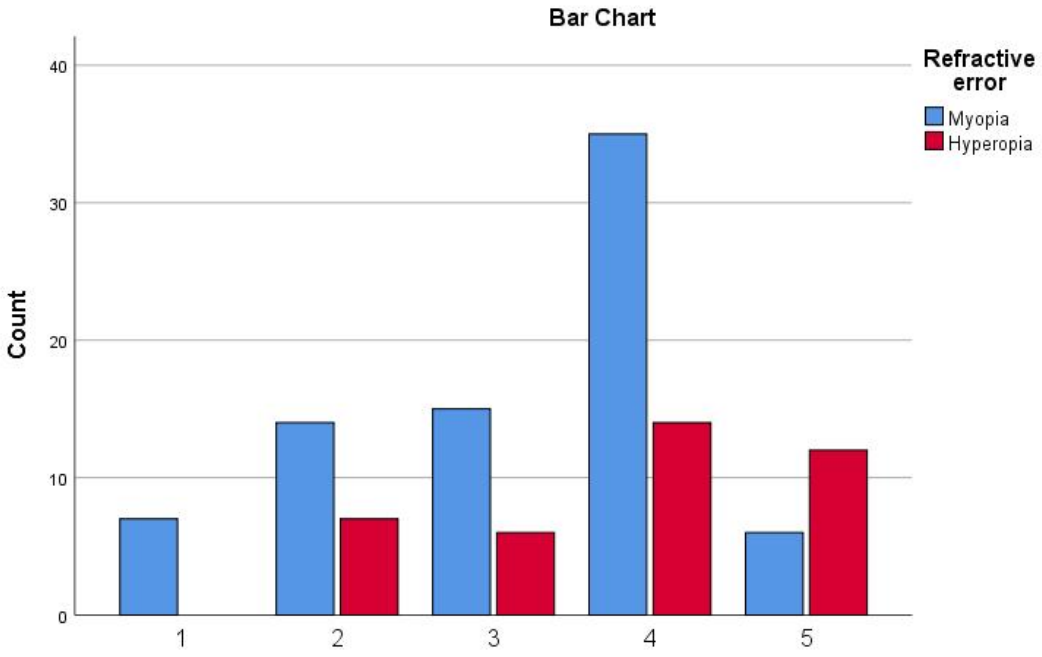


Figure 4.5: A bar chart comparing child's ability to see the board from the back in myopic and hyperopic school children.

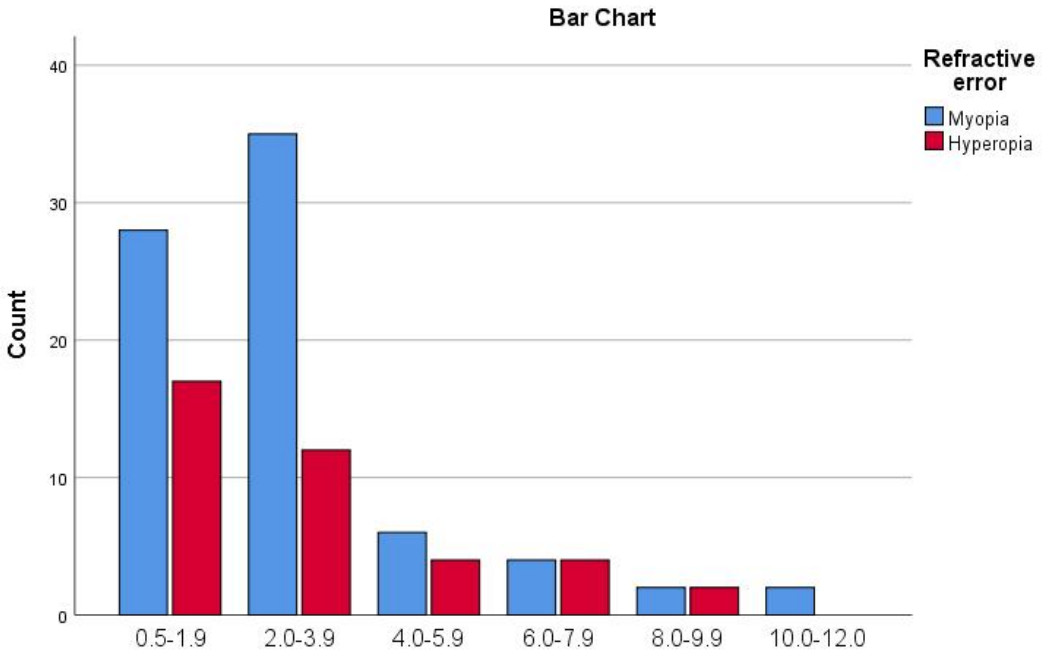


Figure 4.6: A bar chart comparing child's reading duration (hours) in myopic and hyperopic school children.

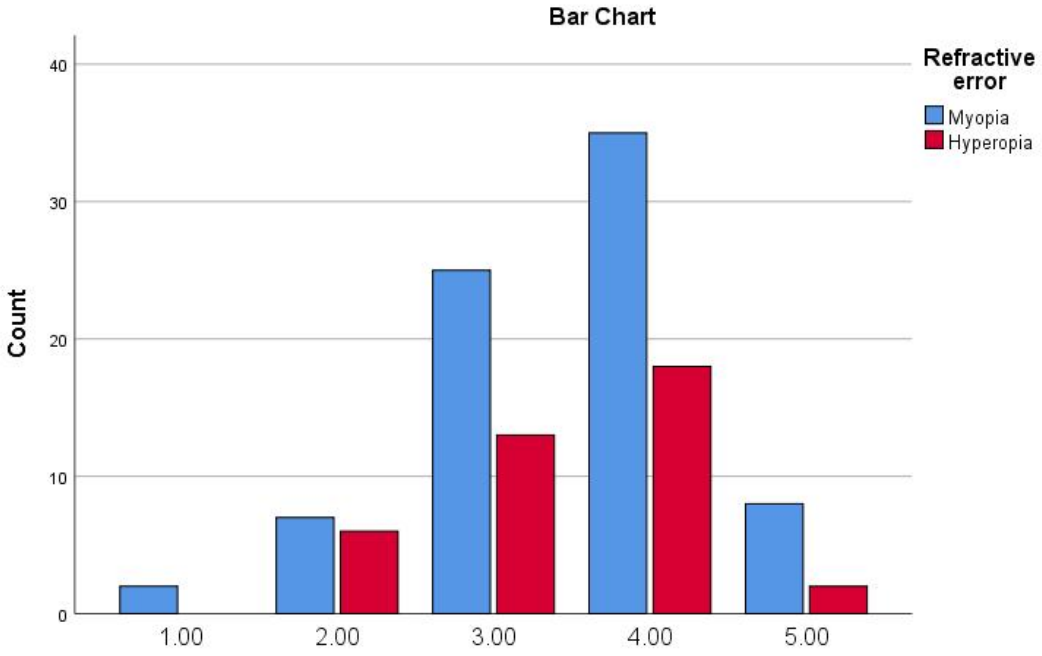


Figure 4.7: A bar chart comparing child's ability to study without strain in myopic and hyperopic school children.

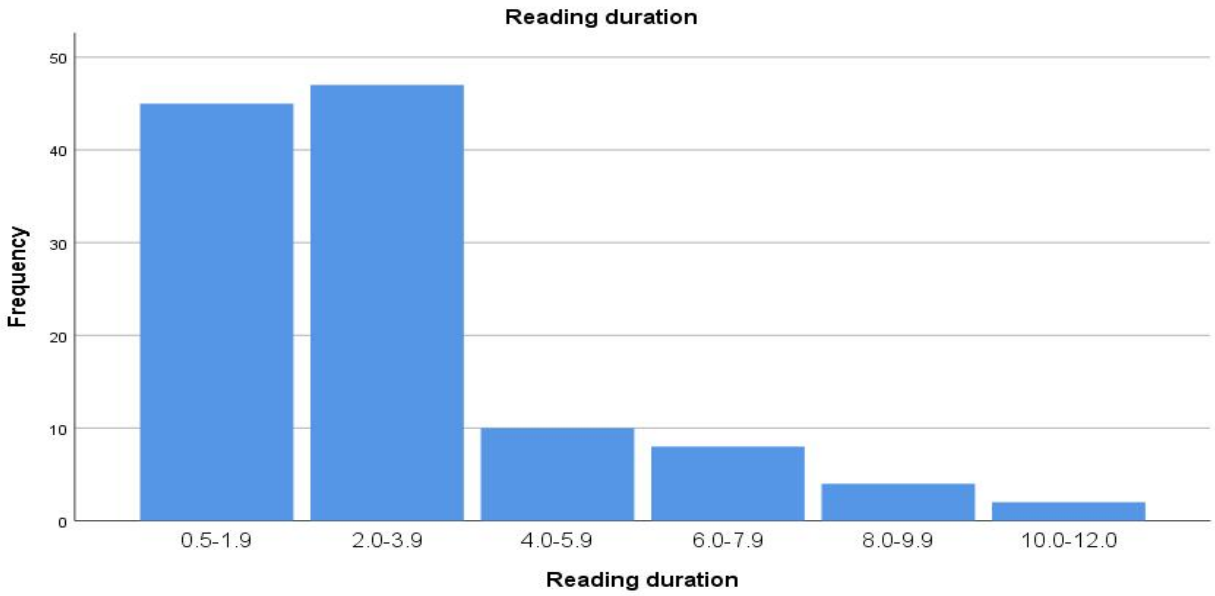


Figure 4.8: Bar chart of frequency distribution of the various reading duration in hours.

