

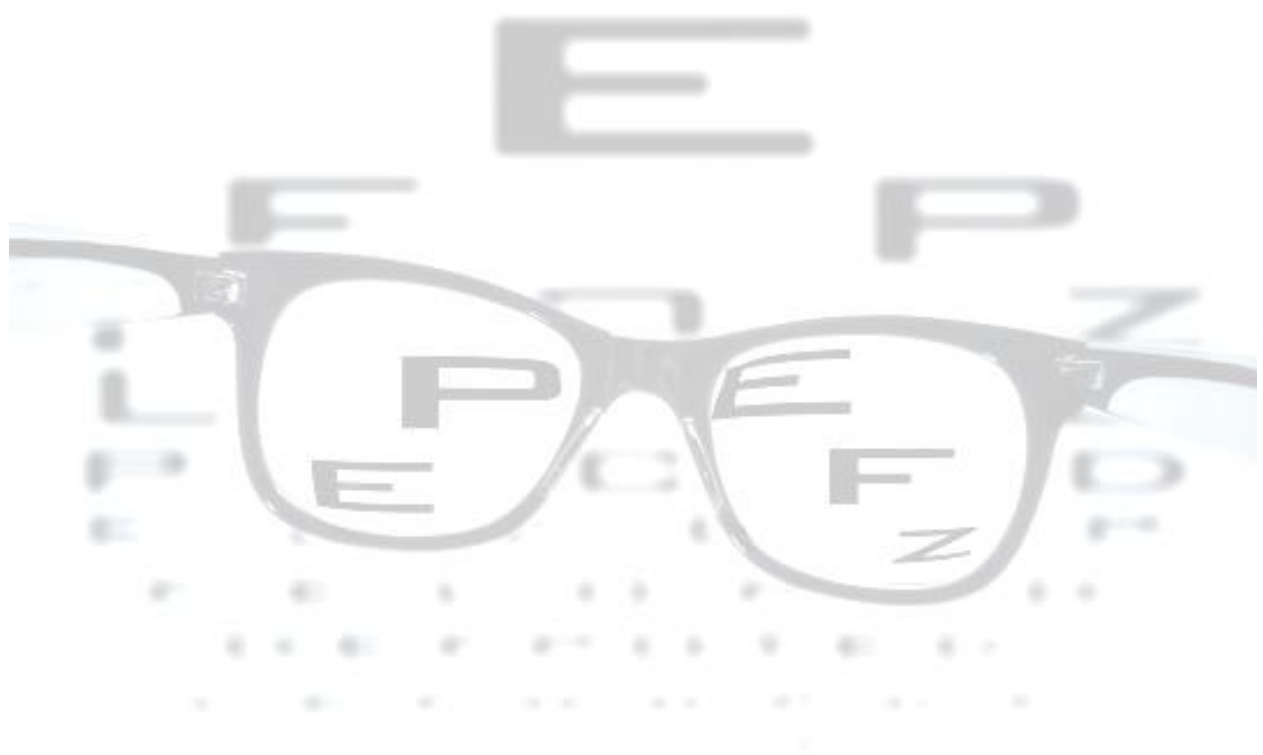


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THE RELATIONSHIP BETWEEN REFRACTIVE ERROR AND SECONDARY ENTRANCE ASSESSMENT (SEA) RESULTS IN TRINIDAD

OPTM 3082 Research Paper

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Contents	Page Number
Chapter 1	3
Chapter 2	6
Chapter 3	11
Chapter 4	16
Data Analysis	26
Chapter 5	37
Acknowledgements	43
Reference	44
Appendixes	50

Definition of Terms

MYOPIA

Myopia is when the person sees better at near than in the distance. Their V.A. at near will be approximately 20/20 or less and their distance V.A. depends on how “bad” their eyes are will be about 20/60 and up. This means in order for them to see clearly in the distance they need negative lenses to correct the refractive error they have.

HYPEROPIA

This is when the person sees better at distance than near. Distance V.A. could be 20/20 or better and the near V.A. will be 20/50 or so. To correct this refractive error positive lenses are used to help the person see better at near. This is rare in young kids most young children tend to be myopia and not hyperopic.

NPC

This test looks at the person ability to converge, meaning the two eyes comes together to focus on this at near. If someone has this issue they tend to complain of difficult while reading and having headaches eye strain and blurry vision. In testing this most young people would “pass” this test. However those that “fail” can have a correlation with exophoria at near. There are various vision therapy that can be done to help improve this issue; such as pencil pushups, Brock String and Stereograms. (Triantafilou, Welder and Longmuir 2020) ⁽³⁰⁾

STEREOPSIS

This looks at one's depth perception, which is basically a person's ability to see in 3D how well can they judge distance. The treatment for this is vision therapy some kids can grow out of it over time. (Getz 2020) ⁽³¹⁾

COLOUR VISION

Mostly males are affected by this, there isn't a treatment for it. It is best practice to do a colour vision test on all males especial if they have never had an exam done or never had a colour vision test done. Person with this issue who have red-green or blue-yellow colour blindness would have shown signs in. There isn't a cure for this however contact lenses and glasses with filters can help colour deficiency.

COVER TEST

This looks at the breaking the fusion between the two eyes to see how strong they are on their own. A person with exophoria means that the eyes tend to deviate outward. Esophoria is the opposite the eyes deviate inward. Phorias are only recognized once the both eyes aren't being used to see an object they are considered as latent deviations. Tropias are visible without having to break fusion between the eyes it is simply the misalignment between the eyes (eg MOM). Treatment for this is also vision therapy such as patching of the deviated eye, prisms , surgery to strengthen the weak muscle or weaken the over active muscle.

**Topic: The Relationship Between Refractive Error and Secondary Entrance Assessment
(SEA) Results in Trinidad**

CHAPTER 1

1.0 INTRODUCTION

Background

The Secondary Examination Assessment low academic achievement in Trinidad and Tobago has been a topic of discussion for many years. Desires of parents from upper, middle-class society; for their children to attend a prestige secondary schools has been identified as one of the primary reasons for low academic achievements among students. (Panday 2011)(1) This reason has also been identified in other countries as indicated by Panday where a study done in the United States 40 forty students indicated their desire to access a prestige school was more important to their parents during their plan for secondary school than their desire for them to be good citizens. The primary schools also portrait Panday has also included the desire for a high percentage of their students to achieve passes for prestige schools as a cause of low academic achievements.

There are many other different reasons for low academic achievement such as socioeconomic, environmental, physiological, psychosocial and medical, one of which can be visual errors. For this study, it would be focusing on refractive errors. Refractive error can be defined as the inability for images to focus correctly on the retina of the eye.

Additionally, uncorrected refractive error is the leading cause of moderate to severe visual impairment in children 15 years and under^{1,5}. Late detection or failure to implement corrective treatment can result in a dramatic impact on learning and educational capabilities⁵.

PROBLEM STATEMENT

It is the concern for the Ministry of Education that a high percentage of students who sat the Secondary Examination Assessment (SEA) exam in 2018 scored in the lower thirty (30) percentile range. It is believed low academic scores projects the possibility of students having poor necessary skills for the enhancement of their personal lives and also their level of contribution to society. There could be many reasons for this level scoring such as environmental, societal, psychological, and physical, one of which can be refractive error.

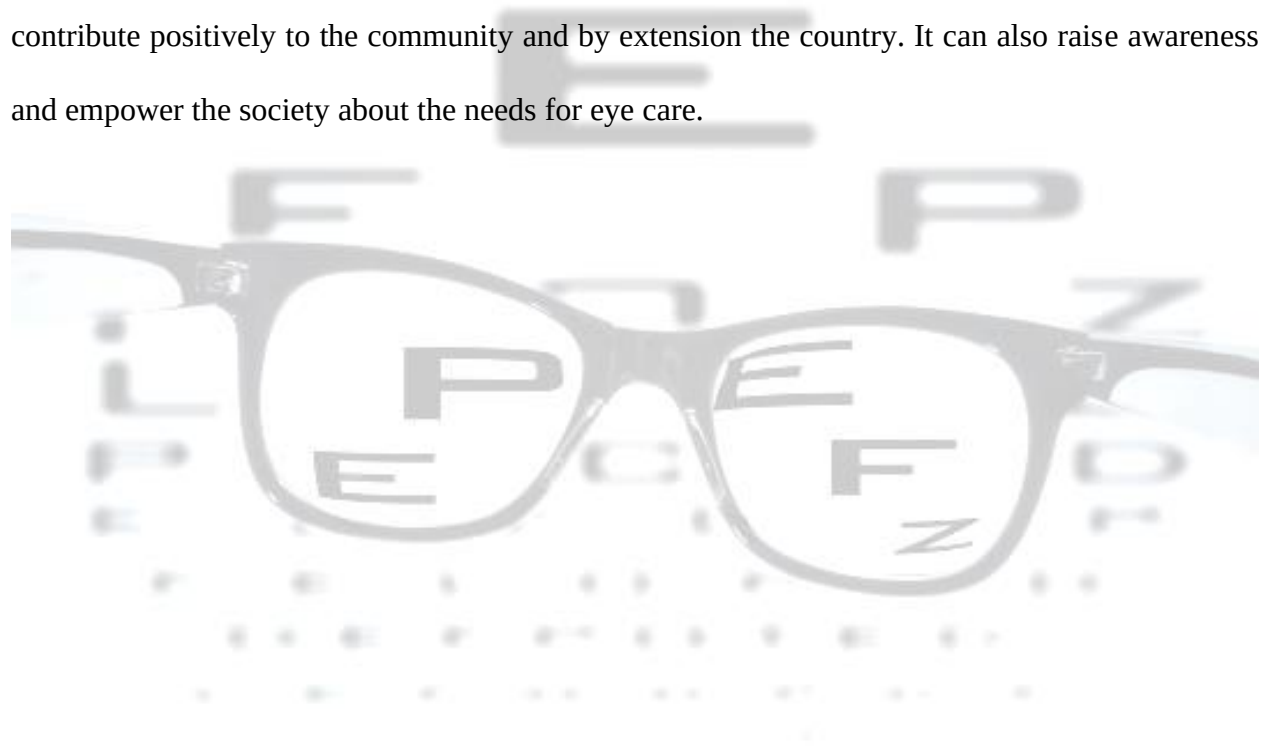
AIM: To analyse the relationship between refractive error and academic performance of students who sat the Secondary Assessment Examination in 2018.

OBJECTIVE:

- 1 To determine if there is a relation between refractive error and the academic performance of 2018 SEA students who scored below 30%
2. To identify the proportion of students who scored below 30% in 2018 SEA with refractive errors.
3. To advise corrective treatment to the students with refractive errors.
4. To emphasise the need for making eye care an integral part in assessing students' academic performance.

