

Risk Assessment on Visual Acuity among Elementary Pupils in the Heritage City of Vigan

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ABSTRACT

Children's vision is linked with the Global Goals for Sustainable Development. The Comprehensive School Eye Health Program's mandate is to prevent, detect, and treat eye disorders in children to realize their rights and enhance their growth and development. The study examined the association between visual acuity and personal factors and the academic performance of 491 pupils of three elementary schools in Vigan City. It used the descriptive correlational research. Data were collected through observation, questionnaire- checklist, and records review and treated by Frequency count, percentage, and simple linear correlation analysis. Findings showed that the majority of the respondents belong to age 10 and 11, male, grade VI, without a family history of vision problems, grandmother commonly suffer vision problem, preferred fruits and vegetables, had 8-10 hours' sleep, television, and cellphone exposure of 0-1 hour daily, and sits while reading. Most respondents have an average visual acuity of 20/20 – 20/25, based on a self-reported result of the Vision Development Quality of Life checklist. The study yielded a significant relationship between quality of Vision (COQV) and a family history of eye problems. Likewise, a significant relationship existed between visual acuity (Snellen's Chart measurement) on both eyes and gadgets used.

Keywords: *visual screening, academic performance, school children, quality of vision, Philippines*

INTRODUCTION

Vision plays a vital role in children's development; it greatly impacts how they learn, interact, and interpret the world around them. Visual impairment can significantly alter a child's neurological, physical, and emotional development. Reduced vision may impair a child's ability and willingness to participate in academics, sports, and other social activities, hurting school performance and limiting personal development. If left untreated, vision problems can affect learning, work productivity, and quality of life, possibly leading to blindness.

Undetected visual problems are one of the causes of academic difficulties in the classroom. An easily administered screening device that identifies children likely to do poorly in school because of vision problems would be a valuable tool. Vision screening and eye examination are vital for detecting conditions that distort the normal visual image, which may lead to inadequate school performance or even blindness in children if left untreated. Cuevas (2007) stressed that vision is a sensory skill that affects a child's learning and general development. To prevent childhood blindness and visual disorder, early detection and treatment of eye and vision problems should be carried out. The student's vision status must

be 20/20 to perform his task demand clearly and comfortably at far and near distances. The nurse's visual screening role and the teacher's part are essential for having a satisfying evaluation of the student's visual health condition, which should be done continuously. Vision screening should be performed at any age, but it is highly recommended as early as age 3 to 4 years. These are the crucial years for detecting eye problems and the best time to initiate treatment for amblyopia, strabismus, anisometropia, and high refractive errors. Further, they mentioned that vision screening at school effectively assesses students' visual acuity and identifies those with vision problems.

Visual acuity describes the acuteness or "sharpness" of vision; that is, the ability to perceive small details measured by the ability to discern letters or numbers at a given distance. The primary measurement tool is the letter chart introduced by Donders and Snellen (Grzybowski, 2016). Measuring visual acuity is frequently taken as a measure of vision. This impression is untrue. Many illnesses can be detected by visual acuity reduction, but not all.

A primary example is glaucoma, which causes extensive and irreversible visual field damage before visual acuity is affected. Letter chart acuity says something about the retinal area onto which the letter seen is projected. When the image of that letter is blurred due to optical factors, the surrounding image will be equally blurred. However, when visual acuity loss is due to retinal factors, letter chart acuity says nothing about how the surrounding retina functions.

Meanwhile, the World Health Organization estimates that 13 million children aged 5–15 years worldwide are visually impaired from uncorrected refractive error. School vision screening programs can identify and treat or refer children with refractive errors (Sharma, Congdon & Patel, 2011). Vision problems affect nearly 13.5 million children. Rates for vision problems increase as children age, and a quarter of adolescents 12 -17 are reported to have eye problems. Poor vision in childhood affects performance in school or at work and negatively influences the child's future, as claimed by Seema, Vashist, Meenakshi & Manish (2009).