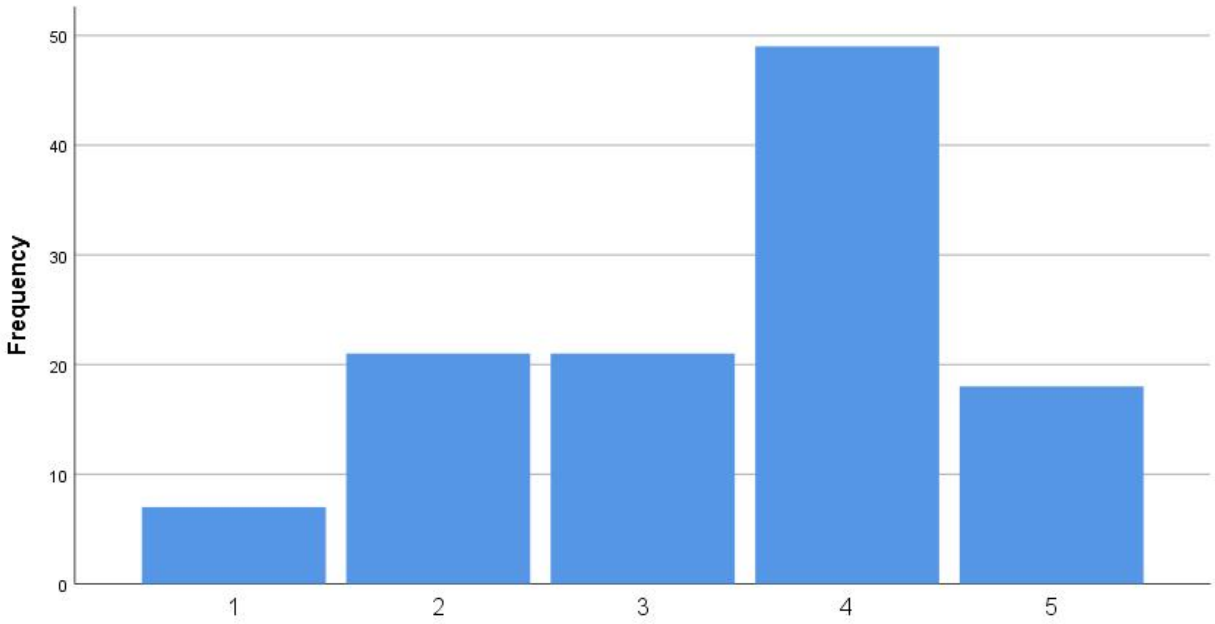


Figure 4.9: Bar chart of frequency distribution of various abilities of seeing the board from the back.

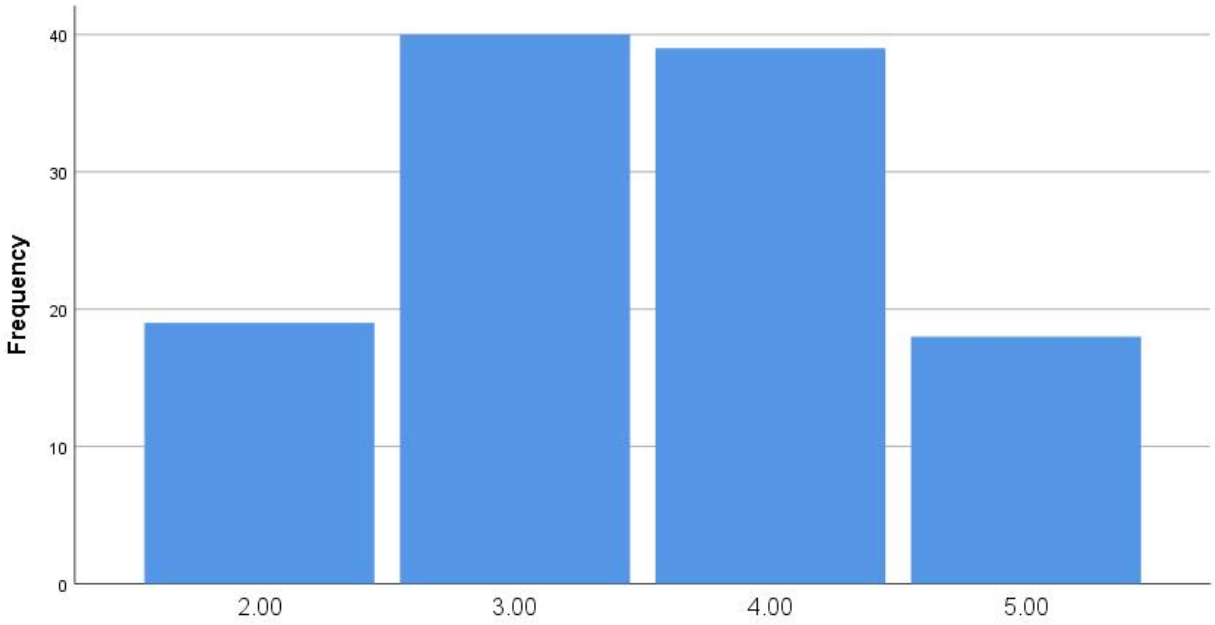


Figure 4.10: Bar chart of frequency distribution of various abilities to study without headache.

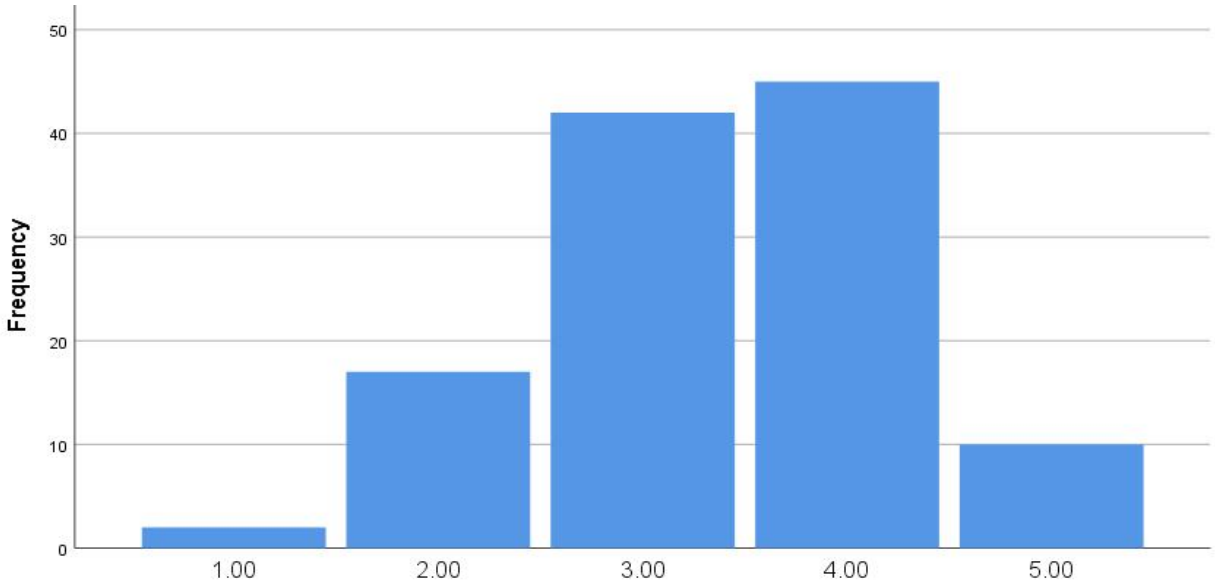


Figure 4.11: Bar chart of frequency distribution of various ability to study without blurry vision

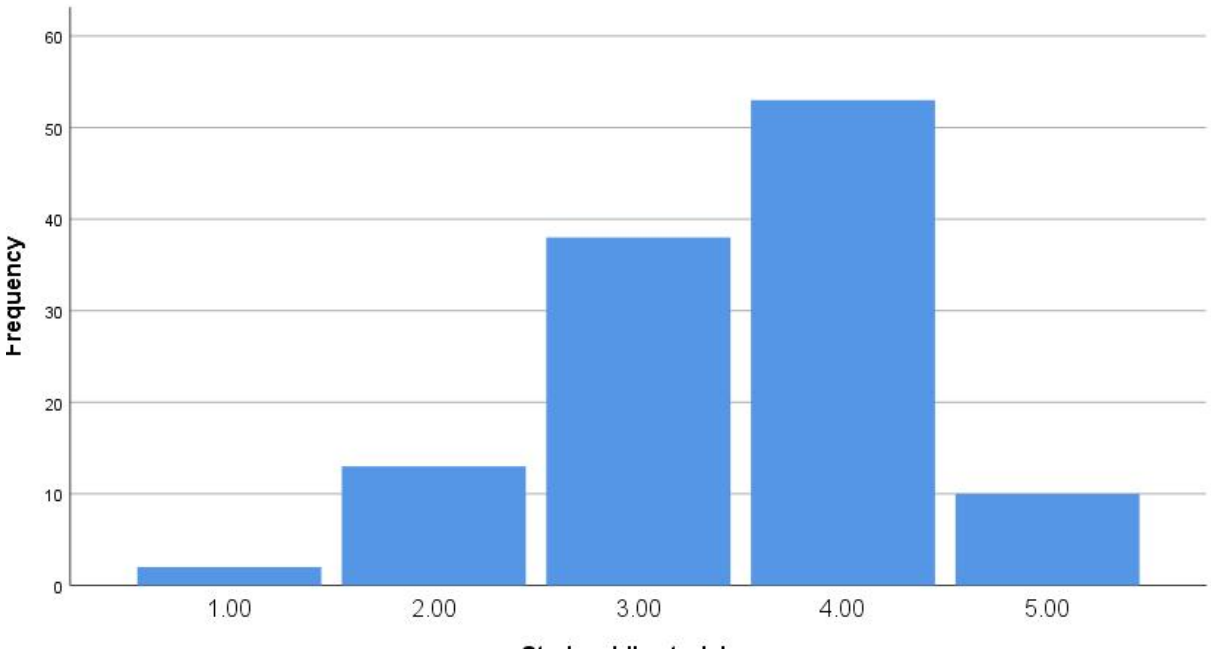


Figure 4.12: Bar chart of frequency distribution of various abilities to study without strain

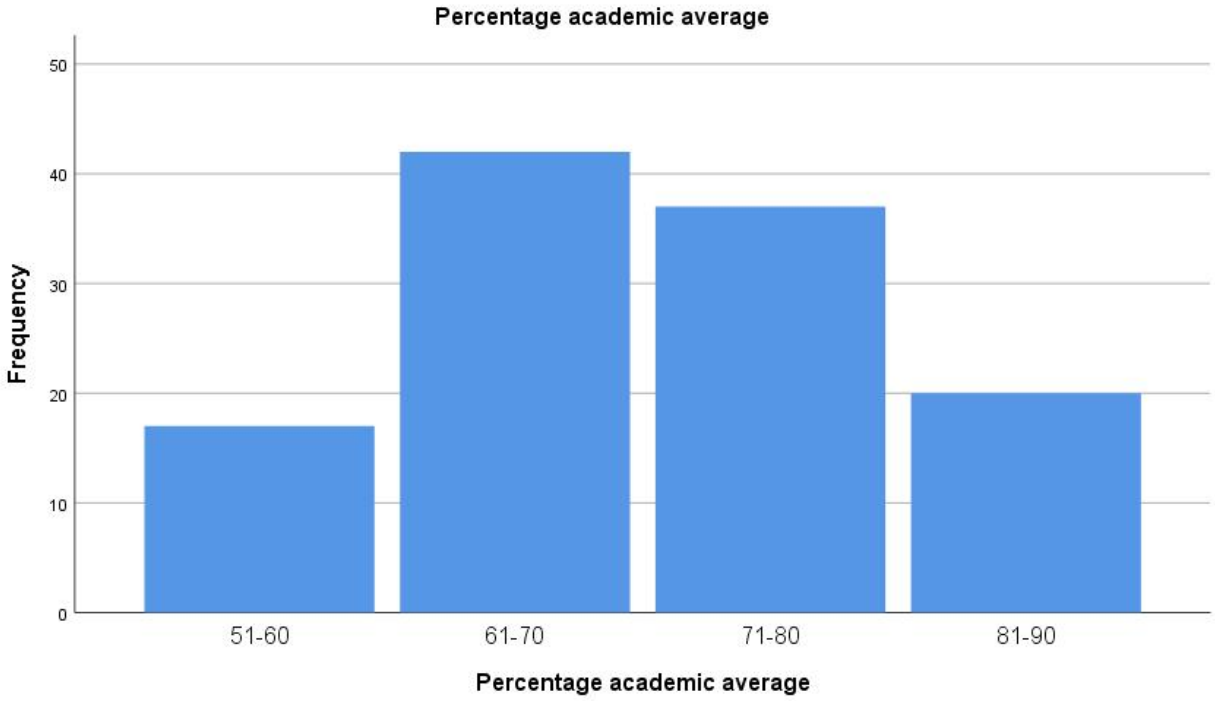


Figure 4.13: Bar chart of frequency distribution of various percentage academic average