SIGNIFICANCE OF THE STUDY

This study would enable the Government of Trinidad and Tobago to do projection planning because they would have an idea of the student's ability to live a productive adult life and also obtain information as to their expected level of contribution to society. It would also aid the students in their academic ability as they could be given treatment for their refractive error and improve their ability to live a productive adult life. There would be more persons who can contribute positively to the community and by extension the country. It can also raise awareness and empower the society about the needs for eye care.



CHAPTER 2

LITERATURE REVIEW

Relationship between academic assessment and Refractive errors

Several studies may show the significance of exploring whether to confirm there is a relationship between refractive error and exam results. These studies also expands in establishing this refractive error relationship can be significant in the SEA results in Trinidad.

Research shows that myopes and those with astigmatism have shown to have more significant improvement after wearing their corrective lenses. (Alio – 2016) ⁽²⁾ For the hyperopes, it was necessary to consider additional factors such as; the counselling of parents, parental, providing nutritious food, maintaining a healthy atmosphere around the children and indulging them in mind concentrating activities. This study also showed that when corrective wear re given to girls, it showed improvement with their grades, in comparison to the boy's .⁽⁴⁾ following research that was conducted in the academic years 2012-2013 and 2013-2014, (Renner K. 2017) it shows a correlation where corrected vision can improve a student's grades. Because a high percentage of information for one to learn is visually presented, people must be able to see it. (Renner K. 2017) ⁽⁵⁾

Myopia appears to be the most common refractive error seen in young children. (Childrennational.org) ⁽⁶⁾ Refractive corrections show to be the leading cause of visual impairment among school children; most school children with such a condition tend to be asymptomatic. Refractive errors once caught early can be corrected; being visually impaired can have a detrimental impact on a child's educational journey.

With this information, it lends more support as to why it is incredibly pertinent that we do visual screenings and eye exams on children upon entry into primary school. This study highlighted that only children whose conditions were severe or noticeable to their parents or teachers were the students to undergo an ophthalmological exam. This study showed a correlation between the students with myopia and those whose father and siblings didn't wear spectacles.(Mohammed A et al, 2014)⁽⁷⁾

Vision problems which do not correct or lessen during growth and development and which remain undocumented and untreated may impact academic performance in schools. There could be a correlation between low-income families and those with undiagnosed refractive errors. (Thurston A et al, 2015)⁽⁸⁾

With 350 students investigated, 28.29% had reduced visual acuity of 20/30 and below, and 71.71% had normal visual acuity in one or both eyes of 20/20 and above. Researchers used the responses from a structured questionnaire, recorded visual acuity and academic performance of each student to assess their school performance. 46.57% of the 350 students had unsatisfactory or poor school performance of 50% and below. This study emphasized the importance of school screening for uncorrected refractive error to identify whether children needed vision therapy like spectacles. (E. L. K et al, 2019)⁽⁹⁾

Researchers found that presenting visual acuity in Singaporean school children showed no significant effect on current or academic school performance. One year later, the study modified to consider associated risk factors, which included gender, ethnicity, school, time spent reading, IQ and father's highest level of education. Visual acuity was not the only method of assessment used for this study. Each student had a comprehensive eye examination and the number of books they read per week was contributing factor. (Dirani M et al, 2019)⁽¹⁰⁾

The effect of environment on academic performance

The data showed that only 7.03% of the Brazilian children of the Elementary School of Curitiba had a visual acuity of equal to or worse than 20/30. Only one child had a poor vision with poor school performance; this was due to the seating position of the child in the last row of desks in the classroom. Visual acuity was not the only means of assessment in this study. The length of the classroom, light intensity, size of blackboard and books' were also used. These methods emphasized the relationship between learning and good school work conditions. This study concluded that there was reduced visual acuity between 7-10-year-olds and it did not affect their academic performance but rather their working conditions. (Neto C. et al, 2019)⁽¹¹⁾

All research cited above from 2014 showed a common thread. The children all had an uncorrected refractive error. Most of them were myopic while the remaining were hyperopic and astigmatic. There was also a correlation with how girls performed compared to the boys, once given corrected wear. It was also very noticeable that having uncorrected refractive errors were related to the students obtaining lower grades in their academic careers. This finding was supported by the studies confirming that when uncorrected refractive errors were corrected, there was a vast

improvement in grades. There was a relationship between those students who did a significant amount of near work activities such as reading. Those whose siblings wore spectacles tended to have myopia. These studies brought about that once refractive errors were corrected early enough, there was a chance for modification of grades of these students.

Other reasons for low academic assessment results

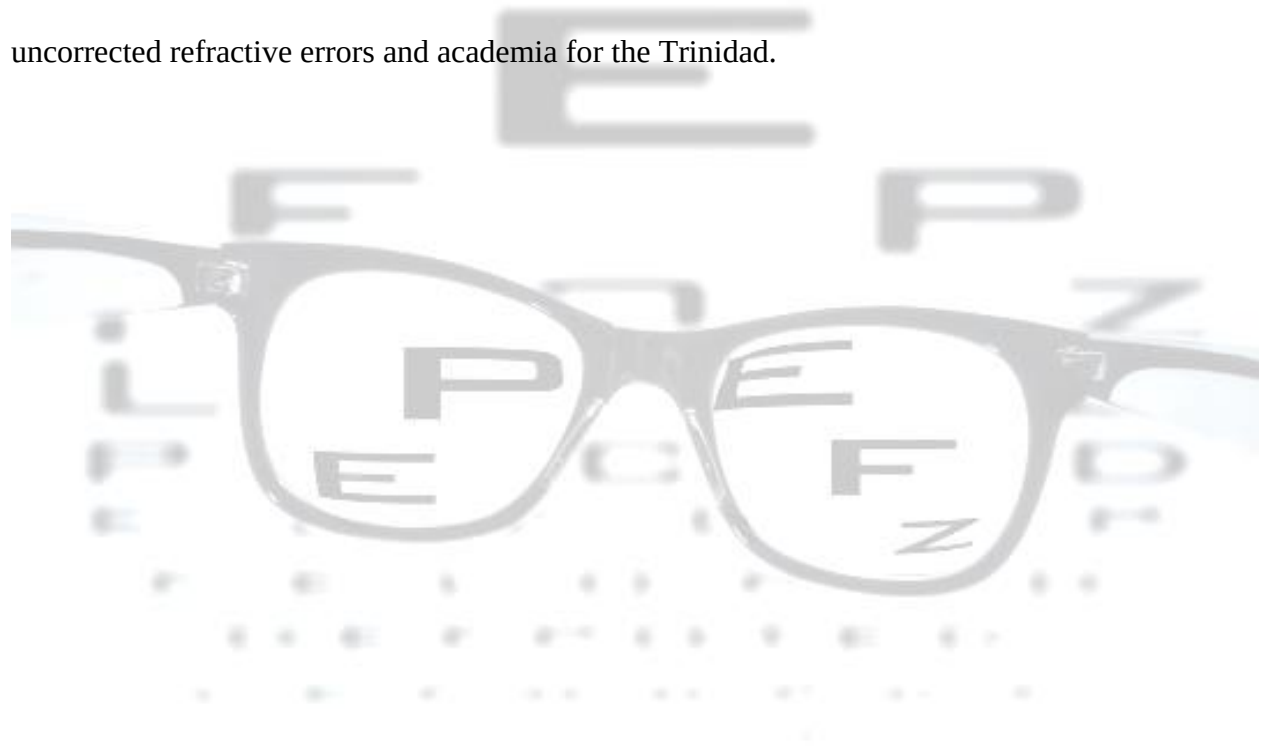
Research shows that primary school children from the rural areas of north China were investigated. The results indicated that there was a high prevalence of reduced uncorrected visual acuity and poor vision using the results from visual acuity screenings among 19,977 grade four ages 10-11 and grade five ages' 11-12 students in 253 primary schools. Visual acuity was not the only source of data collection, a questionnaire, standardized mathematics test and psychological test were other methods used and considered. According to the data presented, it suggested that a student's test score decreased as his/her vision reduced. (YI H et al, 2019)⁽¹²⁾

This study shows that 80% of what a child is to learn will be visual. The study concluded that uncorrected hyperopia ≥ 4.0 D or uncorrected hyperopia that is greater than +3.0 D and associated with reduced binocular near VA (20/40 or worse) or reduced near stereo acuity (240 seconds of arc or worse) in 4- and 5-year-old children it there is low scoring on a test of early literacy.⁽⁹⁾

Based on a study conducted, it was concluded that when there was mild to moderate visual impairment, there was a significant impact on educational performance, specifically mathematics and vocabulary. Mild to moderate visual impairment referred to vision that was just below 20/20. The primary method of assessment used for this study was visual acuity using a Snellen Chart. When children with poorer visual acuities were investigated, they performed better in

mathematics, reading activities and vocabulary. However, when external factors like the education level of their family members were considered, the results were reversed. There was a significant negative effect of reduced visual acuity on mathematics and vocabulary specifically.⁽¹⁰⁾

This study will look at examining if uncorrected errors contribute to the students who wrote the Secondary Entrance Assessment in 2018, scoring in the lower percentiles. This study will add to the already existing literature on the said topic; however, it strives to focus on the relationship with uncorrected refractive errors and academia for the Trinidad.



CHAPTER 3

Research Design

The study design was a case study. This study design was chosen to examine a phenomenon in a real-life situation. It was also a case study because there was an introduction which set the stage, background information which explained why the case study was created, there were presentations of findings and a conclusion which presented all of the data and references (Press Academia, 2018).

Population

The population was a sample size of 100 students who scored 30% and lower in the Secondary Assessment Examination in 2018.

Study Site or Area of the Study

The Ministry of Education identified the Schools in Central Trinidad in demographic area of the University of the West Indies Optometry School in the Couva.

Inclusion Criteria

Students who scored 30% and lowered in the Secondary Assessment Examination in 2018

Exclusion Criteria

Students who scored above 30% in the Secondary Assessment Examination in 2018

Sample Size and Sampling Technique

The students in the school who scored 30% and lower in the Secondary Assessment Examination in 2018

Sample Size Determinations

Students who scored 30% and below in the 2018 Secondary Assessment Examination were recruited from the Ministry of Education

Sampling Techniques

The list of subjects for this research was obtained from the supervisor for student support services division as identified by the Ministry of Education

Ethical Consideration

Written approvals were obtained from the Ethics Committees of the Ministry of Health and Ministry of Education before engaging the school principal and the sample subjects. Following the approvals, the Research team met with the School Principal and Form 1 teachers on the research. One hundred consent forms for parents were given to teachers to distribute to the students who scored 30% and below in the SEA 2018 examination. These forms were signed by the parents permitting the students to participate in the research.

The sample group obtained written consent from their parent/ guardian to participate in the study. The investigators obtained ninety –three written consent forms from the subjects which were signed by the parents upon their arrival at the school. The Subjects got questionnaires consisting of questions which help the researchers develop an understanding of their pass ocular health. All participants gave contact details to contact them if need be.