Vision problems have been shown to affect a child's achievement in school adversely (Orfield, 2001). Myopic children have trouble reading blackboard notes or other classroom presentation materials. Hyperopic children will have trouble reading or doing any close work. Additionally, eye disorders can lead to permanent visual impairment if not identified and treated early by an eye doctor (Ferebee, 2004). Vision problems can adversely affect students' ability to function and enjoy learning.

A similar school-based screening program conducted by Tablante and Cadorna (2021) showed that the rehabilitation of the beneficiaries' nutritional state contributes to high classroom attendance and enhances their health, nutritional values, and behaviors. Furthermore, the feeding program has been beneficial in improving high school performance over the last three years, with a lower dropout rate, higher promotion rate, and lower repetition rate. Similarly, an eye examination is required to check children's health and academic performance.

School-based screening programs allow early detection of conditions that cannot be cured but require appropriate low-vision services. These include inclusive education to

ensure that every child can achieve their full potential. These further advances social and economic growth at individual and community levels. Third, irritated, sore, light-sensitive eyes significantly impede children's learning ability and may lead to harmful practices, which can further damage the eyes. In some areas, eye morbidity represents a significant cause of school dropout. Detecting and treating common eye conditions, such as conjunctivitis and lid infections, are critical to child-centered comprehensive school health programs. Fourth, considering that 80% (estimate) of what a child learns is processed through the visual system, good vision is critical to the child's ability to participate in and benefit from educational experiences. In that respect, improving the vision of school children contributes to improved education status, which in turn leads to better health in adult age, a spiraling up, virtuous circle (Latorre-Arteaga, Gil-González, Bascarán, Núñez, Morales & Orihuela, 2016).

The result of the assessment and its correlation to variables is hoped to contribute to the early detection of vision problems among children, for the academic institution to work closely with the family in designing strategies that can resolve and minimize vision problems and improve pupils' participation in the learning process. The local health agencies, mainly the City Health Office, actively remind school nurses and teachers to conduct an accurate annual vision screening of their pupils and scale-up interventions on the vision development programs. The academe offering health courses can make necessary integration in their curriculum, specifically in the related learning experience of nursing students to actively take part in initiating vision screening of all students and the conduct of eye care campaign in the locality.

Objective of the Study

This study determined the visual acuity measurement of the Intermediate School Pupils of Vigan City. Specifically, it determined the personal factors (age, sex, grade level, and family history of eye problems, food preferences, sleeping patterns, use of technology/gadget, and reading habits), and academic performance of the respondents, and the significant relationship between visual acuity of the respondents and their personal factors, and academic performance.

METHODOLOGY

Research Design. This study used a descriptive–correlational method of research. It described the visual acuity, personal factors, and academic performance of intermediate pupils. Furthermore, it described the significant relationship between the variables. A descriptive–correlational design was used to describe and correlate the variables in the study of Acena and Llanes (2021).

Population and Sample. The respondents were limited to the 491 Intermediate pupils in three elementary schools in the City of Vigan to represent the location from the Poblacion and the two from eastern and western situated schools.

Data-Gathering Instrument. Snellen's Chart was used to measure the visual acuity of the pupils and interpreted using the ranges and equivalent notations (Thomas, B. Umapathy, E. and Iputo, J. 2008.) as shown in the figure illustrated below. The quality of

vision was gathered using an adopted Vision Development Quality of Life checklist of the College of Optometrists Quality of Vision (COQV). A records review was done on their academic performance based on the computed General Weighted Average (GWA) of Pupils during School Year 2017-2018. Personal Factors were gathered through a questionnaire checklist formulated by the researchers, reviewed, and validated by experts.

Figure 1

Visual acuity ranges and visual acuity notations

RANGES		EQUIVALENT NOTATIONS
NEAR NORMAL VISION	RANGE OF NORMAL VISION	20/12.5 20/16 20/20 20/25
	Mild Vision Loss	20/32 20/40 20/50 20/63
LOW VISION	Moderate Vision Loss	20/80 20/100 20/125 20/160
	Severe Vision Loss	20/200 20/250 20/320 20/400
	Profound Vision Loss	20/500 20/630 20/800 20/1000
NEAR BLINDNESS	Near Blindness	20/1250 20/1600 20/2000
	Blindness	

Data Gathering Procedure. The researchers sought permission from the Schools Division Superintendent to conduct the study and gather necessary data from the three schools of his jurisdiction. A permission letter was forwarded to the School Principals of Vigan Central, Rugsuanan, and Mindoro Elementary Schools. Likewise, the class advisers were informed about the activity's purpose and benefits. The General Weighted Average of pupils from the previous school year was reviewed from the adviser's record. Before data gathering, secured consent from parents was obtained, and an explanation of the procedure was given to the pupils.