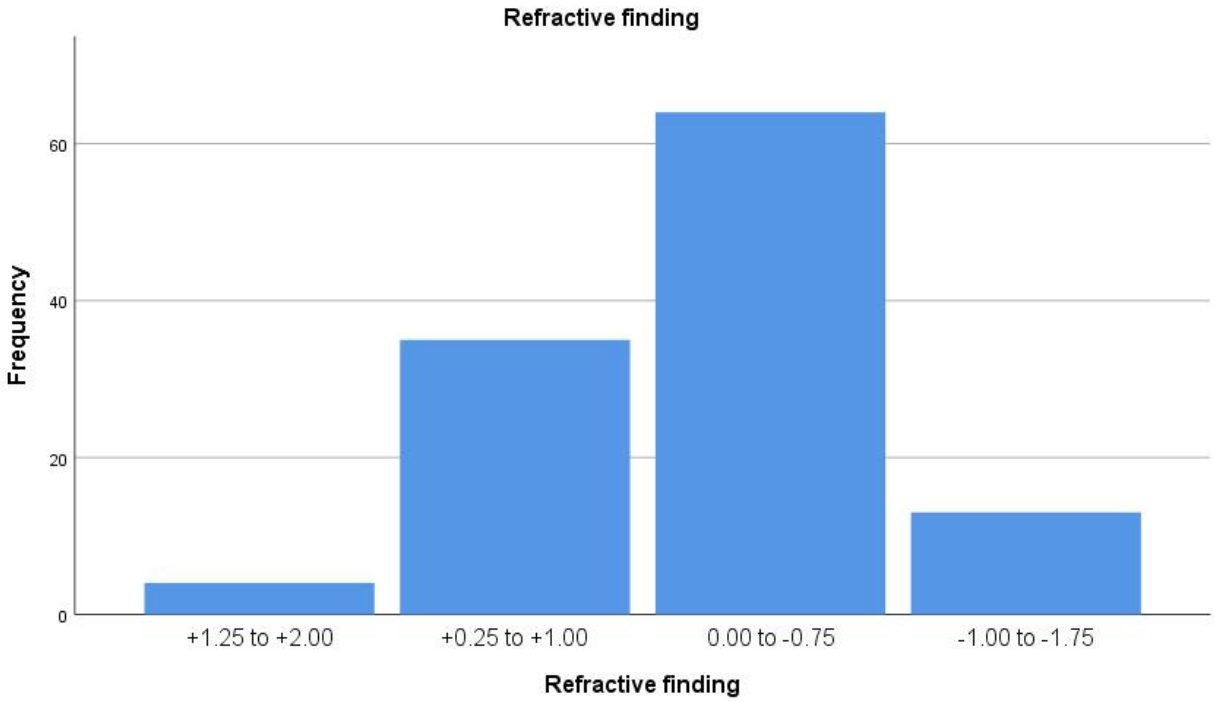


Figure 4.14: Bar chart of frequency distribution of various refractive finding

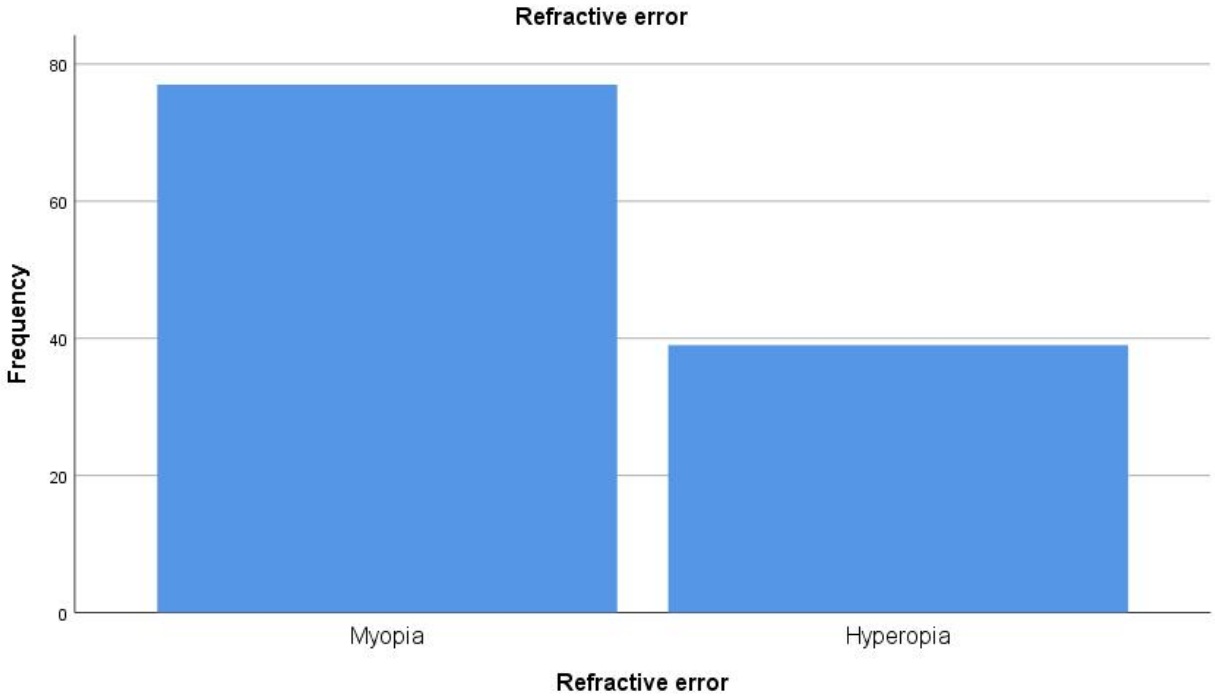


Figure 4.15: Bar chart of frequency distribution of myopia and hyperopia

Table 4.1: Group statistics table.

**Group Statistics**

| | Refractive error | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Percentage academic average | Myopia | 77 | 7.4286 | .75094 | .08558 |
| | Hyperopia | 39 | 7.6923 | 1.23871 | .19835 |
| Strain while studying | Myopia | 77 | 3.5195 | .89752 | .10228 |
| | Hyperopia | 39 | 3.4103 | .81815 | .13101 |
| Blurry vision while studying | Myopia | 77 | 3.3896 | .94807 | .10804 |
| | Hyperopia | 39 | 3.3590 | .81069 | .12981 |
| Headache while studying | Myopia | 77 | 3.4675 | .95400 | .10872 |
| | Hyperopia | 39 | 3.5128 | .94233 | .15089 |
| Focusingabiitywhilestudying | Myopia | 77 | 3.2857 | 1.01122 | .11524 |
| | Hyperopia | 39 | 3.6154 | .74747 | .11969 |
| Reading duration | Myopia | 77 | 2.0000 | 1.14708 | .13072 |
| | Hyperopia | 39 | 2.0256 | 1.20279 | .19260 |
| Seeing board from the back | Myopia | 77 | 3.2597 | 1.11689 | .12728 |
| | Hyperopia | 39 | 3.7692 | 1.11122 | .17794 |

Table 4.2: Table of independent sample test showing the degree of significance of result.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Percentage academic average | Equal variances assumed | 38.281 | .000 | -1.424 | 114 | .157 | -.26374 | .18515 | -.63051 | .10304 |
| | Equal variances not assumed | | | -1.221 | 52.553 | .228 | -.26374 | .21603 | -.69712 | .16964 |
| Strain while studying | Equal variances assumed | .166 | .685 | .637 | 114 | .525 | .10922 | .17136 | -.23023 | .44868 |
| | Equal variances not assumed | | | .657 | 83.020 | .513 | .10922 | .16621 | -.22135 | .43980 |
| Blurry vision while studying | Equal variances assumed | 1.142 | .287 | .172 | 114 | .863 | .03064 | .17779 | -.32156 | .38284 |
| | Equal variances not assumed | | | .181 | 87.811 | .856 | .03064 | .16889 | -.30501 | .36629 |
| Headache while studying | Equal variances assumed | .030 | .863 | -.243 | 114 | .809 | -.04529 | .18674 | -.41521 | .32464 |
| | Equal variances not assumed | | | -.244 | 77.280 | .808 | -.04529 | .18598 | -.41560 | .32502 |
| Focusingabiitywhilestudying | Equal variances assumed | 3.815 | .053 | -1.800 | 114 | .074 | -.32967 | .18310 | -.69240 | .03306 |
| | Equal variances not assumed | | | -1.984 | 98.699 | .050 | -.32967 | .16615 | -.65936 | .00002 |
| Reading duration | Equal variances assumed | 1.201 | .275 | -.112 | 114 | .911 | -.02564 | .22915 | -.47959 | .42831 |
| | Equal variances not assumed | | | -.110 | 73.297 | .913 | -.02564 | .23277 | -.48952 | .43824 |
| Seeing board from the back | Equal variances assumed | .033 | .856 | -2.325 | 114 | .022 | -.50949 | .21914 | -.94361 | -.07537 |
| | Equal variances not assumed | | | -2.329 | 76.784 | .023 | -.50949 | .21877 | -.94515 | -.07383 |

**Explanation of Figures**

Figure 4.1 above compared academic average in myopic and hyperopic school children and from the chart, it showed that myopic school children performed better academically.

Figure 4.2 above compared the ability of the school children to study without blurry vision, and from the chart, we can see that more myopic school children studied better without blurry vision.

Figure 4.3 above compared the ability of the school children to study without headache and from the chart, we can see that more myopic school children studied without headache.

Figure 4.4 compred the ability of the school children to focus while studying and from the chart, it showed that more myopic school children focused better while studying.

Figure 4.5 compared the ability of the school children to see the board from the back in class and the chart showed us that there was almost a tie in this aspect.

Figure 4.6 compared reading duration (hours) in myopic and hyperopic school children and from the chart, it's showing that myopic school children read for longer durations.