Only the principal and co-investigators will have access to data. The laptop and files will be password protected.

Consequences of the risk and any possible treatment can entail, the subjects being prescribed reading spectacles at the end of the routine eye exam.

A trained professional such as a lecturer was present when the measurements were conducted in cases of emergency; they would have assisted

Immediately at the end of the routine eye screening, the results were communicated to the participants.

The following procedures were part of routine screening Visual acuity, NPC, stereopsis testing and colour vision testing.

Test and Instrument /Equipment

Visual acuity (VA), binocular testing, Colour vision testing, and Near Point of Convergence was conducted on the sample students by the investigators from The UWI School of Optometry. These tests would help decipher those with refractive problems and those lacking. These examinations were approximate 10-15minutes each, and occur at the beginning of the January to March school term at a Secondary Comprehensive school compound.

Data Collection Procedure

The data obtained were available to the investigators. No names were used in the study to ensure patient confidentiality.

Data was stored electronically, on a computer for the duration of the research project and will be kept for approximately five years. Only three persons, the principal investigator and two co-investigators, had access this data. All computer devices used were password protected.

Data Collection Method

Simple random sampling was done to give each sample a fair chance of being chosen. Also, because the sample population was small.

The population was 93 as those were the number of consent forms returned. Nine three pieces of paper were used. On each piece of paper, age between 12-14 years, sex male or female was written. An eye screening result for each test conducted, an answer for each of the questions on the questionnaire recorded. Each paper was folded separately and placed in a box. The box then shook to allow mixing of the pieces of paper.

Papers were drawn out of the box randomly and numbered. These numbers were used as the student's identification numbers.

Eye Examinations/Protocols

The students who obtained within the thirty percentile (30%) and below rate were the first to be investigated by answering the questionnaire; for example, they were asked do you wear glasses or not. Their distance visual acuities were then tested using a Log MAR chart. Their near visual acuities were also taken using a near chart. The collected data was then plotted on two graphs to analyse the data gathered; No. of Students vs Visual Acuity for both distance and near. The visual acuity was taken to measure how well each student was able to distinguish the details of objects from a specific distance.

Binocular vision was also assessed to get a holistic view of the vision of the students.⁽¹¹⁾⁽¹²⁾ Stereopsis was tested using stereofly. The Stereofly test was done by giving the students some polarised glasses to wear, which was followed by asking the subject to pick up the wings. If the patient is unable to, it can be due to amblyopia or strabismus. Therefore the examiner would have to do further tests, such as the Frisby. The minutes of arc per student tallied. The results obtained from each student is depicted in a bar chart. Stereopsis was measured to assess how well both eyes work together in order to achieve depth perception.⁽¹⁵⁾

Colour vision is the ability of the eye to detect the various wavelengths of light as well as differentiate the colour of each wavelength of light. The Ishihara colour vision test was performed on each student to assess their colour viewing abilities. It was done by presenting the various plates in the Ishihara booklet to each child at 40cm. The child asked to observe each plate and state what they identified in each plate. The results recorded in a pie chart.⁽¹⁶⁾

To assess how well the eyes were able to focus at near, the Near Point of Convergence (NPC) was measured. It was done by using an RAF rule. Patient-focused on the black dot at the center of the line of the box on the RAF rule. The Raf rule was placed at the nose of the patient. The box moved towards the patient's eyes at a constant pace. The patient asked whether one dot was seen or whether there were two dots. The patient's eyes also observed while conducting the test. The distance where the patient begins to see two dots were recorded in a table.

CHAPTER 4

This research transpired to analyze the relationship between Refractive Error and the academic performance of students who attained 30 % and below in the 2018 secondary assessment examination in Trinidad. The proportion of students with Refractive errors from the sample total identified and corrective treatment inured. An emphasis on eye screening was expressed.

Because of the COVID 19 pandemic, the schools were close; therefore, data could not have been accumulated so hypothetical data was used. An evaluation of 93 students who responded to the questionnaire were the ones that participated in the analytical data.

The following eye screening was conducted with Visual Acuity. Near the point of conversion, colour vision testing, stereopsis testing, and binocular testing.

The visual Acuity was tested for near and distance vision. The following graphs below show the result found. The near conversion test was done. These findings are shown in the following.

Binocular vision was also tested, and the result is seen in a pie chart.

Colour vision screening was also conducted; these findings are depicted below.

A questionnaire was administered to each participant before the commencement of the screening.

The questions asked were;

- 1) Where are you seated in your classroom?
- 2) How many windows are there in your classroom?

- 3) Do you see things more precise when you sit closer or further away from your usual seat?
- 4) Do your eyes water/burn you during the course of the day?
- 5) Does the glare from the sun affect you? If yes, please state what discomfort you experience?
- 6) Have you ever had an eye exam? If yes, can you recall how long ago?
- 7) Do you wear spectacles?
- 8) Anyone in your family wears glasses? If yes, please state who?
- 9) Who influenced your choice of your Secondary School? Your parents. Your teachers or You

The analysis of the answers is as seen below.

The analysis of the refractive error was done on 93 children between the ages of 12 to 14 years in table 1. The participants comprised of 11 males which equalled to 12 % and 82 females being 88%. These finds are shown in figure 1

		# of students	Percentage
age	12 years	4	4%
	13 years	73	78%
	14 years	16	17%

Chart 1 Showing The Different Age Groups Of The Subjects

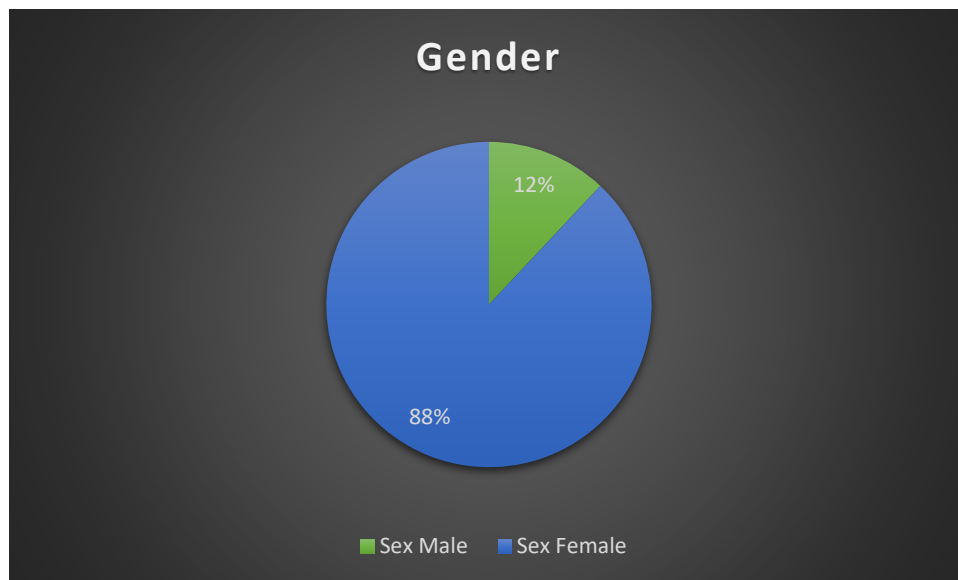


Figure 1 Showing the Percentages of the Different Genders n = 93

The results of the screening for the different types of refractive error are as follow. Visual Acuity was tested for near and distance vision. All participants scored 20/20 for near vision. For distance vision 78 % scored 20/20, 2% scored 20/100, 11% scored 20/80 and 9% scored 20/60. The table for these results is shown in figure 2.

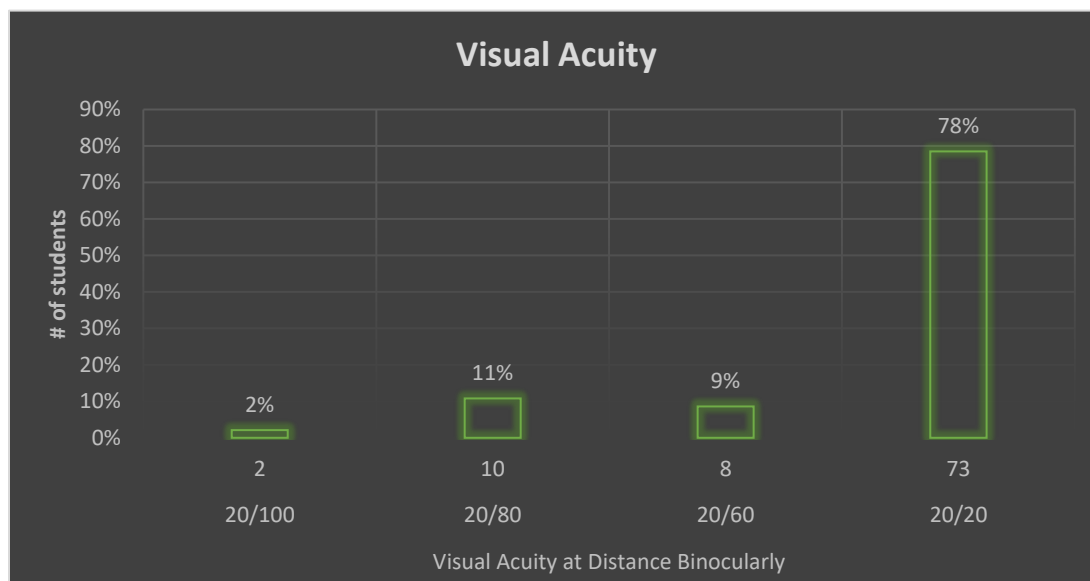


Figure 2 Showing The Amount of Different V.A.'s obtained Participants n =93

The binocular vision of the students we evaluated using near the point of convergence and stereopsis. Which resulted in 88% of the students showed no conversion problem they got to the nose reading from the raf rule that was used, 5% of the students noticed the image became blurry and was unable to clear it up at 10cm. Another 5% of the students had the same issue with a bit more difficulty causing them to report blur at 12 cm. The remaining 1% noticed a break in the accommodative target used at 15cm. The results are shown in table no. 2

		# of Students	Percentage
NPC	Too The Nose	82	88%
	10cm	5	5%
	12cm	5	5%
	15cm	1	1%

Table 2 Show NPC Readings

Stereopsis screening was the 2nd binocular vision test that was done on the students. Which resulted in 92% passed students be able to see the stereofly as well as the identifying that various circles, shapes and objects in the other areas of the test. From the total amount of students that took part 8% failed the stereopsis test. The data, as well as the percentage of students that pass or fail, can be seen in figure 3