Ethical Considerations. In the study, strict adherence to the study protocol was observed. The ethical standards of the study were upheld throughout the whole data

collection and analysis procedure. The University Ethics Review Committee reviewed and approved the study with IERB code # 0142.

Statistical Treatment of Data. Frequency, percentage, mean, and Simple Linear Correlation Analysis were used to treat and interpret the data gathered.

RESULTS AND DISCUSSION

Personal and Health Profile of the Respondents

The majority of the respondents belong to ages 10 and 11 years old, are dominated by males, have no family history of eye problems, sleep 8-10 hours every night, watch television or use a cellphone at least 0-1 hour in a day, and sits while reading.

The study's results conform to the findings of Sundus (2017) that small children can use gadgets an hour a day and two hours a day at school-going children. However, Sundus cited in USA Centers for Disease Control and Prevention that children spend an average of eight hours daily on gadgets like telephones, radios, TV, games, X box, iPad, and stereo systems. They play games, watch videos, listen to songs, chat with friends, and research websites without paying attention to posture, screen brightness, and distance which irritates eyes and causes difficulty focusing.

Moreover, a great number of the respondents are grade six pupils, have their grandmother affected with eye problems, prefer to eat fruits and vegetables, and utilize television as their leisure and information source.

On Visual Acuity of the Respondents

Visual Acuity Scores from Snellen's Chart Measurement are reflected in Table 1. The result of visual acuity test of respondents using the Snellen's Chart measurement of the right eye revealed that most respondents have a normal visual acuity ranging from 20/20 – 20/25, while some were known to have abnormal visual acuity as reflected with 20/30- 20/200. The left eye mostly has a vision of 20/20- 20/25, while a few have abnormal vision measured as 20/30 – 20-200. This measurement discloses that most respondents have good eyesight, although some have mild to severe vision loss, which needs a referral for further assessment and evaluation.

The above findings are supported by the statement from Kentucky Eye Institute, (2019) that a person with 20/40 vision sees things at 20 feet that most people who don't need vision correction can see at 40 feet. This means that they are nearsighted but only slightly. A person with 20/40 vision may or may not need eyeglasses or contacts and can discuss their options with a doctor. In some cases, people with very bad vision can only have their vision corrected to 20/70, meaning they can see objects 20 feet away that others can see at 70 feet. In this case, the person has what is known as low vision impairment.

Table 1*Distribution of respondents according to their visual acuity measurement*

Snellen's Chart Measurement for Right Eye	F	%
20/200	1	.2
20/100	4	.8
20/70	2	.4
20/50	3	.6
20/40	8	1.6
20/30	20	4.1
20/25	104	21.2
20/20	349	71.1
Total	491	100
Snellen's Chart Measurement for Left Eye		
20/200	1	.2
20/100	2	.4
20/70	3	.6
20/50	3	.6
20/40	5	1.0
20/30	23	4.7
20/25	115	23.4
20/20	339	69
Total	491	100
Visual Acuity Condition of Right Eye		
Abnormal Visual Acuity	38	7.74
Normal Visual Acuity	453	92.36
Total	491	100
Visual Acuity Condition of Left Eye		
Abnormal Visual Acuity	37	7.54
Normal Visual Acuity	454	92.46
Total	491	100

Furthermore, it may mean that the respondents have sharp and clear vision. According to American Optometric Association (2019), a child with 20/20 vision already has perfect vision. It indicates sharpness or clarity of vision at a distance of 20 feet or 6 meters from what is being read. A visual measurement of 20/70 vision, a person can read at 20 meters of what an unimpaired vision can see from 70 feet away.