Figure 4.7 compares the ability of the myopic and hyperopic school children to study without strains and it shows that the myopes studied better without strains.

# CHAPTER FIVE

## 5.0 DISCUSSION

This study provides qualitative evidence as to the distribution of myopia and hyperopia in school children and also the different ways myopic and hyperopic school children behave towards their academics.

Judging from the results obtained, myopia was the most common type of refractive error found among the school children, having a percentage distribution of 66.4% and hyperopia, having a percentage distribution of 33.6%. Thus, myopia was more distributed in this study.

The results of the academic behaviour of the school children in the previous chapter explicitly showed the differences in how myopic and hyperopic school children acts or behaves towards their academics.

In the area of the school children's academic average (%), despite the bar chart showing some slight differences, statistical comparison showed no significant difference, P>0..05, thus academic average (%) in myopic and hyperopic school children were similar.

In the aspect of the school children's ability to study without strain, despite the bar chart showing some slight differences, statistical comparison showed no significant difference, P>0..05, thus ability to study without strain in myopic and hyperopic school children were similar.

In the aspect of the school children's ability to study without blurry vision, despite the bar chart showing some slight differences, statistical comparison showed no significant difference, P>0..05, thus ability to study without blurry vision in myopic and hyperopic school children were similar.

In the aspect of the school children's ability to study without headache, despite the bar chart showing some slight differences, statistical comparison showed no significant difference, P>0..05, thus ability to study without headache in myopic and hyperopic school children were similar.

In the aspect of the school children's ability to focus while studying, despite the bar chart showing some slight differences, statistical comparison showed no significant difference, P>0..05, thus ability to focus while studying in myopic and hyperopic school children were similar.

In the aspect of the school children's reading/study duration, despite the bar chart showing some slight differences, statistical comparison showed no significant difference, P>0..05, thus reading/study duration in myopic and hyperopic school children were similar.

In the aspect of the school children's ability to see the board from the back, despite the bar chart showing some slight differences, statistical comparison showed significant difference, P<0..05, thus ability to see the board from the back in myopic and hyperopic school children were different.

Myopic and hyperopic school children were found to be similar in different aspects of academic behaviour used in this study except for the ability to see the board from the back. Hyperopes saw the board better from the back, compared to myopes.

# CHAPTER SIX

## 6.0 CONCLUSION AND RECOMMENDATION

Recent and older studies indicate that myopic and hyperopic school children have a significant difference in their academic behaviour. Comparison of the academic behaviour in the areas of reading duration, focusing ability while studying, ability to study without headache, ability to study without blurry vision, ability to study without strain,, and academic average (%), in myopic and hyperopic school children found no significant difference between the groups ($p>0.05$), thus, we accept the null hypothesis (Ho), that there is no significant difference in the academic behaviour in myopic and hyperopic school children, except in their ability to see the board from the back.

Thus, we conclude by saying that there is no difference in the academic behavior of myopic school children compared with that of hyperopic school children. And, hyperopic school children can see the board better from the back in class, compared to myopic school children.

## 6.1 RECOMMENDATIONS

More research should be carried out on the comparison of academic behaviour in myopic and hyperopic school children as this may provide solution to a lot of problems school children face.

From this study carried out, it has been found that academic behaviour in the school children were the same in all aspect except in the area of the child's ability to see the board from the back.

This information will help in proper class room sitting arrangement in such a way that myopes should be sitted in front in class and hyperopes, behind.

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## APPENDIX A

QUESTIONNAIRE FORM

1. BIODATA:

Name:

Age:

Gender:

Class:

2. Ocular symptoms

i. How long can you read before getting tired?

| | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| How well can you see the board from the back in class? | | | | | | |
| How often do you focus while studying? | | | | | | |
| How often do you study without experiencing headache? | | | | | | |
| How often do you study without eye strain? | | | | | | |
| How often do you study without blurry vision? | | | | | | |

3. ACADEMIC PERFORMANCE

What was your last term academic average (%)?

4. REFEACTION

Visual acuity

OD:

OS:

OU:

Retinoscopy finding

OD:

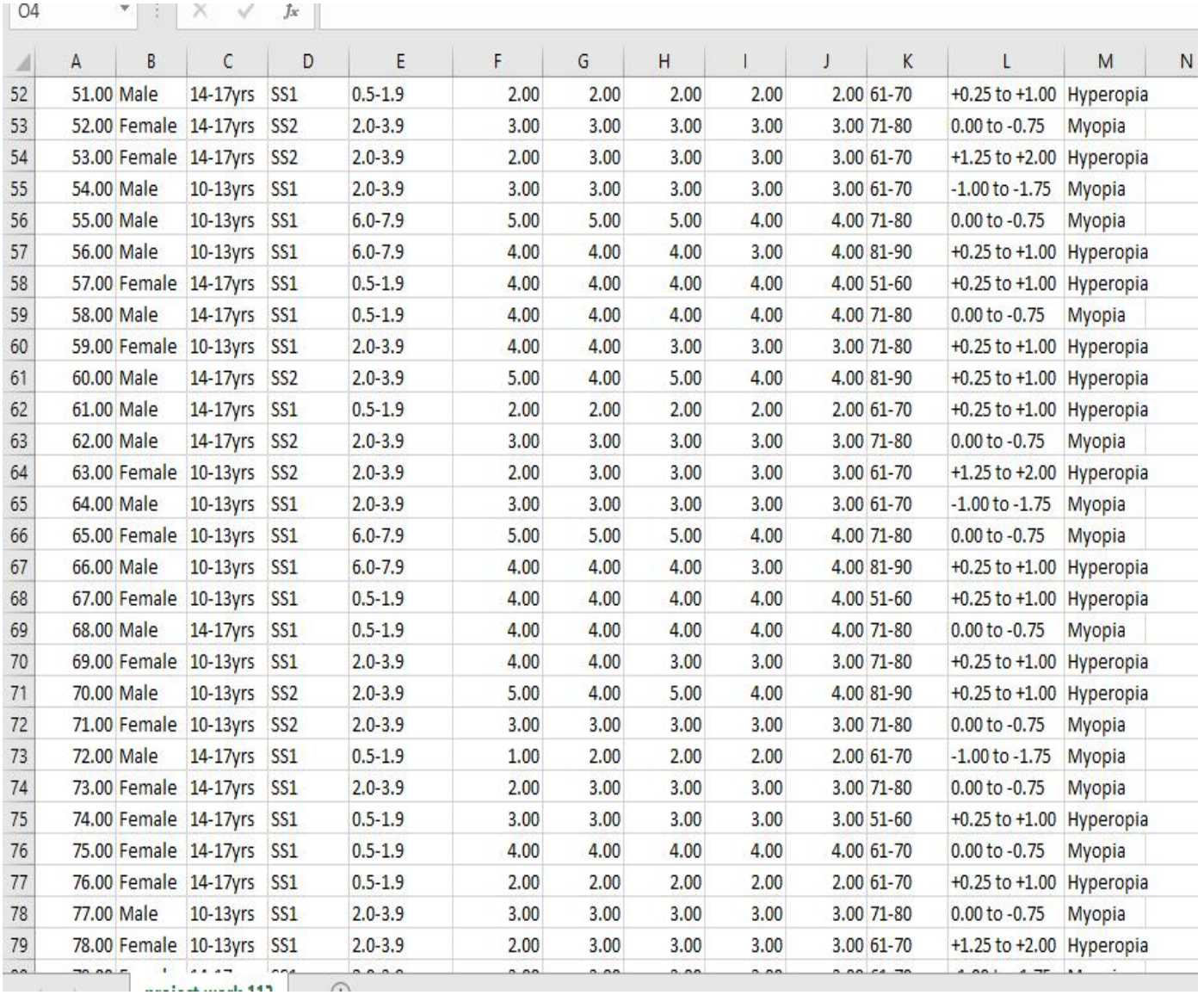
OS:

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 24.00 | Female | 14-17yrs | SS2 | 2.0-3.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 26 | 25.00 | Male | 14-17yrs | SS2 | 2.0-3.9 | 3.00 | 3.00 | 4.00 | 4.00 | 4.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 27 | 26.00 | Female | 14-17yrs | SS2 | 8.0-9.9 | 5.00 | 4.00 | 3.00 | 4.00 | 3.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 28 | 27.00 | Male | 14-17yrs | SS1 | 4.0-5.9 | 5.00 | 4.00 | 4.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 29 | 28.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 30 | 29.00 | Female | 14-17yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 31 | 30.00 | Male | 14-17yrs | SS1 | 4.0-5.9 | 3.00 | 4.00 | 4.00 | 3.00 | 3.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 32 | 31.00 | Female | 10-13yrs | SS1 | 10.0-12.0 | 1.00 | 3.00 | 3.00 | 3.00 | 3.00 | 51-60 | -1.00 to -1.75 | Myopia |
| 33 | 32.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 3.00 | 3.00 | 2.00 | 2.00 | 2.00 | 51-60 | +0.25 to +1.00 | Hyperopia |
| 34 | 33.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 2.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 35 | 34.00 | Female | 14-17yrs | SS1 | 2.0-3.9 | 2.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 36 | 35.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 5.00 | 5.00 | 4.00 | 5.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 37 | 36.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 4.00 | 5.00 | 5.00 | 5.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 38 | 37.00 | Female | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 3.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 39 | 38.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 40 | 39.00 | Female | 14-17yrs | SS1 | 2.0-3.9 | 4.00 | 4.00 | 4.00 | 5.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 41 | 40.00 | Female | 14-17yrs | SS1 | 4.0-5.9 | 4.00 | 2.00 | 3.00 | 5.00 | 5.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 42 | 41.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 1.00 | 1.00 | 3.00 | 1.00 | 1.00 | 81-90 | 0.00 to -0.75 | Myopia |
| 43 | 42.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 4.00 | 1.00 | 2.00 | 2.00 | 2.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 44 | 43.00 | Male | 10-13yrs | SS1 | 4.0-5.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | -1.00 to -1.75 | Myopia |
| 45 | 44.00 | Female | 10-13yrs | SS1 | 4.0-5.9 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 46 | 45.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 5.00 | 2.00 | 5.00 | 4.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 47 | 46.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 3.00 | 3.00 | 3.00 | 5.00 | 81-90 | -1.00 to -1.75 | Myopia |
| 48 | 47.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | -1.00 to -1.75 | Myopia |
| 49 | 48.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 50 | 49.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 51-60 | +0.25 to +1.00 | Hyperopia |
| 51 | 50.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 52 | 51.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | +0.25 to +1.00 | Hyperopia |