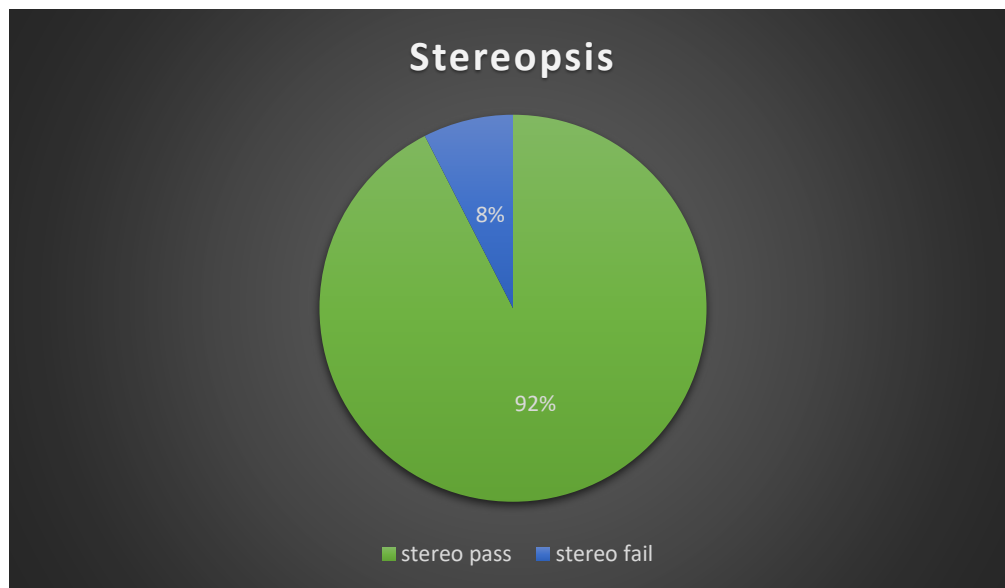


Figure 3 showing Percentage of Those That Pass vs Fail Stereopsis test Participants n =93

The cover test resulted with subjects having exophoria, esophoria, exotropia and orthophoria and orthotropia. A significant amount of the population was orthophoria 83% another 6% of them were exophoria and esophoria. Another 4% of them exotropia. These values are observed in table 3

		# of students	Percentage
Cover text findings	orthophoria	77	83%
	exophoria	6	6%
	esophoria	6	6%
	exotropia	4	4%

Table 3 Showing The Amount of Students Presented with Phorias /Tropia and those without

From the questionnaires were conducted among the subjects, 12% of them were males, and 88% were females. Out of this, 20% of reported having family members that wore glasses, 80% said none of their family members wore spectacles. We evaluated students wearing glasses, along with those who do not were observed. Respectfully the readings for this were 10% and 90%. 3% of the students complained of having glare problems, 6% have watery eyes, 4% found their eyes burnt, and 80% of them had none of the environmental issues. The data can be seen in tables 4 and 5 respectfully.

		Total	Percentage
Glass History	Students family members with glass	19	20%
	Students family members without glasses	74	80%
	students with glasses	9	10%
	students without glasses	84	90%

Table 4 Show Students That has Family that wears Glass as well as Those without Compared to Students that wear Glass and those That Don't

		Total	Percentage
Environmental Factors	Glare	3	3%
	Water	6	6%
	Burning	4	4%
	Nil	80	86%

Table and Graph 5 Showing Environmental Factors that Affect Students Vision

The amount of light that enters into a room carries a certain level of importance when it comes to vision. Based on this, we found it fruitful to inquire how many windows were in the classrooms that the various students occupied. Two windows were reported in 52% of the subject's classrooms, an astonishing 15% had no windows allowing natural light into their class. 14% of students reported having four windows in their class, while 12% had three and the remaining 3% and 4% concluded there were one window and six windows in their respectful classrooms. Data is evaluated in figure 4.

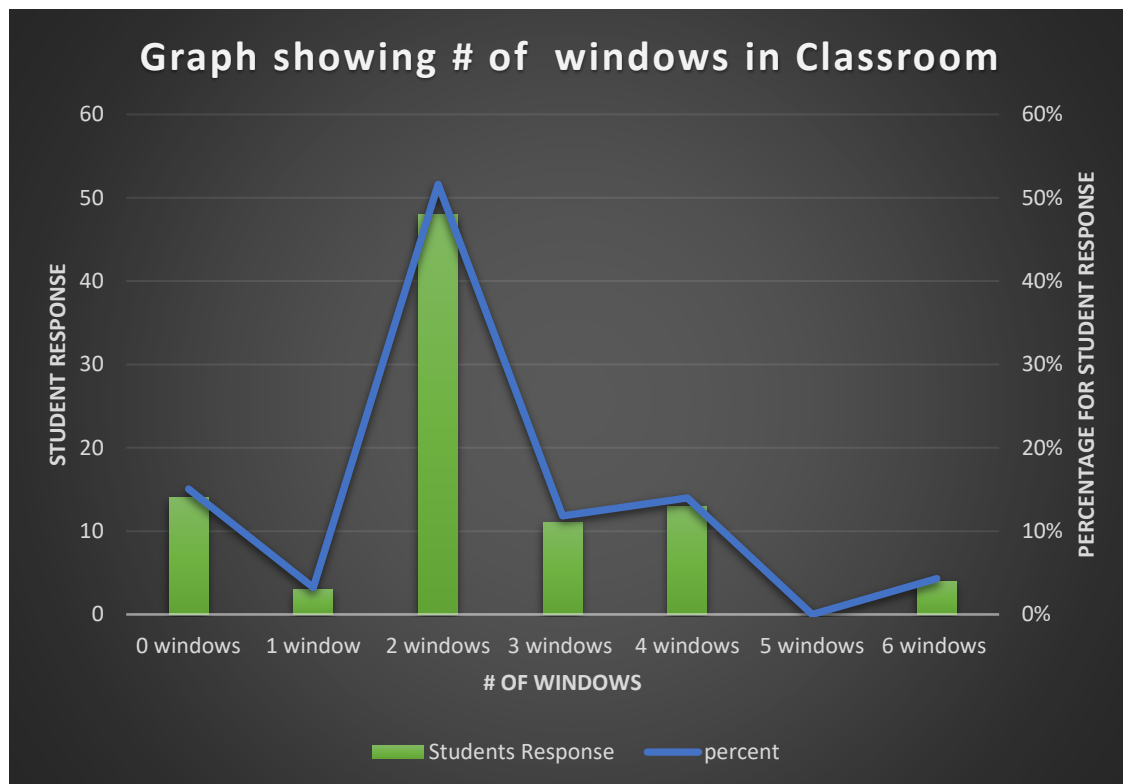


Figure 4 Showing The Responses for How Many Windows Are in Students Classrooms Participants n =93

Children tend to be under a significant amount of pressure from family members, their school and self when it comes to passing exams to entering secondary school. Parents for some kids put an immense amount of pressure on their kids, 89% of the kids said their parents placed a burden on them. 29% of them said they placed pressure on themselves to ensure that they achieve the school they desire. There were 3% that said their school was very influential in secondary schools they attend. Data is represented in table 6.

		Total	Percentage
Source of Pressure to perform accademically	Parents	63	68%
	School	3	3%
	Self	27	29%

Table 6 Shows Where Student Feels Most Pressure to Perform

Based on where someone sits it can cause them to have difficulty seeing, eight said that they see best when they are close to the board, 4% found that further away the board is the better, and 77% believed that at an average distance they see best. 11% of were not sure where it was noticed vision being the best. Besides this, we expanded on it, asking the kids where they sit in class. 22% said the front, 46% favored the middle, 17% sit at the back of the class, and 15% of them occupied the sides. Identifying if the subjects ever had an eye exam is very relevant, 10% of them had an exam before, and 90% never did. Data is represented in figures 5 and 6.

