E-B
Environment - Behaviour
Proceedings Journal

AcE-Bs2026Kuching

e-IPH
e-International Publishing House Ltd., United Kingdom

https://www.amerabra.org/
14th Asian Conference on Environment-Behaviour Studies.
Damai Beach Resort, Kuching, Malaysia, 27-28 Mar 2026

Self-Reported Visual Clarity and Its Association with Refractive Error in Schoolchildren

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Abstract
Self-reported visual clarity is widely used as a rapid screening indicator for detection of refractive error in schoolchildren. This study investigated associations between self-reported visual clarity, refractive error, and objective visual acuity among primary schoolchildren attending vision screening programs. Data from 930 children were analysed retrospectively using chi-square tests. Significant associations were found between self-reported visual clarity and age, refractive error (specifically myopia), and presenting visual acuity; while gender and other refractive error subtypes showed no significant associations. Some children reported clear vision despite reduced visual acuity, supporting combined subjective and objective screening approaches in paediatric vision programmes globally.

Keywords: Refractive error; Self-reported visual clarity; Visual acuity; Vision screening.

1.0 Introduction

Refractive error is an optical condition in which the eye is unable to focus a light onto the retina properly. It is broadly classified into three main subtypes: myopia (short-sightedness), hyperopia (long-sightedness), and astigmatism (distorted vision). It is a common cause of visual impairment affecting populations worldwide. Global estimates from 2006 indicated that 153 million individuals aged over 5 years were visually impaired due to uncorrected refractive error, including approximately 8 million who were blind (Alghamdi, 2021). The prevalence of refractive errors varies widely by age, gender, ethnicity, and geographic location. Epidemiological studies among schoolchildren have reported variations in the distribution of refractive error subtypes, with some studies identified myopia as the most prevalent (Alghamdi, 2021), while others have reported astigmatism as more common (Santiago et al., 2023; Tajbakhsh et al., 2022). Despite these variations, the authors also reported consistent trends in which the spherical equivalent (SE) of refractive error increases towards myopia as children grow. Similar patterns have also been reported in local studies, where myopia is the most common refractive error among schoolchildren, followed by astigmatism and hyperopia (Goh et al., 2005; Ismail & Sukumaran, 2022; Wardati et al., 2024).

Given the high prevalence of refractive error among school-aged children, early detection through school-based vision screening programs has become an important public health strategy. Vision screening in schools allows early identification of visual impairment that may otherwise go unnoticed, particularly because children may not be familiar with recognizing or reporting visual difficulties. The self-reported visual clarity survey is widely used in clinical practice, population-based studies, and vision screening programs as a rapid, cost-effective method to assess perceived visual function. Individuals are commonly asked to rate their overall vision quality, and this subjective measure is often used as a surrogate indicator of visual satisfaction and functional vision status. However, self-reported vision may not always correspond with objective visual findings, as previous studies have shown variable validity and reliability of self-reported ocular conditions compared with clinical examination results (Foreman et al., 2017). Although discrepancies between self-rated vision and objective visual acuity measures have been reported, highlighting the influence of functional, demographic, and health-related factors on subjective visual perception (El-Gasim et al., 2013), this relationship remains insufficiently explored, particularly among schoolchildren. Understanding the relationship between self-reported visual clarity and objective measures such as refractive error and visual acuity is therefore important for assessing the reliability of subjective responses, especially to improve the effectiveness of vision screening strategies among schoolchildren.

2.0 Literature Review

2.1 Self-Reported Visual Clarity as a Measure of Perceived Visual Function

Self-reported visual clarity has been widely used in population-based studies and clinical assessments as an indicator of perceived visual function. Self-rated vision is commonly used to reflect an individual's perception of visual quality and functional vision in daily activities. Evidence suggests that self-rated vision is significantly associated with objective visual performance measures, including visual acuity, contrast sensitivity, visual field status, and stereopsis (El-Gasim et al., 2013). In addition, questionnaire-based approaches are commonly used in large population studies to estimate refractive status, as clinical examination is often costly and logistically difficult. However, the effectiveness of self-report depends heavily on the accuracy of the questions used (Cumberland et al., 2016). These findings support the use of subjective visual assessment as a practical tool in large-scale epidemiological and screening settings.

2.2 Relationship Between Self-Reported Vision and Objective Visual Assessment

Previous studies indicate that better visual acuity increases the likelihood that individuals report better visual status, suggesting that subjective visual perception is influenced by measurable visual function. However, the correlation between self-reported and objective visual measures is generally moderate, reflecting additional influence from functional, behavioural, and psychosocial factors (Coyle et al., 2017). Validation studies also report variable agreement between self-reported ocular conditions and clinical findings, with self-report often showing higher specificity than sensitivity (Foreman et al., 2017). Therefore, self-reported visual clarity is useful for screening but should complement, not replace, objective assessment.

Despite this evidence, research examining self-reported visual clarity in relation to specific refractive error types among primary schoolchildren remains limited. Most studies focus on adults, with fewer conducted in paediatric school screening settings, particularly in Southeast Asian populations. Further research is warranted to determine whether self-reported visual clarity can reliably reflect refractive error and objective visual acuity in school-based screening contexts.