**APPENDIX B:** DATA COLLECTED

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | No. | Gender | Age | Class | Reading duration (hrs) | Ability to see the board from the back | Ability to focus while studying | Ability to study without headache | Ability to study without blurry vision | Ability to study without strain | Academic average (%) | Refractive finding | Refractive error |
| 2 | 1 | Male | 10-13yrs | SS2 | 2.0-3.9 | 3 | 3 | 3 | 3 | 3 | 71-80 | 0.00 to -0.75 | Myopia |
| 3 | 2.00 | Female | 14-17yrs | SS1 | 0.5-1.9 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | -1.00 to -1.75 | Myopia |
| 4 | 3.00 | Male | 14-17yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 5 | 4.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 51-60 | +0.25 to +1.00 | Hyperopia |
| 6 | 5.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 7 | 6.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | +0.25 to +1.00 | Hyperopia |
| 8 | 7.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 9 | 8.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | +1.25 to +2.00 | Hyperopia |
| 10 | 9.00 | Male | 14-17yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | -1.00 to -1.75 | Myopia |
| 11 | 10.00 | Female | 10-13yrs | SS1 | 6.0-7.9 | 5.00 | 5.00 | 5.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 12 | 11.00 | Female | 10-13yrs | SS1 | 6.0-7.9 | 4.00 | 4.00 | 4.00 | 3.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 13 | 12.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 51-60 | +0.25 to +1.00 | Hyperopia |
| 14 | 13.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 15 | 14.00 | Male | 14-17yrs | SS1 | 2.0-3.9 | 5.00 | 4.00 | 3.00 | 3.00 | 3.00 | 71-80 | +0.25 to +1.00 | Hyperopia |
| 16 | 15.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 5.00 | 4.00 | 5.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 17 | 16.00 | Female | 14-17yrs | SS2 | 0.5-1.9 | 2.00 | 3.00 | 3.00 | 2.00 | 3.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 18 | 17.00 | Female | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | +0.25 to +1.00 | Hyperopia |
| 19 | 18.00 | Male | 10-13yrs | SS2 | 8.0-9.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 20 | 19.00 | Male | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 4.00 | 2.00 | 2.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 21 | 20.00 | Male | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 2.00 | 2.00 | 3.00 | 3.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 22 | 21.00 | Male | 14-17yrs | SS2 | 2.0-3.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 23 | 22.00 | Male | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 3.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 24 | 23.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 5.00 | 5.00 | 5.00 | 61-70 | 0.00 to -0.75 | Myopia |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 24.00 | Female | 14-17yrs | SS2 | 2.0-3.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 26 | 25.00 | Male | 14-17yrs | SS2 | 2.0-3.9 | 3.00 | 3.00 | 4.00 | 4.00 | 4.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 27 | 26.00 | Female | 14-17yrs | SS2 | 8.0-9.9 | 5.00 | 4.00 | 3.00 | 4.00 | 3.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 28 | 27.00 | Male | 14-17yrs | SS1 | 4.0-5.9 | 5.00 | 4.00 | 4.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 29 | 28.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 30 | 29.00 | Female | 14-17yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 31 | 30.00 | Male | 14-17yrs | SS1 | 4.0-5.9 | 3.00 | 4.00 | 4.00 | 3.00 | 3.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 32 | 31.00 | Female | 10-13yrs | SS1 | 10.0-12.0 | 1.00 | 3.00 | 3.00 | 3.00 | 3.00 | 51-60 | -1.00 to -1.75 | Myopia |
| 33 | 32.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 3.00 | 3.00 | 2.00 | 2.00 | 2.00 | 51-60 | +0.25 to +1.00 | Hyperopia |
| 34 | 33.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 2.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 35 | 34.00 | Female | 14-17yrs | SS1 | 2.0-3.9 | 2.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 36 | 35.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 5.00 | 5.00 | 4.00 | 5.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 37 | 36.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 4.00 | 5.00 | 5.00 | 5.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 38 | 37.00 | Female | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 3.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 39 | 38.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 40 | 39.00 | Female | 14-17yrs | SS1 | 2.0-3.9 | 4.00 | 4.00 | 4.00 | 5.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 41 | 40.00 | Female | 14-17yrs | SS1 | 4.0-5.9 | 4.00 | 2.00 | 3.00 | 5.00 | 5.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 42 | 41.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 1.00 | 1.00 | 3.00 | 1.00 | 1.00 | 81-90 | 0.00 to -0.75 | Myopia |
| 43 | 42.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 4.00 | 1.00 | 2.00 | 2.00 | 2.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 44 | 43.00 | Male | 10-13yrs | SS1 | 4.0-5.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | -1.00 to -1.75 | Myopia |
| 45 | 44.00 | Female | 10-13yrs | SS1 | 4.0-5.9 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 46 | 45.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 5.00 | 2.00 | 5.00 | 4.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 47 | 46.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 3.00 | 3.00 | 3.00 | 5.00 | 81-90 | -1.00 to -1.75 | Myopia |
| 48 | 47.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | -1.00 to -1.75 | Myopia |
| 49 | 48.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 50 | 49.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 51-60 | +0.25 to +1.00 | Hyperopia |
| 51 | 50.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 52 | 51.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | +0.25 to +1.00 | Hyperopia |



| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 52 | 51.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | +0.25 to +1.00 | Hyperopia | |
| 53 | 52.00 | Female | 14-17yrs | SS2 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia | |
| 54 | 53.00 | Female | 14-17yrs | SS2 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | +1.25 to +2.00 | Hyperopia | |
| 55 | 54.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | -1.00 to -1.75 | Myopia | |
| 56 | 55.00 | Male | 10-13yrs | SS1 | 6.0-7.9 | 5.00 | 5.00 | 5.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia | |
| 57 | 56.00 | Male | 10-13yrs | SS1 | 6.0-7.9 | 4.00 | 4.00 | 4.00 | 3.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia | |
| 58 | 57.00 | Female | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 51-60 | +0.25 to +1.00 | Hyperopia | |
| 59 | 58.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia | |
| 60 | 59.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 4.00 | 4.00 | 3.00 | 3.00 | 3.00 | 71-80 | +0.25 to +1.00 | Hyperopia | |
| 61 | 60.00 | Male | 14-17yrs | SS2 | 2.0-3.9 | 5.00 | 4.00 | 5.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia | |
| 62 | 61.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | +0.25 to +1.00 | Hyperopia | |
| 63 | 62.00 | Male | 14-17yrs | SS2 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia | |
| 64 | 63.00 | Female | 10-13yrs | SS2 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | +1.25 to +2.00 | Hyperopia | |
| 65 | 64.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | -1.00 to -1.75 | Myopia | |
| 66 | 65.00 | Female | 10-13yrs | SS1 | 6.0-7.9 | 5.00 | 5.00 | 5.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia | |
| 67 | 66.00 | Male | 10-13yrs | SS1 | 6.0-7.9 | 4.00 | 4.00 | 4.00 | 3.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia | |
| 68 | 67.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 51-60 | +0.25 to +1.00 | Hyperopia | |
| 69 | 68.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia | |
| 70 | 69.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 4.00 | 4.00 | 3.00 | 3.00 | 3.00 | 71-80 | +0.25 to +1.00 | Hyperopia | |
| 71 | 70.00 | Male | 10-13yrs | SS2 | 2.0-3.9 | 5.00 | 4.00 | 5.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia | |
| 72 | 71.00 | Female | 10-13yrs | SS2 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia | |
| 73 | 72.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | -1.00 to -1.75 | Myopia | |
| 74 | 73.00 | Female | 14-17yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia | |
| 75 | 74.00 | Female | 14-17yrs | SS1 | 0.5-1.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 51-60 | +0.25 to +1.00 | Hyperopia | |
| 76 | 75.00 | Female | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia | |
| 77 | 76.00 | Female | 14-17yrs | SS1 | 0.5-1.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 61-70 | +0.25 to +1.00 | Hyperopia | |
| 78 | 77.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia | |
| 79 | 78.00 | Female | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | +1.25 to +2.00 | Hyperopia | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | 79.00 | Female | 14-17yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | -1.00 to -1.75 | Myopia |
| 81 | 80.00 | Male | 10-13yrs | SS1 | 6.0-7.9 | 5.00 | 5.00 | 5.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 82 | 81.00 | Male | 10-13yrs | SS1 | 6.0-7.9 | 4.00 | 4.00 | 4.00 | 3.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 83 | 82.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 51-60 | +0.25 to +1.00 | Hyperopia |
| 84 | 83.00 | Female | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 85 | 84.00 | Female | 14-17yrs | SS1 | 2.0-3.9 | 5.00 | 4.00 | 3.00 | 3.00 | 3.00 | 71-80 | +0.25 to +1.00 | Hyperopia |
| 86 | 85.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 5.00 | 4.00 | 5.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 87 | 86.00 | Male | 14-17yrs | SS2 | 0.5-1.9 | 2.00 | 3.00 | 3.00 | 2.00 | 3.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 88 | 87.00 | Male | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | +0.25 to +1.00 | Hyperopia |
| 89 | 88.00 | Female | 10-13yrs | SS2 | 8.0-9.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 90 | 89.00 | Female | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 4.00 | 2.00 | 2.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 91 | 90.00 | Female | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 2.00 | 2.00 | 3.00 | 3.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 92 | 91.00 | Female | 14-17yrs | SS2 | 2.0-3.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 93 | 92.00 | Female | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 3.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 94 | 93.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 5.00 | 5.00 | 5.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 95 | 94.00 | Male | 14-17yrs | SS2 | 2.0-3.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 96 | 95.00 | Female | 14-17yrs | SS2 | 2.0-3.9 | 3.00 | 3.00 | 4.00 | 4.00 | 4.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 97 | 96.00 | Male | 14-17yrs | SS2 | 8.0-9.9 | 5.00 | 4.00 | 3.00 | 4.00 | 3.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 98 | 97.00 | Female | 14-17yrs | SS1 | 4.0-5.9 | 5.00 | 4.00 | 4.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 99 | 98.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 100 | 99.00 | Male | 14-17yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 101 | 100.00 | Female | 14-17yrs | SS1 | 4.0-5.9 | 3.00 | 4.00 | 4.00 | 3.00 | 3.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 102 | 101.00 | Male | 10-13yrs | SS1 | 10.0-12.0 | 1.00 | 3.00 | 3.00 | 3.00 | 3.00 | 51-60 | -1.00 to -1.75 | Myopia |
| 103 | 102.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 3.00 | 3.00 | 2.00 | 2.00 | 2.00 | 51-60 | +0.25 to +1.00 | Hyperopia |
| 104 | 103.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 2.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 105 | 104.00 | Male | 14-17yrs | SS1 | 2.0-3.9 | 2.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 106 | 105.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 5.00 | 5.00 | 4.00 | 5.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 107 | 106.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 4.00 | 5.00 | 5.00 | 5.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |