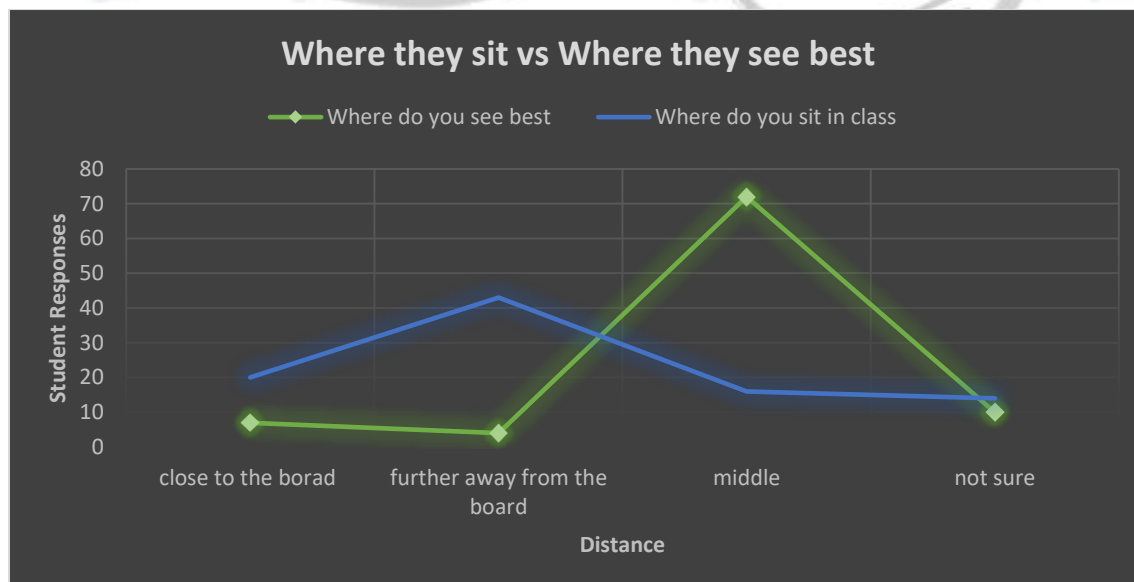


Figure 5 Show Where The Student Sits vs Where They See Best Participants n =93

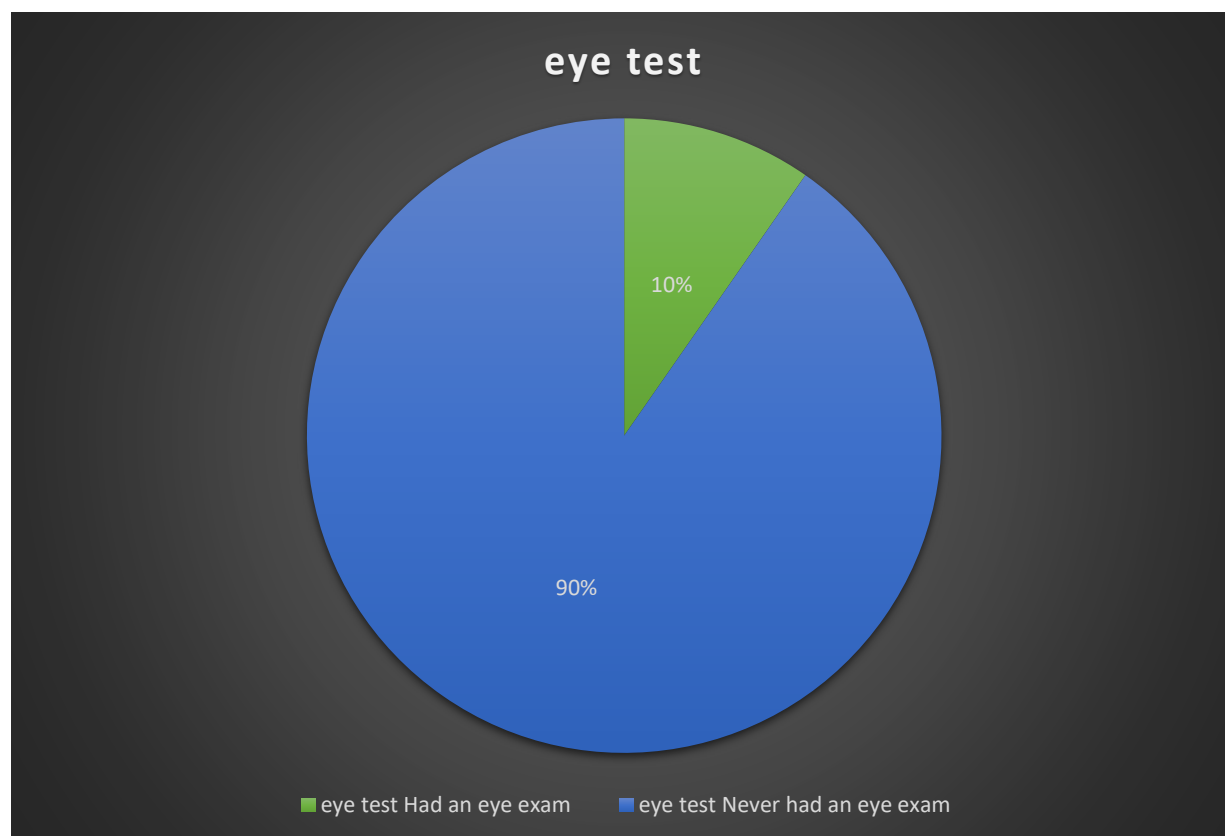


Figure 6 Showing Subjects That Had an Eye Exam vs Those That never had an Eye Exam Participants n =93.

DATA ANALYSIS

Statistical Review of Simulated Findings

The Data was analyzed using Excel computer package SPSS Software. Descriptive statistics were used to generate continuous variables and frequencies for nominal variables. Contingency chi-square test was used to assess the association.

Association between the ‘Seating location’ and ‘The ability to see on the Board’

Ho: There is **no association** between where the student sits and their ability to see on the board

Ha: There is **an association** between where the student sits and their ability to see on the board

A 3 x 2 Fisher’s Exact Test conducted to evaluate whether there was an association between where students sit and their ability to see on the board. Approximately 80 % of the students surveyed (as seen in Figure 5) reported that they could see both areas, while 13.3% were not sure, and 6.7% were able to see close.

The results revealed that there is no statistically significant relationship between the variables, $F(N=93) = 5.28, p=.809$. Cross-tabulations further told that students who sat at the **back** of the class were more likely (87.5%) to report **being able both places than those who** sit at the **Front, Middle and Side** of the classroom. Those who sit at the front were more likely (10%) to indicate that they can see ‘**Close**’ than those in other positions and those who sat in the back were more likely (6.3%) to see further.

Crosstabulation: Perception of the Students' ability to see in relation to where they were seated

Response	Seating Area								Total Frequency
	BACK		FRONT		MIDDLE		SIDE		
	F	Proportion (%)	F	Proportion (%)	F	Proportion (%)	F	Proportion (%)	
Both	14	87.5%	16	80.0%	30	71.4%	12	80.0%	72
Close	1	6.3%	2	10.0%	3	7.1%	1	6.7%	7
Further	1	6.3%	1	5.0%	2	4.8%	0	0.0%	4
Not Sure	0	0.0%	1	5.0%	7	16.7%	2	13.3%	10
Total	16	100%	20	100%	42	100%	15	100%	93

Fisher's Exact Test Statistics for Association between the 'Seating Location' and 'The Ability to see on the Board'

	N	F	P-Value	Cramer's V
<i>Exact two sided results</i>	93	5.28	0.809	0.138

Association between ‘Eye Exam’ and ‘Visual Activity at a Distance (VAD)’u

Ho: There is **no association** between an eye exam and visual activity issues at a distance

Ha: There is **an association** between an eye exam and visual activity issues at a distance

A 3 x 2 Fisher’s Exact Test conducted to evaluate where there was an association between the students who have or have not had an eye exam and having a visual activity issue at a distance.

Approximately 74.2% (69) of the students surveyed (as seen in figure 2) reported no visual activity issues at a distance, and 25.8% (24) reported visual activity issues at a distance.

The results revealed that there is no statistically significant relationship between the two variables, $F(N=93) = 1.79$, $p=.617$. Cross-tabulations further revealed that students who had **No Eye Exam** were less likely (72.6%) to report **20/20 vision** than those who had an eye exam (88.5%). These results suggest that whether or not the students had an eye exam did play and impacting role on their visual activity at a distance for those students sampled.

Crosstabulation: Classification of Eye Exams Undertaken by Students with respect to Visual Activity Problems at a Distance

Eye Exams	Eye Exam Undertaken				Total Frequency
	NO		YES		
	Frequency	Proportion (%)	Frequency	Proportion (%)	
20/100	2	2.4%	0	0.0%	2 (2.2%)
20/20	61	72.6%	8	88.9%	69 (74.2%)
20/60	12	14.3%	0	0.0%	12 (12.9%)
20/80	9	10.7%	1	11.1%	10 (10.8%)
Total	84	100%	9	100%	93

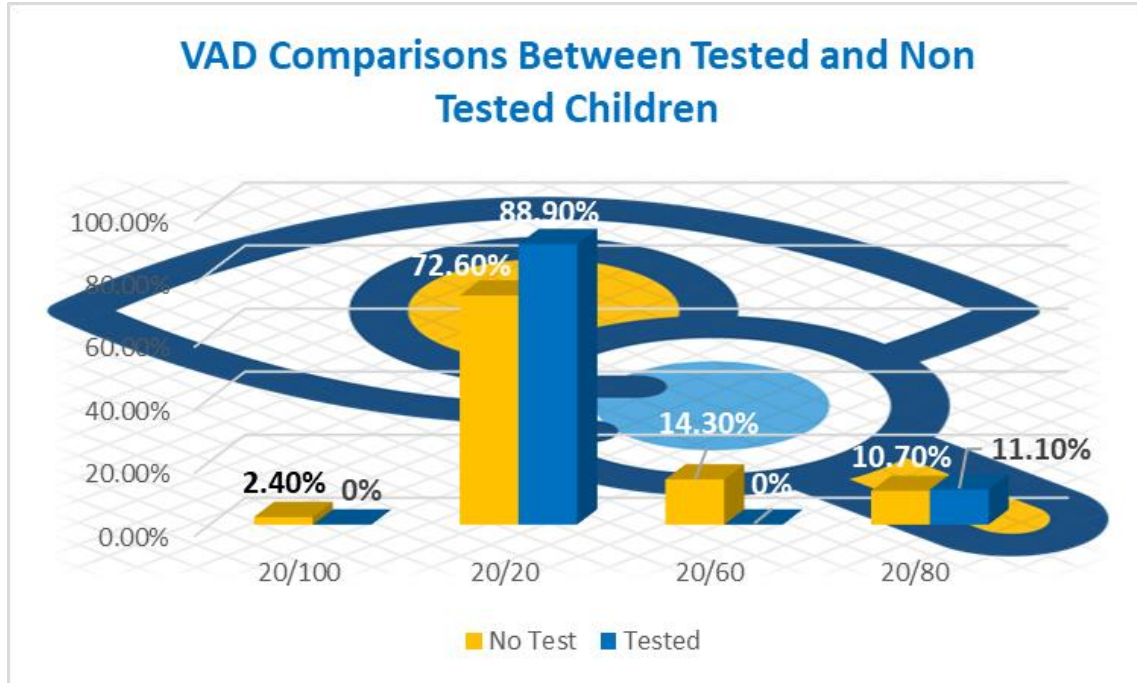


Figure 7 Comparisons Between Tested and Non Tested Children

Fisher's Exact Test Statistics for Association between the 'Eye Exam' and 'Visual Activity at a Distance (VAD)'

	N	F	P-Value	Phi Coefficient
<i>Exact two sided results</i>	93	1.79	0.617	0.139

Association between 'number of windows in the classroom and type of environment

Ho: There is **no association** between the number of windows in the classroom and type of environment

Ha: There is **an association** between the number of windows in the classroom and type of environment

The cross-tabulation analysis revealed there was no discernible pattern of association between the number of Windows and the type of environment experienced by the student. Approximately 86.0% (80) of the class reported no issues. Students situated in classes where there was no window were more likely (15.4%) to report watery eyes than students located where there were 1 to 2 windows, (3.9%) and 3 to 6 windows (6.9%). Children in spaces with 1 to 2 windows (90.2%) and 3 to 6 windows (86.2%) were more likely to report no effect than children with no windows (69.2%), those children in areas with 3 to 6 windows were more likely (6.9%) to experience glare than those with 1 to 2 windows (2%) or no window (0%). Those students with no window were surely (15.4%) to experience burning eyes than their counterparts situated in other configurations.

A 4 x 3 Fisher's Exact test revealed no statistically significant association between the number of windows and environment experienced $F(N= 93) = 8.31, p= .121$

Crosstabulation: Number of Windows in Classroom and Environment Effect

<i>Response</i>	No Window		1 to 2 Windows		3 to 6 Windows		Total Frequency
	Frequency	Proportion (%)	Frequency	Proportion (%)	Frequency	Proportion (%)	
<i>Burning</i>	2	15.40%	2	3.90%	0	0%	4(4.3%)
<i>Glare</i>	0	0%	1	2.00%	2	6.90%	3(3.2%)
<i>Nil</i>	9	69.20%	46	90.20%	25	86.20%	80(86.0%)
<i>Watery</i>	2	15.40%	2	3.90%	2	6.90%	6(6.5%)
Total	13	100	51	100	29	100	93

Fisher's Exact Test Statistics for Association between the 'Number of Windows in Classroom and type of Environment'

	N	F	P- Value	Cramer's V
<i>Exact two sided results</i>	93	8.31	0.121	.226

Association between 'Gender' and 'Performance Pressure'

Ho: There is **no association** between gender and students' performance pressure

Ha: There is **an association** between gender and students' performance pressure

A 3 x 2 Fisher's Exact Test conducted to evaluate where there was an association between gender and performance pressure. Approximately 67.7% (63) of the students surveyed (as seen in table 6) reported parents to be responsible for exerting performance pressure while 29% was self- pressure and 3.2% school pressure. The results revealed that there is no statistically significant relationship between the two variables, $F(N=93) = 2.51, p=.282$. Cross-tabulations revealed that students who experienced performance pressure from parents are more likely to be Female (69.5%) than male (54.5%)

Those experiencing pressure from self are more likely (36.4%) to be Males than **Female (28%)** and 9.1% of **Male students'** experience performance pressure from the school compared to 2.4% of female students.