On Quality of Vision

Table 2 presents the respondents' quality of vision. Most of the respondents garnered a score of below 20, which means that these respondents generally have developed a good-quality of vision. On the contrary, some scored 20-24, which means they are suspected of having vision problems. Moreover, a few got 25 points or more, indicating that they need a referral to an eye specialist to further evaluate their sense of sight. The

above measurement is almost the same as the result of Snellen's Chart measurement; only a negligible number made a difference. These few respondents had difficulty with their reading skills.

Table 2

Distribution of respondents based on vision development quality of life

College of Optometrists Quality of Vision (COQV)	f	%
25 points or more (Refer for Care)	20	4.1
20-24 (Suspect)	30	6.1
Below 20 (Normal)	441	89.8
Total	491	100

The above scores may imply that the respondents have normal vision. This is further supported by their responses to the items using a COQV checklist. Mostly "never" experience the items to evaluate the quality of their vision as follows: headaches with near work; words run together when reading; burning, itchy, watery eyes; skips/ repeats lines when reading; difficulty copying from chalkboard/monitor or screen; avoids reading and other close activities; omits small words when reading; eyes turning inward or outward; blurred or double vision; eyes tiring while reading or doing other school work; using the finger to maintain place while reading; frequent eye rubbing or blinking and fail to distinguish colors. Very few of them had "seldom" and occasionally experienced the above discomforts.

The above findings, backed up by Wythe Eye Associate (2020), claimed that physical signs of functional vision problems are a lazy eye or crossed eyes, excessive blinking, holding a device too close, red-itchy burning eyes, and headaches in the temples. Additionally, behavioral signs may include a short attention span, and experiences blurring and double vision.

On Academic Performance

Table 3 displays the Academic Performance of the Respondents. The academic performance of the respondents reveals a great number of respondents with a "Satisfactory" academic performance. On the other hand, only a few had an "Outstanding" performance. Respondents, as school-aged individuals, have fully developed their cognition. They are independent in terms of entering school and developing a unique personalities and behavior. Looking at their general weighted average, school children can cope with scholastic activities as facilitated by their teachers. They engage in various group and individual activities that help develop coordination, balance, and strength and enhance social, cognitive, and personal development.

Table 3

Distribution of respondents according to their academic performance

Grading Scale and description	f	%
90-100 "Outstanding"	59	12.0
85- 89 "Very Satisfactory "	107	21.8
80- 84 "Satisfactory"	190	38.7
75- 79 "Fairly Satisfactory"	135	27.5
Total	491	100

According to Avila and Acena (2021), students believe that their teachers care about both their academic progress and how they are as people. Thus, student services programs are offered to encourage interactions between teachers and pupils, acting as a vital link between pupils and their families, school resources, and community-based health and social services.

Relationship Between the Respondents' Visual Acuity and their Personal Related Factor

Table 4 displays the correlation between respondents' vision acuity and personal factors. The table reveals a slight positive correlation between the quality of vision score and a family history of eye problems. Other factors such as age, sex, grade level, sleep pattern, and frequency of gadget use did not yield a significant relationship; hence, they do not pose a risk of developing vision problems. The findings mean that the respondents whose family has no history of vision problems tend to have a better quality of vision, as seen in the COQV.

Table 4

Correlation coefficient showing the relationship between visual acuity and personal factors of the respondents

Variables	General Weighted Average	Age	Sex	Family History	Grade Level	Sleep Pattern	Frequency of gadget Use
Quality of Vision	-.035	.025	.018	.111*	.012	-.068	-.054
Snellen's Chart Measurement for Right Eye	.020	- .023	.040	.035	-.001	.015	-.025
Snellen's Measurement for Left Eye	.024	- .005	.027	-.043	.031	.015	-.025

This supports the finding made by Astbury (2022) that early care may stop worsening or, in some circumstances, even correct the problem. A family history of vision issues can raise the likelihood of passing on hereditary eye diseases. If eye disorders run in your family, it's crucial to have routine eye exams.