project work 113

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 91 | 90.00 | Female | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 2.00 | 2.00 | 3.00 | 3.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 92 | 91.00 | Female | 14-17yrs | SS2 | 2.0-3.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 93 | 92.00 | Female | 14-17yrs | SS2 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 3.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 94 | 93.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 5.00 | 5.00 | 5.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 95 | 94.00 | Male | 14-17yrs | SS2 | 2.0-3.9 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 96 | 95.00 | Female | 14-17yrs | SS2 | 2.0-3.9 | 3.00 | 3.00 | 4.00 | 4.00 | 4.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 97 | 96.00 | Male | 14-17yrs | SS2 | 8.0-9.9 | 5.00 | 4.00 | 3.00 | 4.00 | 3.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 98 | 97.00 | Female | 14-17yrs | SS1 | 4.0-5.9 | 5.00 | 4.00 | 4.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 99 | 98.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 100 | 99.00 | Male | 14-17yrs | SS1 | 2.0-3.9 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 101 | 100.00 | Female | 14-17yrs | SS1 | 4.0-5.9 | 3.00 | 4.00 | 4.00 | 3.00 | 3.00 | 51-60 | 0.00 to -0.75 | Myopia |
| 102 | 101.00 | Male | 10-13yrs | SS1 | 10.0-12.0 | 1.00 | 3.00 | 3.00 | 3.00 | 3.00 | 51-60 | -1.00 to -1.75 | Myopia |
| 103 | 102.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 3.00 | 3.00 | 2.00 | 2.00 | 2.00 | 51-60 | +0.25 to +1.00 | Hyperopia |
| 104 | 103.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 2.00 | 3.00 | 2.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 105 | 104.00 | Male | 14-17yrs | SS1 | 2.0-3.9 | 2.00 | 4.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 106 | 105.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 5.00 | 5.00 | 4.00 | 5.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 107 | 106.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 4.00 | 5.00 | 5.00 | 5.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 108 | 107.00 | Male | 14-17yrs | SS1 | 0.5-1.9 | 4.00 | 3.00 | 4.00 | 4.00 | 4.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 109 | 108.00 | Male | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 110 | 109.00 | Male | 14-17yrs | SS1 | 2.0-3.9 | 4.00 | 4.00 | 4.00 | 5.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 111 | 110.00 | Male | 14-17yrs | SS1 | 4.0-5.9 | 4.00 | 2.00 | 3.00 | 5.00 | 5.00 | 71-80 | 0.00 to -0.75 | Myopia |
| 112 | 111.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 1.00 | 1.00 | 3.00 | 1.00 | 1.00 | 81-90 | 0.00 to -0.75 | Myopia |
| 113 | 112.00 | Male | 10-13yrs | SS1 | 2.0-3.9 | 4.00 | 1.00 | 2.00 | 2.00 | 2.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 114 | 113.00 | Female | 10-13yrs | SS1 | 4.0-5.9 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 61-70 | -1.00 to -1.75 | Myopia |
| 115 | 114.00 | Male | 10-13yrs | SS1 | 4.0-5.9 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 81-90 | +0.25 to +1.00 | Hyperopia |
| 116 | 115.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 5.00 | 2.00 | 5.00 | 4.00 | 4.00 | 61-70 | 0.00 to -0.75 | Myopia |
| 117 | 116.00 | Female | 10-13yrs | SS1 | 0.5-1.9 | 4.00 | 3.00 | 3.00 | 3.00 | 5.00 | 81-90 | -1.00 to -1.75 | Myopia |
| 118 | | | | | | 4.00 | | | | | | | |

**APPENDIX C:** STATISTICAL ANALYSIS

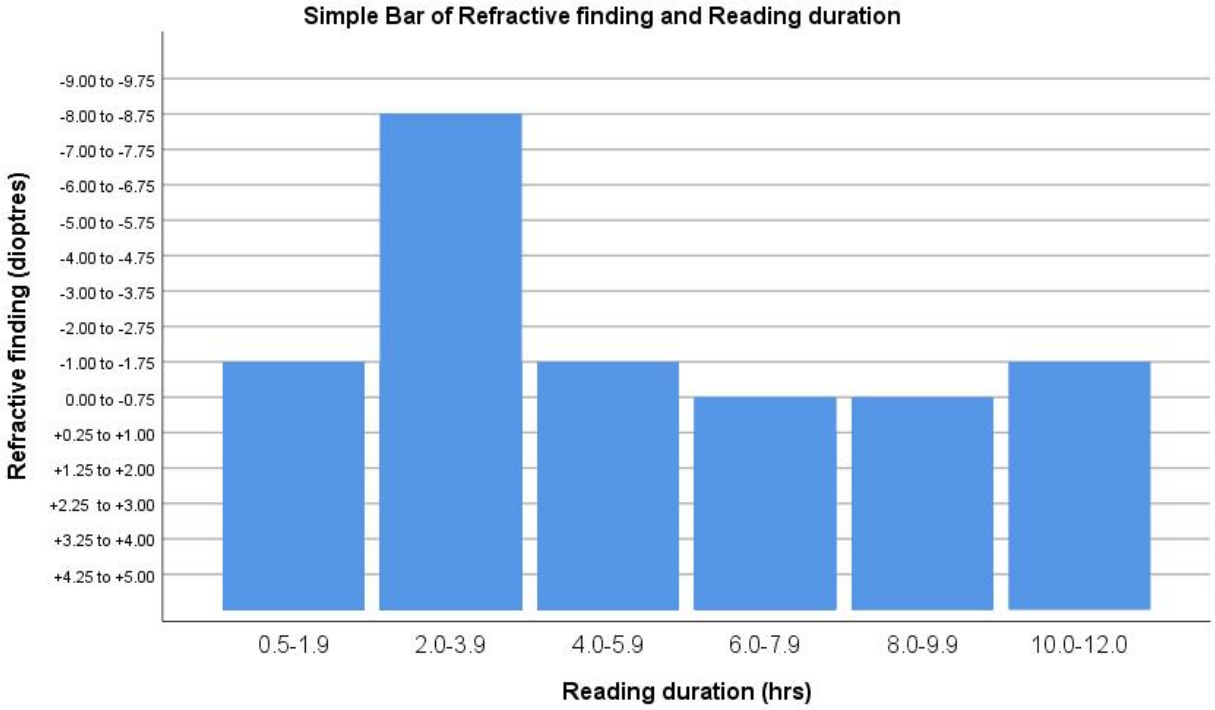



Figure 1: Bar of reading duration (hours) and refractive finding (dioptres)

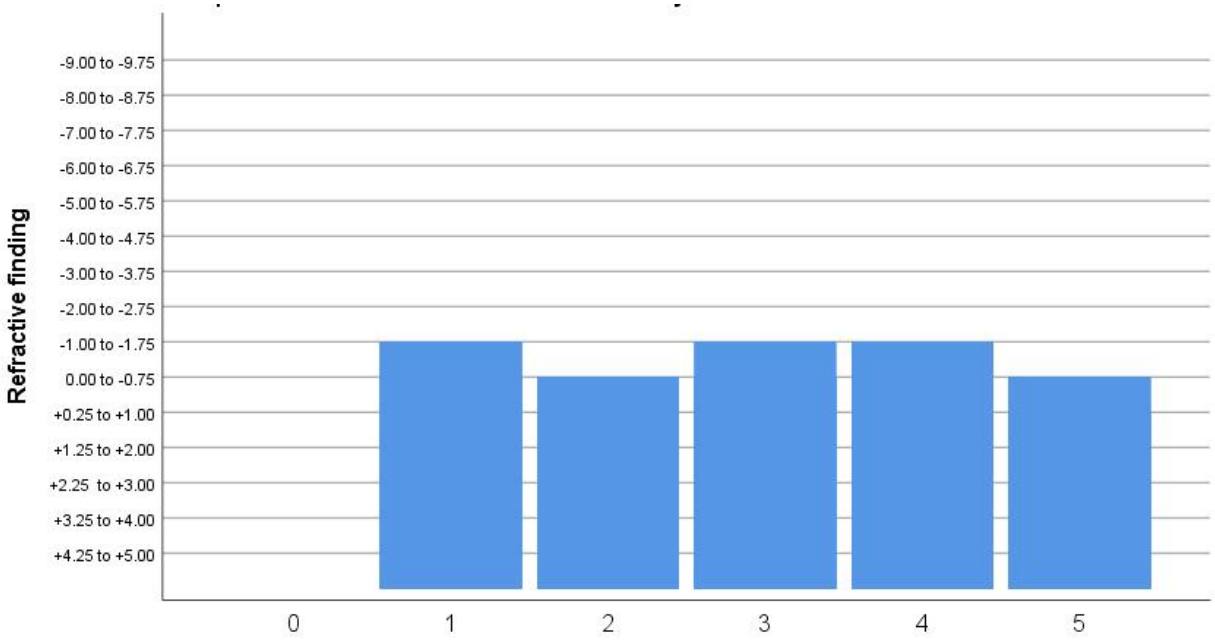



Figure 2: Bar of ability to see the board from the back and refractive finding (dioptres)

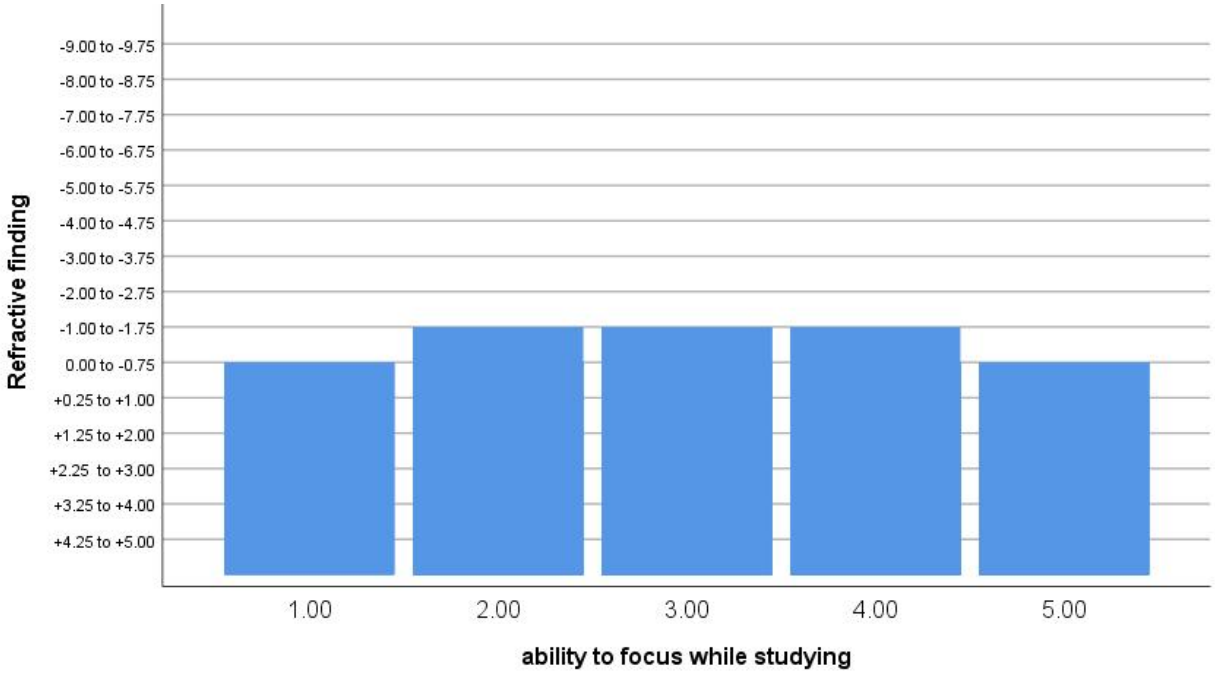



Figure 3: Bar of ability to focus while studying and refractive finding (dioptres)