Crosstabulation: Various Groups Students are Pressured by Sex

Options	Perception of pressure felt by students by the various groups				Total Frequency
	FEMALE		MALE		
	Frequency	Proportion (%)	Frequency	Proportion (%)	
Parent	57	69.5%	6	54.5%	63 (67.7%)
Self	23	28.0%	4	36.4%	27 (29%)
School	2	2.4%	1	9.1%	3 (3.2%)
Total	82	100%	11	100%	93

Fisher's Exact Test Statistics for Association between the 'Gender' and 'Performance Pressure'

	N	F	P- Value	Phi Coefficient
<i>Exact two sided results</i>	93	2.51	.282	0.142

Association between 'Person Wearing Glasses' and 'Family Member Wearing Glasses'

Ho: There is **no association** between student wearing glasses and family member wearing glasses

Ha: There is **an association** between student wearing glasses and family member wearing glasses

A Pearson Chi-Square Test conducted to evaluate where there was an association between students who wore glasses and family members wearing glasses. Approximately 90.5% of the students surveyed (as seen in table 4) reported that they wore glasses,

The results revealed that there is a statistically significant relationship between the two variables, $X^2(1) = 12.04$, $p = .001$. Cross-tabulations further revealed that students who did not have a family member who did not wear glasses were surely (90.5%) **Not Wear Glasses** themselves than those who had family who wore glasses (70.0%). Conversely, those have family members who wore glasses were more likely to (30%) to **Wear Glasses** themselves and those who had family members that did not wear glasses (4.1 %).

The association is moderately intense, as assessed by the Phi coefficient (.360). These results suggest that if a student has family members who wear glasses, then they stand a good chance of wearing glasses. Additionally, if acknowledged whether or not the student has family members who wear glasses, then 36% of the time, it can correctly predict whether or not they too are wearing glasses.

Cross tabulation: Students' who wore glasses in relation to whether or not their family members also wore glasses

	GLASS FAMILY				
	NO		YES		Total
	Frequency	Proportion (%)	Frequency	Proportion (%)	
<i>Glass Self</i>					Frequency
No	70	95.9%	14	70.0%	84 (90.5%)
Yes	3	4.1%	6	30.0%	9 (9.7%)
Total	73	100%	20	100%	93



Figure 8 Children Who Wear Glasses vs Family Members Who Also Wear Glasses

Pearson Chi-Square Test Statistics for Association between the 'Person Wearing Glasses' and 'Family Member Wearing Glasses'

	N	F	P-Value	Phi Coefficient
Exact two sided results	93	12.04	0.001	0.360

CHAPTER 5

Discussion

In this research, all of the participant scored 20/20 for near in visual acuity. For distance 2% scored 20/100, 11% scored 20/80 and 9% scored 20/60 and 78% scored 20/20, In a study conducted ⁵ a high percentage 71.17% of children had normal visual acuity in one or both eyes this is supporting my research findings of 100 % of the participants scoring 20/20 at near distance and 78 % at far distance. Near vision has been shown to have a positive impact on good academic performance²⁵ (Castellanos 2019)

In another study ⁷ 7.03% of the participants had a visual acuity of 20/30 and worst. This finding was reflected in my study where visual acuity were 2%, 9%, and 11% totaling 22% this showed a high percentage of students with visual acuity and low academic performance. This result can also be linked to the significance of students test scores being low with low visual acuity.⁽⁸⁾

Although visual acuity has found to be positive influence on students' academic performance is argumentative because of adverse findings and variables in different researches. Due to the limitations in the research methodology, the tools used and the different sample size. It is recommended that well designed studies be done to understand the relationship between academic performance and students' visual acuity. (Hopkins et al. 2019) ⁽³²⁾

The study emphasized the importance of an adequate learning environment for the achievement of a high - level academic performance. This result is related to a survey conducted which highlighted the value of vision in learning associated with a learning environment to achieve positive academic performance. Concerning school, environment plays a part in academic achievement a study

showed no reduction in academic performance and classroom environment ⁽⁷⁾. The significance of proper seating arrangement in connection with vision has been found to be a major contribution to the success in students' academic performance.⁽²⁶⁾ (Negiloni, Ramani and Sudhir 2019) When compared to the literature this research looked at the seating position in class as it relates to vision. There was an association between where the students sat and their ability to see the board.

The results revealed that there is no statistically significant relationship between the variables, $F(N=93) = 5.28, p=.809$. Cross-tabulations further told that students who sat at the back of the class were more likely (87.5%) to report being able to see appropriately both places than those who sat at the Front, Middle and Side of the classroom. Those who sit at the front were more likely (10%) to indicate that they can see 'Close' than those in other positions and those who sat in the back were more likely (6.3%) to see further.

The effect on parents' opinions on the students' academic performance was tested by asking if the school of choice was influence by the parents, students themselves or their primary school 89 % of the students said their parents influenced their decision. The literature has shown parental influence impact positively on students' academic performances. (Lara and Saracostti 2019) ⁽²⁷⁾. In this study, approximately 67.7% (63) of the students surveyed (as seen in table 6) reported parents to be responsible for exerting performance pressure while 29% was self- pressure and 3.2% school pressure. The results revealed that there is no statistically significant relationship between the two variables, $F(N=93) = 2.51, p=.282$. Cross-tabulations revealed that students who experienced performance pressure from parents are more likely to be Female (69.5%) than male

(54.5%) This can be related to a study which stated females who lived with their fathers performed better academically than males. (Sharma and Jasleen 2017) ⁽²⁸⁾

The relationship between the use of glasses between students and family members were addressed. The results showed if a student has family members who wear glasses, then they stand a good chance of wearing glasses. Additionally, if acknowledged whether or not the student has family members who wear glasses, then 36% of the time, it can correctly predict whether or not they too are wearing glasses. It has been reported that students who are diagnosed with myopia tend to have siblings who wore glasses ⁽⁷⁾.

Finally, the importance of students having vision screening has been investigated the findings revealed that students who had No Eye Exam were less likely (74.2%) to report 20/20 vision than those who had an eye exam (88.5%). These results suggest that whether or not the students had an eye exam did play an impacting role on their visual activity at a distance for those students sampled. This belief is shown in a study conducted in Florida, where it was reported the exposure of the students to vision screening may have impacted on their passing reading and mathematics examination by 2 %. (Glewwe, West and Lee 2017) ⁽²⁹⁾

CONCLUSION

This study was conducted to evaluate the effects of refractive error on the academic performance of the students who scored 30% and below in the 2018 Secondary Assessment Examination in Trinidad. Of the simulated results one hundred (100) consent forms were delivered to the teachers at the Chaguanas Secondary School to be given to all the students who scored 30% and below in the 2018 Secondary Assessment Examination. Ninety three (93) forms were returned, thus this being the size of the population for the study, which was 12% males and 88% females. The age group ranged from 12 to 14 years of age.

The result of the research showed 100% of the participants had a score of 20/20 visual acuity in near vision, 78 % in distant vision with 22 % having abnormal visual acuity in distant vision.

The research has also shown the environment, and classroom settings have effects on students' academic performance.

The results obtained from the study showed a significant relationship between refractive error, the effects of the learning environment and family input into the academic performance of the students who scored 30% and below in the 2018 Secondary Examination Assessment in Trinidad.

Some of the conclusions drawn from the study may assist with the beginning of other studies in connection with the reasons for low level grading of students' academic performance. Because of the low academic performance it is projected the possibility of defective basic skills in the students personal lives and their level of contribution to society as an adult.

LIMIATIONS

Due to the COVID 19 pandemic schools were closed which prevented access to communicate with the students to get parental consent, do the eye screening, and have the questionnaires filled out.

Another limitation is the use of one school to conduct the study this was also due the closure of the Ministry of Education as a result of the COVID 19 pandemic which hindered access to get the list of school where the students were allocated after the examination. Therefore only one school was used for the study because of time and location.

The unavailability of data from Trinidad on the research topic has been a severe limitation.

There is unavailability of data from Trinidad on the effect of the classroom on students' academic performance.

Different tools are used to evaluate the effect of refractive errors on academic performance for example some researchers use eye screening only, some relate vision to environment, and others to social and psychological problems.

RECOMMENDATIONS

The list of the schools where the students were allocated could be made available in soft and not wait to be submitted in hard copy from the Ministry of Education.

Another recommendation is to redo this study in the future on SEA students who scored 30% below to see the effect of refractive errors on their academic outcome. This would inform the education system in Trinidad if this is an effect of children's low academic performance.

Further studies are needed to be done on different age groups and schools to determine the relationship of refractive errors and academic performances.

A larger sample size using more than one school in different locations in Trinidad would give a more accurate result to impact on policy change such as the importance of school students having vision screening.

The tools used to test refractive errors on children should be standardized. To include eye screening and other factors such as social, environmental and psychological to assess students' academic performance accurately. This would support researchers who are assessing the effect of social, environmental and psychological factors on students' academic performance.

It may be interesting to expand the demographic data of the family in relation to gender, marital status and financial income. This information could help the researcher to draw further conclusions about parental involvement in relation to students' academic learning. Thus allowing the recommendations to be made according to family needs. There can also be links to student's visual acuity and that of their family.

ACKNOWLEDGEMENTS

It is essential to take this time to say a heartfelt thanks to; The Ministry of Education, The University of The West Indies, The Ministry of Health and The School Board for providing the required approvals to conduct this research.

Appreciation is extended to the UWI Optometry Clinic, which provided all the equipment needed to conduct the research. As well as access to the relevant literature to ensure the project's success. In addition to the administration staff at the clinic, I will like to give recognition to Dr Ezinne for her guidance, extensive knowledge on the Binocular aspect of the research, editing assistance as well as all her recommendations given throughout making this project successful and lastly her encouragement through it all. To Mr Farnon for supervising.

The statistical analysis, along with its respected figures, is as a result of the statistician Ms Smith.