The above finding is backed up by Geek (2019) that having an eye history of immediate relatives like parents, grandparents, aunts, and uncles can help determine if a child is at higher risk for developing an eye disorder. Furthermore, he also affirms that genetics plays a role in many eye conditions, which tend to cause blindness. It disclosed the findings of research that vision problems in otherwise healthy eyes, such as strabismus (cross-eyes), amblyopia (lazy eye) and refraction errors, myopia (nearsightedness), hyperopia (farsightedness), and astigmatism are linked to genetics.

However, the visual acuity measurement of both the right and left eyes did not yield a significant relationship with the general weighted average and personal factors.

The findings of Chen, AH, Bleything, and Lim (2011), that children with average to above-average academic achievement had a distinct visual performance profile than those with low academic achievement, is in direct opposition to this. They exhibited a statistically significant higher pass rate in the areas of physical ability (visual acuity), physiological ability (ocular motor balance), and perceptual ability (visual-motor integration/visual-spatial and visual analysis abilities). Other factors like the type and frequency of gadget use could bring their vision beyond normal.

Table 5 displays the correlation between respondents' vision acuity and personal factors in terms of family members, food preference, a gadget used, and reading habits. The table exhibits a significant relationship between respondents' gadgets and the visual acuity based on Snellen's chart measurement of their right and left eyes. No significant relationship existed between the quality of vision and the family members with an eye condition, food preferences, a gadget used, and reading habits. Likewise, there was no significance between visual acuity based on Snellen's chart measurement of both eyes and the factors above.

Table 5

Summary of the chi-square test for Independence showing the significant relationship between respondent's vision acuity on personal factors

Variables	Chi-Square Value			
	Family Members	Food Preference	Gadget Used	Reading Habits
Quality of Vision	13.677	14.389	4.736	13.741
Snellen's Chart Measurement for Right Eye	4.007	11.612	18.322**	9.371
Snellen's Chart Measurement for Left Eye	6.138	7.438	10.800*	9.000

* Correlation is significant at the 0.05 level (2 –tailed)

** Correlation is significant at the 0.01 level (2- tailed)

The above findings imply that children exposed to digital technology tend to experience poorer vision in both eyes. More time spent on various electronic devices would significantly affect the sense of sight. The article by Medillo (2017-2019) stated that during the Calendar Year 2017, the Philippine Department of Health had expressed concerns over the rapid increase of nearsightedness or myopia in Filipino children. He further mentioned DOH Undersecretary Domingo's statement that prolonged and excessive use of gadgets can

hinder the development of a child's eyesight. He reiterated that research findings showed that screens' blue light triggers a retina process that kills cells, which could lead to eye disease or blindness. Using screens in the dark is even more damaging due to blue light. Many eye doctors claim that electronic gadget emits blue light, which can be dangerous not only for the eyes but for the entire body, according to the Huffington Post, as cited in Optos. Excessive time spent in front of screens can affect the eyes in two ways: once the eyes are too dry, they are also prone to some complications.

CONCLUSIONS

The respondents do not have a family history of eye problems; the grandmother surfaced to be affected by an eye problem and do not have a satisfying level of academic performance. The most preferred food to take in are fruits, vegetables, and chicken. They meet the required eight to ten sleeping hours, use technology for at least 0-1 hour a day, and sit while reading. The visual acuity of the respondents is within normal vision, and the quality of vision score of below 20. A family history of eye problems poses a risk to the quality of vision, which yielded a significant relationship. More exposure to technology likewise risks the visual acuity of both the right and left eyes. Visual acuity is found to have no bearing on academic performance.

RECOMMENDATIONS

The school must include yearly comprehensive eye examinations in its annual plan of activities/programs for early detection and treatment of eye problems. The teachers should undergo training on a proper assessment of vision and implement assessment activities annually or as necessary. Counseling parents and making referrals required ophthalmologists to cater to students with eye problems. Children with a known family history of vision problems should be given closer attention to prevent the development of eye problems. Parents must institute media-free times daily to break the child's fixation on digital devices, reduce eye fatigue, limit blue light exposure, and have time to connect with family. Seminars/information dissemination for parents and children about the effects of technology, reading, and sleeping habits on a child's vision and academic performance.

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Risk Assessment on Visual Acuity among Elementary Pupils in the Heritage City of Vigan O. R. Espiritu et al.
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