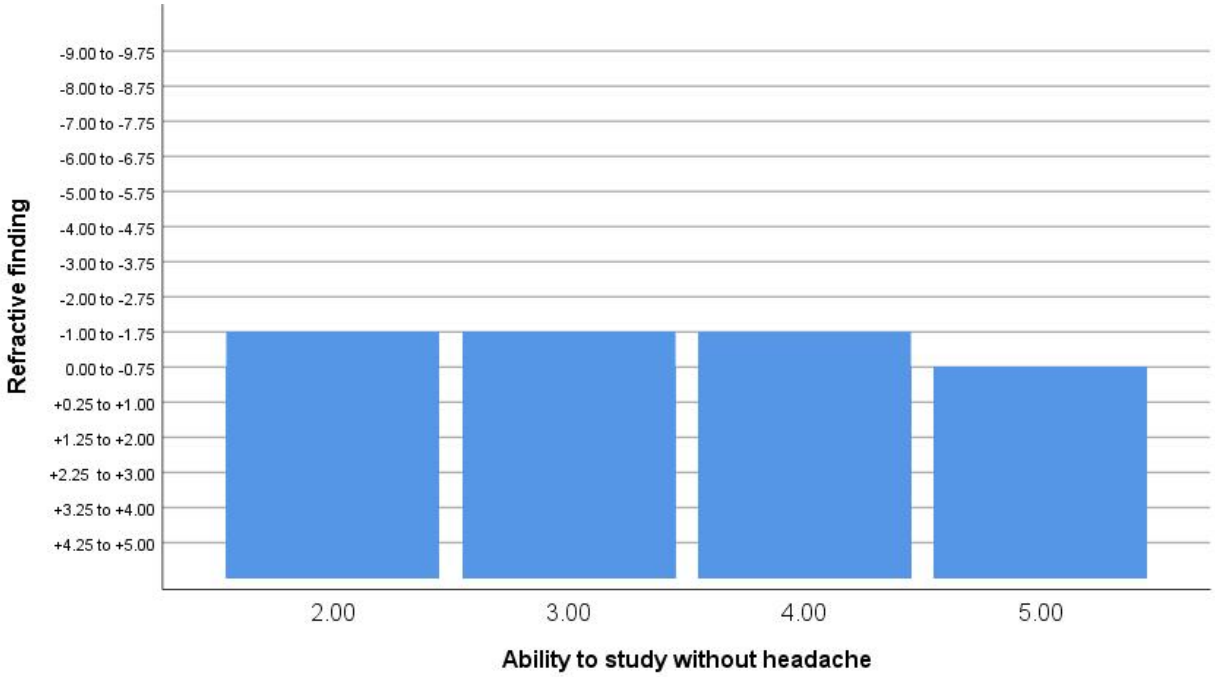



Figure 4: Bar of ability to study without headache and refractive finding (dioptres)

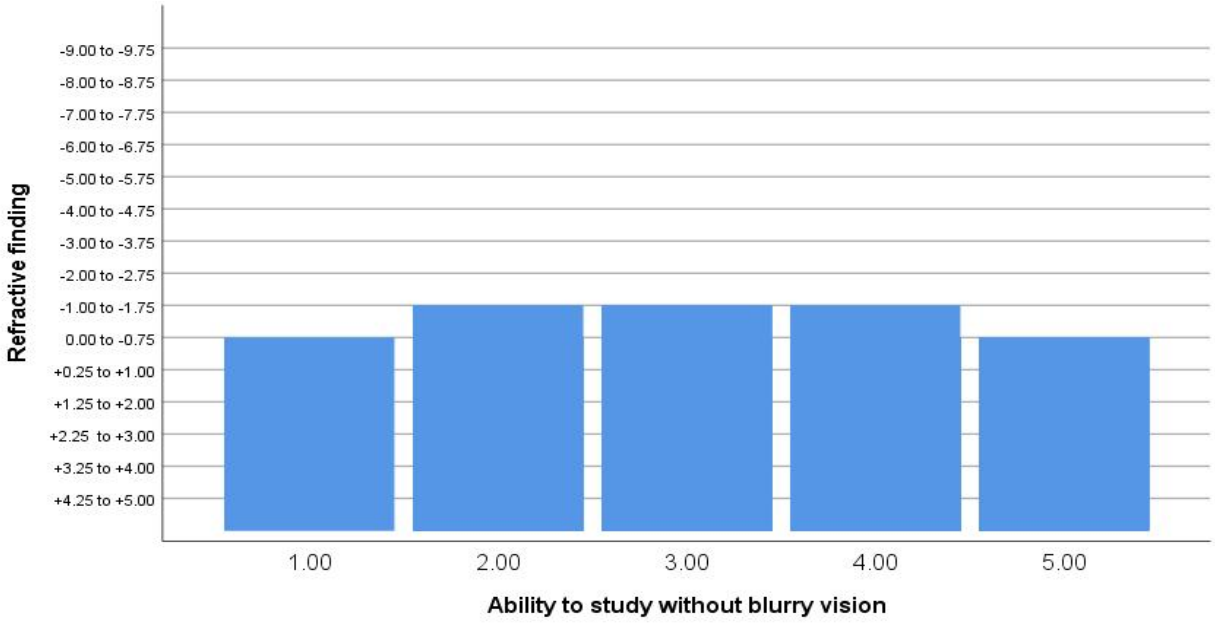



Figure 5: Bar of ability to study without blurry vision and refractive finding (dioptres)

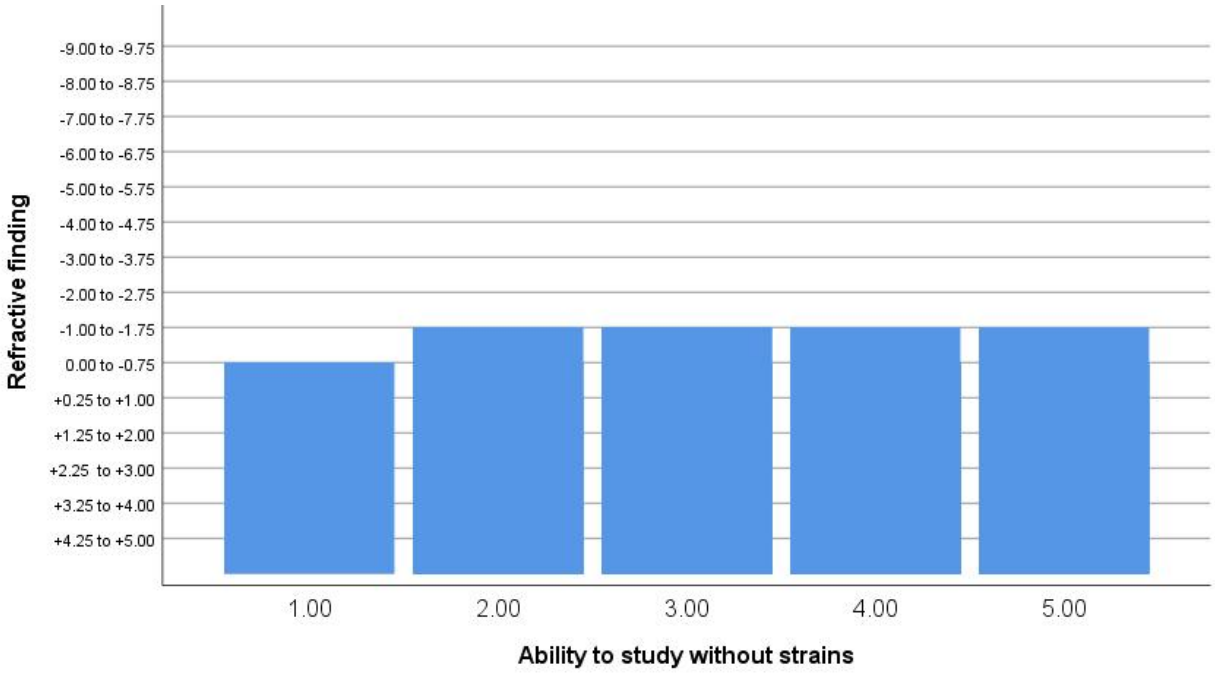



Figure 6: Bar of ability to study without strains and refractive finding (dioptres)

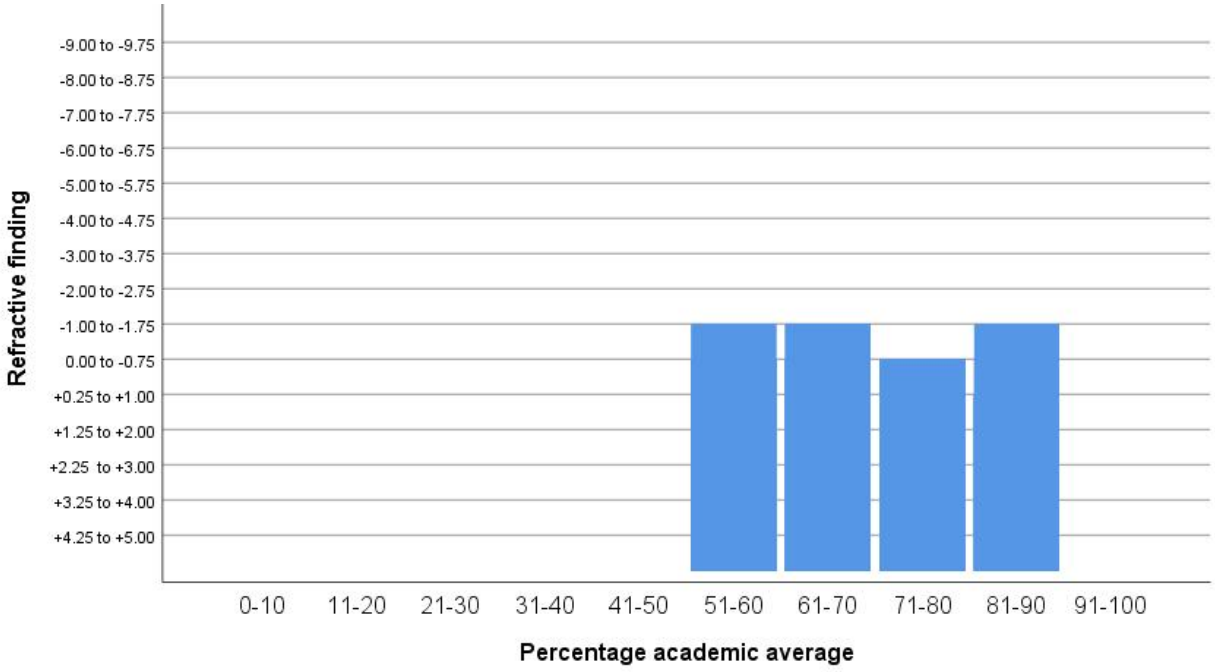



Figure 7: Bar of percentage academic average and refractive finding (dioptres)