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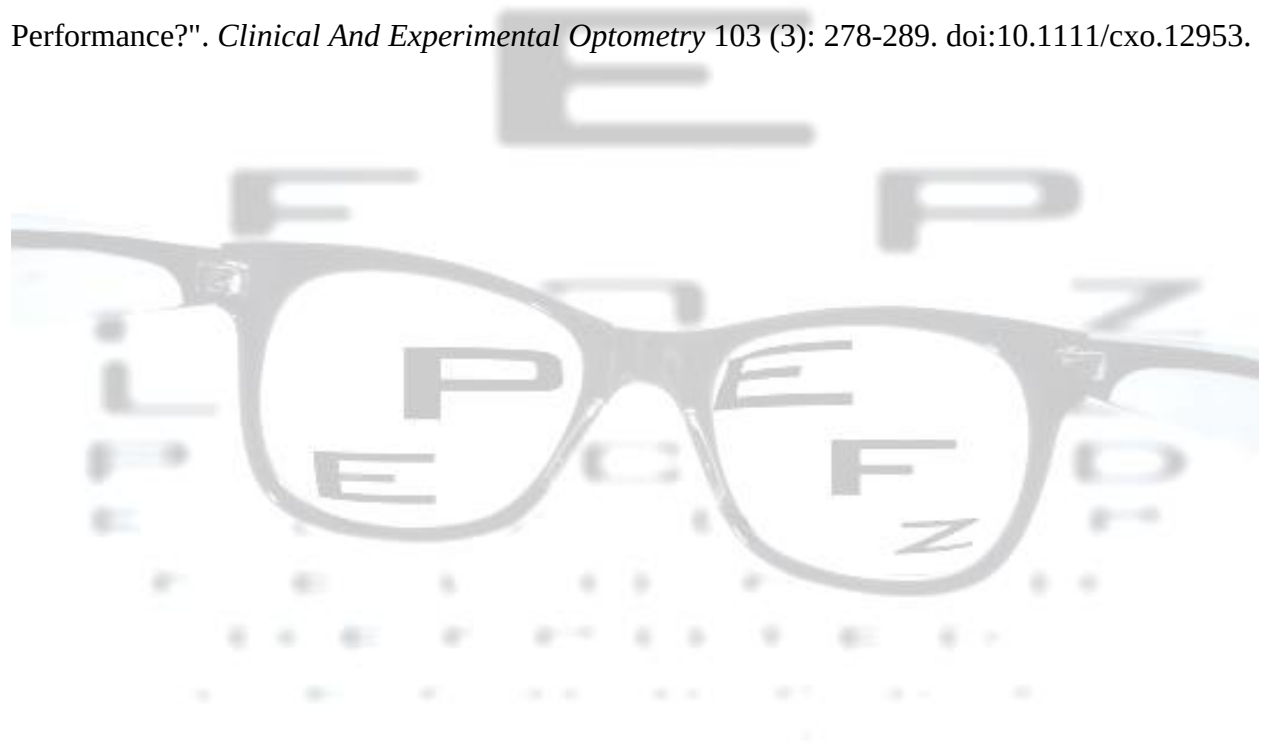
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APPENDICESE

Approvals Form Ministry of Education


Government of the Republic of Trinidad and Tobago
MINISTRY OF EDUCATION
Education Towers, No.5 St. Vincent Street, Port of Spain, Trinidad
1.868.622.2181 Ext. 2342, (Fax) 1.868.624.1222, www.moe.gov.tt
Educational Planning Division
Level 14

E: 14/4/16

18th March, 2020

Ms. Daniella Richardson
Optometry Unit
Couva Hospital and Multi-Training Facility
Faculty of Medical Sciences

Dear Ms. Richardson,

Your request to conduct research entitled **"The Relationship between Refractive Error and Academic Performance in Form One (1) Students in Trinidad and Tobago"** has been approved by the Chief Education Officer of the Ministry of Education.

This approval is granted for the academic year 2019/2020 and permits the researcher to conduct Visual Acuity (VA), Binocular, Colour Vision and Near Point of Convergence (NPC) tests with students at Malick Secondary School in the St. George East Education District.

Attached is a letter of confidentiality, which is to be completed and returned to the Educational Planning Division of the Ministry of Education by the person conducting their research.

Should you require additional information please contact Ms. Jermaine Williams, Research Officer I, Educational Planning Division at 622-2181 ext. 2335 or jermaine.williams@moe.gov.tt.

Yours Respectfully,


Mrs. Lisa Henry-David
Director
Educational Planning Division



The Approval Form Ministry of Health



Government of the Republic of Trinidad and Tobago
Ministry of Health
OFFICE OF THE CHIEF MEDICAL OFFICER
#63 Park Street, Port of Spain

He: 3/13/441 Vol. II
March 9th, 2020

Ms. Daniella Richardson
Optometry Unit
The Couva Hospital and Multi-Training Facility
Faculty of Medical Sciences
The University of the West Indies

Dear Ms. Richardson

Re: Research Study- The Relationship between Refractive Error and Academic Performance in Form One (1) Students at an Urban Secondary School in Trinidad.

The Ministry of Health thanks you for the submission of the research proposal for consideration by the Ethics Committee. After reviewing of the documents submitted for the conduct of this study, we are pleased to inform you that approval has been granted for the conduct of your study.

It is our sincere hope that the results obtained during your study will guide policy and practice in Trinidad and Tobago. In this regard, we would be grateful if the Ministry of Health can be made aware of the results when the study is complete.

Respectfully



Dr. Roshan Parasram
Chief Medical Officer
CHIEF MEDICAL OFFICER
MINISTRY OF HEALTH



1 (868) 627-0010/12/14
Ext. 1616, 1617



1 (868) 623-3755



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The Approval Form UWI Ethics Committee



THE UNIVERSITY OF THE WEST INDIES

ST AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES

CAMPUS RESEARCH ETHICS COMMITTEE

TEL: (1-868) 662-2002 ext. 82755 Email: campusresearch@sta.uwi.edu

March 4 2020

Mr. Niall Farnon (Daniella Richardson)

Gordon Street, St. Augustine, St. George Trinidad and Tobago

Email: niall.farnon@sta.uwi.edu

Dear Mr. Niall Farnon,

Ref: CREC-SA.0070/10/2019

Title: The Relationship Between Refractive Error and Secondary Entrance Assessment (SEA) Results in Trinidad

I am pleased to advise that your application for research on the above captioned topic has been approved on behalf of Campus Research Ethics Committee, St. Augustine.

Sincerely,

A handwritten signature in blue ink, appearing to read 'S Arjoon'.

Surendra Arjoon (Prof.)

Chairman

Ethics Committee

Digitally generated by UWIScholar

Parents' Consent Form And Ascent Form



THE UNIVERSITY OF THE WEST INDIES
ST AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES
CAMPUS RESEARCH ETHICS COMMITTEE
TEL: (1-868) 662-2002 ext. 82700 Email: campusethics@uwi.edu.jm

PARENT/GUARDIAN CONSENT FORM

Title of Research: The Relationship Between Refractive Error and Secondary Entrance Assessment (SEA) Results in Trinidad

Investigators: Mr. Niall Farnon, Daniella Richardson

Your child /ward is being asked to be in a research study. We ask that you read this form and ask any questions that you may have before allowing your child to participate in this study.

What are the things I should know about this study in which I am allowing my child/ward to participate?

This study inquires if the students who scored 30% and less in the SEA exam was due to an uncorrected refractive error; such as VA (near & distance), Stereopsis, Colour vision, NPC.

How much time will it take for my child/ward to participate in this study?

Approximately 20-30mins.

What will happen to my child/ward during the study?

The children would be subjected to various test, which looks at their visual acuity.

Will my child get hurt in the study?

There will be no harm brought to your child during this study.

What if I don't want my child/ward to be in the study?

Parents reserve the right to decline or not part take in the study.

Can he/she be withdrawn from the study?

At any point in time during the study the child can be excused from completing it.

Who should I contact if I have any questions to ask concerning my child's/ward's participation?

Principal Investigator Niall Farnon head of Optometry Unit UWI 225-1016 or Co-Investigators: Daniella Israel-Richardson students at the UWI school of Optometry.

Indicate **Yes** or **No** for the following:

I give consent for my child to be audio-taped during this study
☐ Yes
☐ No

I give consent for my child to be video-taped during this study
☐ Yes
☐ No

Signature

Before deciding if you want your child to be in the study, ask any question you may have. You are also free to ask any question during the study. If you sign your name below, it means that you agree to allow your child to take part in this research study.

Print Your Name

Age

Your Signature

Date

Signature of Second Witness

Date

By Chairman:

This document was approved by Campus Ethics Committee on:

March 4 2020

This document expires on:

2020-04-18



EXPERIMENTAL SUBJECT'S RIGHTS

If I consent for my child/ward to participate in this study involving a medical experiment, I or my child/ward have the right to:

1. Learn the nature and purpose of the experiment (also called "study" or "clinical trial").
2. Receive an explanation of the procedures to be followed in the study, and any drug or device used.
3. Receive a description of any discomforts and risks that I could experience from the study.

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4. Receive an explanation of any benefits that might be expected from the study.
 5. Learn about the risks and benefits of any other available procedures, drugs or devices that might be helpful to my child/ward.
 6. Learn what medical treatment will be made available should my child/ward be injured as a result of this study.
 7. Ask any questions about the study or the procedures involved.
 8. My child/ward can quit the study at any time, and their decision will not be used as an excuse to withhold necessary medical treatment.
 9. Receive a copy of the signed and dated consent form.
 10. I or my child/ward can decide to consent or not to consent to a study without feeling forced or obligated.

If I have questions about a research study, I can call the contact person listed on the consent form. If I have concerns about the research staff, or need more information about my rights as a subject, I can contact the Principal Investigator, The University of the West Indies at: niall.farnon@sta.uwi.edu

By signing this document, I agree that I have ready and received a copy of this document.

REQUEST FOR PERMISSION TO USE AN INDIVIDUAL'S PRIVATE HEALTH INFORMATION

Name of Study: The Relationship Between Refractive Error and Secondary Entrance Assessment (SEA) Results in Trinidad

Investigators: Mr. Niall Farnon, Daniella Richardson

What is private health information?

Private health information is any information that can be traced back to your child/ward. We need your permission to use their private health information in this study. The type of private health information that will be used and shared for this study includes:

- Their past and present physical and mental health information
- Information that can be used to contact you or your child/ward
- Results of their medical tests and DNA
- Questionnaires and information on their drug/alcohol usage and that of your family.

Who else will see their information?

Both the Principal Investigator as well as the Co-Investigators.

How long will the investigators use and share their information?

For the duration of the study after which the data would be destroyed.

What if I change my mind about sharing my child's/ward's research information?

Parents reserve the right to withdraw from the study at any given time.

Do I have the right to see and copy their research information?

In the interest of confidentiality, no names will be taken therefore it will be difficult to

determine which information would pertain to your child specifically.

If you agree to share their information, you should sign this form below. You will receive a copy of this form.

I agree to share my child's/ward's information as described in this form.

Print Name

Signature

Date

If you have questions or concerns about your privacy and the use of your personal medical information, please contact the investigator at the telephone number listed in the consent form.

ASSENT FORM

THE SECTION BELOW TO BE DISCUSSEDD WITH AND SIGNED BY CHILDREN AGES 7 TO 17 YEARS

Name of Study:The Relationship Between Refractive Error and Secondary Entrance Assessment (SEA) Results in Trinidad

Investigators:Mr. Niall Farnon, Daniella Richardson

Why is this study to be done?

This research is conducted to assess if there is a relationship between uncorrected refractive errors and SEA results obtained in Trinidad. From the finding's measures will be taken to not only correct the refractive errors, but to aid in lowering the number of students with uncorrected refractive errors.

What will happen to me during the study?

Tests will be conducted geared in assessing your child's vision.

Can anything bad happen to me?

No

Can anything good happen to me?

Yes, participants can obtain knowledge on their eyes, as well as explanations can be given if need be.

How much time will this take?

Approximately 20mins to screen your child's eyes.

What if I don't want to be in the study? Can I drop out at any time?

No one is obligated to complete the study. All participants reserve the right to cease from continuing.



Will anybody know that I am in this study?

There will be no record of knows during this study, therefore the identity of the subjects would be anonymous.

Signature

Before deciding if you want to be in the study, ask any questions you have. You are free to ask any question during the study. If you sign your name below, it means that you agree to take part in this research study.

Print Your Name	Date
_____	_____
Your Signature	Age
_____	_____
_____	_____

Digitally generated by UWIScholar



The Questionnaire used

Questionnaire

- 1) Where are you seated in your classroom?



2020. *Emergingedtech.Com.*

<https://www.emergingedtech.com/wp/wp-content/uploads/2019/08/Healthy-Positive-Classroom.jpg>

- 2) How many windows are there in your classroom?
- i) 0 windows
 - ii) 1-2 windows
 - iii) 3-6 windows
- 3) Do you see things clearer when you sit closer or further away from your usual seat?
- 4) Do your eyes water/burn you during the course of the day?
- 5) Does the glare from the sun affect you? If yes please state what discomfort you experience?
- 6) Have you ever had an eye exam? If yes can you recall how long ago?
- 7) Do you wear spectacles/glasses?



- 8) Anyone in your family wears spectacles/glasses? If yes please state who?
- 9) Who influence your choice for secondary school?
- i) Parents
 - ii) My Primary School
 - iii) Self

The Excel Sheet where Data was Tailed

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	IDNO.	AGE	SEX	V.A.N	V.A.D	N.P.C.	ST	C.V.T.	C.T.	GL.FAM	GL.SELF	ENV.	OPTION	WINDOW	SEE	SEAT	EYE TEST
2	1	13	F	20/20	20/20	12	PASS	na defec	OTH	NO	NO	G	PT	6	CLOSE	FRONT	NO
3	2	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	4	FURTHER	BACK	NO
4	3	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	YES	NIL	PT	3	CLOSE	BACK	YES
5	4	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	YES	NIL	PT	4	NOT SUI	FRONT	YES
6	5	14	M	20/20	20/100	T.T.H	FAIL	na defec	OTH	NO	NO	NIL	PT	2	CLOSE	MIDDLE	NO
7	6	13	F	20/20	20/160	T.T.H	PASS	na defec	ESOPH	NO	NO	NIL	SO	4	FURTHER	MIDDLE	NO
8	7	14	F	20/20	20/20	10	PASS	na defec	OTH	YES	NO	W	S	0	BOTH	FRONT	NO
9	8	13	M	20/20	20/160	T.T.H	FAIL	na defec	OTH	YES	NO	NIL	PT	0	BOTH	MIDDLE	NO
10	9	14	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	W	PT	3	FURTHER	FRONT	NO
11	10	14	F	20/20	20/160	T.T.H	PASS	na defec	ESOPH	NO	NO	NIL	PT	4	BOTH	BACK	NO
12	11	13	F	20/20	20/20	T.T.H	PASS	na defec	ESOPH	YES	YES	W	PT	0	BOTH	SIDE	YES
13	12	13	F	20/20	20/20	14	PASS	na defec	OTH	NO	NO	B	PT	0	BOTH	FRONT	NO
14	13	13	F	20/20	20/160	10	PASS	na defec	OTH	NO	NO	B	PT	0	BOTH	MIDDLE	NO
15	14	14	F	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	NO	NIL	PT	0	BOTH	SIDE	NO
16	15	15	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	0	BOTH	BACK	NO
17	16	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	NOT SUI	MIDDLE	NO
18	17	13	F	20/20	20/180	10	PASS	na defec	OTH	NO	NO	NIL	S	3	BOTH	MIDDLE	NO
19	18	13	F	20/20	20/20	12	PASS	na defec	ESOPH	NO	NO	NIL	PT	2	BOTH	FRONT	NO
20	19	13	F	20/20	20/20	T.T.H	PASS	na defec	ESOPH	NO	NO	NIL	PT	4	BOTH	BACK	NO
21	20	13	M	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	NO	NIL	SO	6	BOTH	MIDDLE	NO
22	21	13	M	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	G	S	4	BOTH	SIDE	NO
23	22	13	F	20/20	20/160	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	4	BOTH	MIDDLE	NO
24	23	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	4	BOTH	MIDDLE	NO
25	24	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	1	BOTH	SIDE	NO
26	25	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	YES	NIL	PT	0	BOTH	BACK	YES
27	26	13	F	20/20	20/20	T.T.H	FAIL	na defec	OTH	NO	NO	NIL	PT	2	BOTH	FRONT	NO
28	27	13	F	20/20	20/180	T.T.H	PASS	na defec	ESOPH	NO	NO	NIL	PT	2	CLOSE	MIDDLE	NO
29	28	13	F	20/20	20/20	T.T.H	FAIL	na defec	ESOTR	NO	NO	NIL	PT	2	NOT SUI	MIDDLE	NO
30	29	13	M	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
31	30	14	F	20/20	20/20	12	PASS	na defec	OTH	YES	NO	NIL	PT	2	BOTH	MIDDLE	NO
32	31	14	M	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	BACK	NO
33	32	14	M	20/20	20/180	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	4	BOTH	FRONT	NO
34	33	14	F	20/20	20/20	T.T.H	PASS	na defec	ESOTR	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
35	34	14	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	BOTH	MIDDLE	NO
36	35	14	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	1	BOTH	SIDE	NO
37	36	14	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	4	BOTH	FRONT	NO
38	37	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	NO	NIL	PT	4	BOTH	BACK	NO
39	38	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	6	BOTH	MIDDLE	NO
40	39	13	F	20/20	20/160	T.T.H	PASS	na defec	OTH	NO	NO	W	S	6	FURTHER	MIDDLE	NO
41	40	13	F	20/20	20/180	10	PASS	na defec	OTH	NO	NO	NIL	S	3	NOT SUI	SIDE	NO
42	41	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	NO	NIL	PT	2	BOTH	FRONT	NO
43	42	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	B	S	2	BOTH	MIDDLE	NO
44	43	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	BOTH	BACK	NO
45	44	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	BOTH	FRONT	NO
46	45	13	F	20/20	20/100	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	CLOSE	SIDE	NO
47	46	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
48	47	13	F	20/20	20/20	T.T.H	PASS	na defec	ESOPH	YES	NO	NIL	PT	0	BOTH	FRONT	NO
49	48	12	F	20/20	20/20	T.T.H	PASS	na defec	ESOTR	YES	YES	NIL	PT	0	BOTH	BACK	YES
50	49	12	F	20/20	20/180	12	PASS	na defec	OTH	NO	NO	NIL	PT	0	BOTH	MIDDLE	NO
51	50	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
52	51	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	YES	NIL	PT	4	NOT SUI	MIDDLE	YES
53	52	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
54	53	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	3	BOTH	SIDE	NO
55	54	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	YES	NIL	PT	3	BOTH	FRONT	YES
56	55	14	F	20/20	20/160	T.T.H	PASS	na defec	OTH	NO	NO	NIL	SO	3	BOTH	BACK	NO
57	56	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	NO	NIL	PT	3	BOTH	BACK	NO
58	57	14	M	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	NO	NIL	S	3	NOT SUI	SIDE	NO
59	58	13	F	20/20	20/160	T.T.H	PASS	na defec	OTH	YES	NO	NIL	S	2	BOTH	MIDDLE	NO
60	59	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
61	60	13	F	20/20	20/160	T.T.H	PASS	na defec	ESOPH	NO	NO	NIL	S	2	BOTH	MIDDLE	NO
62	61	14	F	20/20	20/20	T.T.H	FAIL	na defec	OTH	NO	NO	NIL	PT	2	NOT SUI	MIDDLE	NO
63	62	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
64	63	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	FRONT	NO
65	64	12	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	FRONT	NO
66	65	13	M	20/20	20/180	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	BOTH	BACK	NO
67	66	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	YES	NO	NIL	S	2	BOTH	BACK	NO
68	67	13	F	20/20	20/20	12	PASS	na defec	OTH	NO	NO	NIL	S	2	BOTH	SIDE	NO
69	68	13	F	20/20	20/160	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
70	69	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	BOTH	MIDDLE	NO
71	70	13	F	20/20	20/180	T.T.H	PASS	na defec	ESOPH	NO	NO	W	S	2	BOTH	FRONT	NO
72	71	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	BOTH	FRONT	NO
73	72	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	YES	G	S	2	CLOSE	FRONT	YES
74	73	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	0	BOTH	BACK	NO
75	74	14	F	20/20	20/180	T.T.H	PPASS	na defec	OTH	NO	NO	NIL	PT	0	BOTH	SIDE	NO
76	75	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	FRONT	NO
77	76	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	3	BOTH	MIDDLE	NO
78	77	13	M	20/20	20/20	T.T.H	FAIL	na defec	OTH	NO	NO	NIL	PT	2	NOT SUI	MIDDLE	NO
79	78	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
80	79	13	F	20/20	20/20	10	PASS	na defec	OTH	NO	NO	B	PT	2	NOT SUI	MIDDLE	NO
81	80	12	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	NOT SUI	MIDDLE	NO
82	81	13	F	20/20	20/160	T.T.H	PASS	na defec	ESOTR	YES	NO	NIL	PT	2	BOTH	MIDDLE	NO
83	82	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	W	PT	1	BOTH	SIDE	NO
84	83	13	M	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	SIDE	NO
85	84	13	F	20/20	20/180	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	4	BOTH	MIDDLE	NO
86	85	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
87	86	13	F	20/20	20/160	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	MIDDLE	NO
88	87	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	BOTH	SIDE	NO
89	88	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	BOTH	FRONT	NO
90	89	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	S	2	BOTH	FRONT	NO
91	90	13	F	20/20	20/20	T.T.H	FAIL	na defec	OTH	NO	NO	NIL	PT	2	BOTH	BACK	NO
92	91	13	F	20/20	20/20	T.T.H	PASS	na defec	ESOPH	YES	NO	NIL	S	2	BOTH	SIDE	NO
93	92	13	F	20/20	20/20	T.T.H	PASS	na defec	OTH	NO	NO	NIL	PT	2	CLOSE	MIDDLE	NO
94	93	13	F	20/20	20/180	10	PASS	na defec	ESOPH	YES	YES	NIL	S	3	BOTH	MIDDLE	YES