Table 1: statistics table

**Statistics**

| | | Reading duration | Seeing board from the back | Focusingabiit ywhilestudyin g | Headache while studying | Blurry vision while studying | Strain while studying | Percentage academic average | Refractive finding | Refractive error |
|---|---|---|---|---|---|---|---|---|---|---|
| N | Valid | 116 | 116 | 116 | 116 | 116 | 116 | 116 | 116 | 116 |
| | Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | | 2.0086 | 3.4310 | 3.3966 | 3.4828 | 3.3793 | 3.4828 | 7.5172 | 5.7414 | 1.3362 |

Table 2: Frequency distribution of various reading duration in hours

**Reading duration**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 0.5-1.9 | 45 | 38.8 | 38.8 | 38.8 |
| | 2.0-3.9 | 47 | 40.5 | 40.5 | 79.3 |
| | 4.0-5.9 | 10 | 8.6 | 8.6 | 87.9 |
| | 6.0-7.9 | 8 | 6.9 | 6.9 | 94.8 |
| | 8.0-9.9 | 4 | 3.4 | 3.4 | 98.3 |
| | 10.0-12.0 | 2 | 1.7 | 1.7 | 100.0 |
| | Total | 116 | 100.0 | 100.0 | |

Table 3: Frequency distribution of various abilities to see the board from the back

**Seeing board from the back**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1 | 7 | 6.0 | 6.0 | 6.0 |
| | 2 | 21 | 18.1 | 18.1 | 24.1 |
| | 3 | 21 | 18.1 | 18.1 | 42.2 |
| | 4 | 49 | 42.2 | 42.2 | 84.5 |
| | 5 | 18 | 15.5 | 15.5 | 100.0 |
| | Total | 116 | 100.0 | 100.0 | |

Table 4: Frequency distribution of ability to focus while studying

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1.00 | 4 | 3.4 | 3.4 | 3.4 |
| | 2.00 | 15 | 12.9 | 12.9 | 16.4 |
| | 3.00 | 38 | 32.8 | 32.8 | 49.1 |
| | 4.00 | 49 | 42.2 | 42.2 | 91.4 |
| | 5.00 | 10 | 8.6 | 8.6 | 100.0 |
| | Total | 116 | 100.0 | 100.0 | |

Table 5: Frequency distribution of various ability to study without headache

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 2.00 | 19 | 16.4 | 16.4 | 16.4 |
| | 3.00 | 40 | 34.5 | 34.5 | 50.9 |
| | 4.00 | 39 | 33.6 | 33.6 | 84.5 |
| | 5.00 | 18 | 15.5 | 15.5 | 100.0 |
| | Total | 116 | 100.0 | 100.0 | |

Table 6: Frequency distribution of various ability to study without blurry vision

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1.00 | 2 | 1.7 | 1.7 | 1.7 |
| | 2.00 | 17 | 14.7 | 14.7 | 16.4 |
| | 3.00 | 42 | 36.2 | 36.2 | 52.6 |
| | 4.00 | 45 | 38.8 | 38.8 | 91.4 |
| | 5.00 | 10 | 8.6 | 8.6 | 100.0 |
| | Total | 116 | 100.0 | 100.0 | |

Table 7: Frequency distribution of various ability to study without strain

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1.00 | 2 | 1.7 | 1.7 | 1.7 |
| | 2.00 | 13 | 11.2 | 11.2 | 12.9 |
| | 3.00 | 38 | 32.8 | 32.8 | 45.7 |
| | 4.00 | 53 | 45.7 | 45.7 | 91.4 |
| | 5.00 | 10 | 8.6 | 8.6 | 100.0 |
| | Total | 116 | 100.0 | 100.0 | |

Table 8: Frequency distribution of various academic average

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 51-60 | 17 | 14.7 | 14.7 | 14.7 |
| | 61-70 | 42 | 36.2 | 36.2 | 50.9 |
| | 71-80 | 37 | 31.9 | 31.9 | 82.8 |
| | 81-90 | 20 | 17.2 | 17.2 | 100.0 |
| | Total | 116 | 100.0 | 100.0 | |

Table 9: Frequency distribution of various refraactive finding

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | +1.25 to +2.00 | 4 | 3.4 | 3.4 | 3.4 |
| | +0.25 to +1.00 | 35 | 30.2 | 30.2 | 33.6 |
| | 0.00 to -0.75 | 64 | 55.2 | 55.2 | 88.8 |
| | -1.00 to -1.75 | 13 | 11.2 | 11.2 | 100.0 |
| | Total | 116 | 100.0 | 100.0 | |

Table 10: Frequency distribution of various hyperopia and myopia

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Myopia | 77 | 66.4 | 66.4 | 66.4 |
| | Hyperopia | 39 | 33.6 | 33.6 | 100.0 |
| | Total | 116 | 100.0 | 100.0 | |

Table 11: Cross tabulation of refractive error and percentage acdemic average

**Percentage academic average * Refractive error Crosstabulation**

Count

| | | Refractive error | | |
|---|---|---|---|---|
| | | Myopia | Hyperopia | Total |
| Percentage academic average | 51-60 | 8 | 9 | 17 |
| | 61-70 | 33 | 9 | 42 |
| | 71-80 | 32 | 5 | 37 |
| | 81-90 | 4 | 16 | 20 |
| Total | | 77 | 39 | 116 |

Table 12: Cross tabulation of refractive error and abilities to study without strain

Count

| | | Refractive error | | |
|---|---|---|---|---|
| | | Myopia | Hyperopia | Total |
| Strain while studying | 1.00 | 2 | 0 | 2 |
| | 2.00 | 7 | 6 | 13 |
| | 3.00 | 25 | 13 | 38 |
| | 4.00 | 35 | 18 | 53 |
| | 5.00 | 8 | 2 | 10 |
| Total | | 77 | 39 | 116 |

Table 13: Cross tabulation of refractive error and ability to study without blurry vision

Count

| | | Refractive error | | |
|---|---|---|---|---|
| | | Myopia | Hyperopia | Total |
| Blurry vision while studying | 1.00 | 2 | 0 | 2 |
| | 2.00 | 11 | 6 | 17 |
| | 3.00 | 27 | 15 | 42 |
| | 4.00 | 29 | 16 | 45 |
| | 5.00 | 8 | 2 | 10 |
| Total | | 77 | 39 | 116 |

Table 14: Cross tabulation of refractive error and ability to study without headache

Count

| | | Refractive error | | |
|---|---|---|---|---|
| | | Myopia | Hyperopia | Total |
| Headache while studying | 2.00 | 13 | 6 | 19 |
| | 3.00 | 27 | 13 | 40 |
| | 4.00 | 25 | 14 | 39 |
| | 5.00 | 12 | 6 | 18 |
| Total | | 77 | 39 | 116 |

Table 15: Cross tabulation of refractive error and ability to focus while studying

Count

| | | Refractive error | | |
|---|---|---|---|---|
| | | Myopia | Hyperopia | Total |
| Focusingabiitywhilestudying | 1.00 | 4 | 0 | 4 |
| | 2.00 | 11 | 4 | 15 |
| | 3.00 | 29 | 9 | 38 |
| | 4.00 | 25 | 24 | 49 |
| | 5.00 | 8 | 2 | 10 |
| Total | | 77 | 39 | 116 |

Table 16: Cross tabulation of refractive error and ability to see the board from the back

Count

| | | Refractive error | | |
|---|---|---|---|---|
| | | Myopia | Hyperopia | Total |
| Seeing board from the back | 1 | 7 | 0 | 7 |
| | 2 | 14 | 7 | 21 |
| | 3 | 15 | 6 | 21 |
| | 4 | 35 | 14 | 49 |
| | 5 | 6 | 12 | 18 |
| Total | | 77 | 39 | 116 |

Table 17: Cross tabulation of refractive error and reading duration

**Reading duration * Refractive error Crosstabulation**

Count

| | | Refractive error | | |
|---|---|---|---|---|
| | | Myopia | Hyperopia | Total |
| Reading duration | 0.5-1.9 | 28 | 17 | 45 |
| | 2.0-3.9 | 35 | 12 | 47 |
| | 4.0-5.9 | 6 | 4 | 10 |
| | 6.0-7.9 | 4 | 4 | 8 |
| | 8.0-9.9 | 2 | 2 | 4 |
| | 10.0-12.0 | 2 | 0 | 2 |
| Total | | 77 | 39 | 116 |

## APPENDIX D: CONSENT FORM

# DEPARTMENT OF OPTOMETRY

**FACULTY OF LIFE SCIENCES**

**UNIVERSITY OF BENIN**

*Your Ref:* .....

Date: 21st November, 2022

*Our Ref:* .....

**CONSENT FORM**

I, **Precious Ediriverere AYOVUNEFE**, Department of Optometry, University of Benin, would be conducting a study **Comparing the Academic Behaviour in Hyperopic and Myopic School Children.** The information obtained from the study will help school teachers and optometrists better understand the specific needs and concerns of hyperopic and myopic school children and enable them tailor their management towards meeting those needs. It will also be useful in planning appropriate interventions for the prevention of avoidable causes and management of visual impairments among pupils.

The process involves the use of questionnaires to obtain information from the students, and also the use of instruments such as the retinoscope (which reflects light into the child's eye) and trial lenses that helps to know the exact refractive state of your child's eyes

Participation in this study is voluntary. The treatment and care of the participant will not be altered in any way as every procedure regarding health and safety will be maintained. Full disclosure of information given by or obtained from the participants is guaranteed. If participation to take part in this study is granted, please acknowledge and sign below.

**Consent Certificate Form**

I .....,

Hereby freely consent on behalf of my child to participate in the above study. I acknowledge that the procedure has been explained to me thoroughly by the project researcher and I have agreed for the examination to be carried out on my child. I understand that participation in this research is entirely voluntary.

Parent/Guardian's signature: ..... Date: .....

Precious E. Ayovunefe: ..... Date:.....