3.0 Methodology

This study employs a retrospective, cross-sectional, descriptive study to examine the trend in self-reported visual clarity associated with refractive error using datasets from vision screening programs conducted in Kuala Lumpur in 2024 and 2025. This approach was selected to facilitate evaluating the concordance between self-reported visual clarity and the different types of refractive error and their respective objective visual acuity. This study screened approximately 1000 primary schoolchildren aged 7 to 9 years, randomly selected from 10 different primary schools in Kuala Lumpur. The collected datasets included self-reported visual clarity from the Eyes and Vision Survey, monocular distance visual acuity, and subjective refraction findings, all analysed retrospectively. Only records with complete data across all components were included in the analysis, those with missing information were excluded to ensure data accuracy and completeness.

The Eyes and Vision Survey was provided in Bahasa Malaysia and administered in hardcopy format to ensure accessibility and ease of participation among the target population. The survey consisted of three questions. The first question collected information on self-reported visual clarity, in which participants were asked whether they could see clearly and whether they used spectacle correction. The second question assessed whether participants had experienced specific visual symptoms, and the last question gathered information related to academic performance. In the present study, only data from Question 1 was extracted for analysis.

Habitual and best-corrected monocular distance visual acuity was measured using a standardized digital visual acuity chart (Canton Optics Equipment Co. Ltd. China) positioned at 6 meters, with results recorded in Snellen notation (e.g., 6/6). These values were then subsequently converted into logMAR notation (e.g., 6/6 equivalent to 0.00 and 6/9 equivalent to 0.20) to allow standardized quantitative analysis. Distance visual acuity was then classified into 2 categories, where 6/9 or better was considered optimal, while visual acuity worse than 6/9 was categorized as suboptimal (World Health Organization, 2019).

Additionally, subjective refraction findings obtained with a digital visual acuity chart (Canton Optics Equipment Co. Ltd. China) at a target distance of 6 meters were also extracted. Refraction was performed under non-cycloplegic conditions. However, a modified cycloplegic refraction using a delayed fogging method was performed for participants who demonstrated fluctuating responses or excessive accommodation. The measured refractive values were recorded in spherical power and minus cylinder format. These data were then converted to spherical equivalent refraction (SER) and subsequently classified into emmetropia (absence of refractive error), myopia (short-sightedness), hyperopia (long-sightedness), astigmatism (distorted vision) and antimetropia (one eye is myopic and the other eye is hyperopic).

The finalized datasets were then imported into SPSS version 29.0.2.0 for statistical analysis. Descriptive statistical analyses, including frequencies, percentages, means, and chi-square test were performed to examine trends and association between self-reported visual clarity in relation to refractive error. Throughout the study, all data were handled confidentially, anonymized before analysis, and managed in accordance with ethical guidelines to ensure participant privacy and research integrity. Ethical approval for this study was granted by the Research Ethics Committee of Universiti Teknologi MARA (REC/12/2025 [ST/MR/224]). All study procedures were carried out in compliance with the Malaysian Good Clinical Practice Guidelines and the Declaration of Helsinki.

4.0 Findings

4.1 Age and Gender Distribution of Participants

A total of 930 participants with complete datasets were included in the present study. Table 4.1 summarizes the age and gender distribution of the study participants. The age distribution showed a higher proportion of 7-year-old participants (38.8%), followed by 8-year-olds (32.3%) and 9-year-olds (28.9%), indicating a gradual decrease in sample size with increasing age. The gender distribution was nearly equal, with males comprising 50.1% and females 49.9% of the study population. This balanced distribution suggests that the sample was demographically comparable across age and gender, reducing the likelihood of age- or gender-related skewness in the observed outcomes.

Table 4.1 The age and gender distribution of the study participants.

Variables	Frequency (%)
Age	
7 years old	361 (38.8)
8 years old	300 (32.3)
9 years old	269 (28.9)
Gender	
Male	466 (50.1)
Female	464 (49.9)

4.2 Visual Acuity Status

The presenting visual acuity was determined from monocular distance visual acuity. Table 4.2 summarizes the distribution of presenting and best-corrected distance visual acuity. For presenting visual acuity, a higher proportion of participants demonstrated non-optimal vision (worse than 6/9), with 56.3% and 55.8% in the right and left eyes, respectively. Only 43.7% of right eyes and 44.2% of left eyes achieved visual acuity of 6/9 and better, with comparable patterns observed between eyes.

Following the subjective refraction, most participants attained optimal visual acuity. Best-corrected visual acuity of 6/9 and better was observed in 90.6% of right eyes and 91.3% of left eyes, whereas only a small proportion remained below the 6/9 threshold. The similar distribution of best-corrected visual acuity between eyes indicates a consistent improvement in visual performance after correction.

Table 4.2 The presenting and best-corrected monocular distance visual acuity status

Variables	RE (%)	LE (%)
Presenting VA		
6/9 and better	406 (43.7)	411 (44.2)
Worse than 6/9	524 (56.3)	519 (55.8)
Best-corrected VA		
6/9 and better	843 (90.6)	849 (91.3)
Worse than 6/9	87 (9.4)	81 (8.7)

4.3 Distribution of Refractive Error

The distribution of refractive error types among the study participants is presented in Table 4.3. Emmetropia was identified in 20.1% of the participants, indicating that approximately one-fifth of the study population was classified as having no refractive error. The remaining 79.9% of participants were classified to acquire refractive errors.

Among participants with refractive errors, myopia was the most prevalent, accounting for 39.6% of the total sample. Hyperopia was identified as the second most common refractive error, affecting 25.9% of participants. Astigmatism and antimetropia were identified less frequently, accounting for 7.4% and 7.0%, respectively. Overall, the refractive error distribution was characterised by a predominance of myopia, followed by hyperopia, while astigmatism and antimetropia constituted smaller proportions of the refractive error profile.

Table 4.3 The frequency of participants based on the type of refractive error

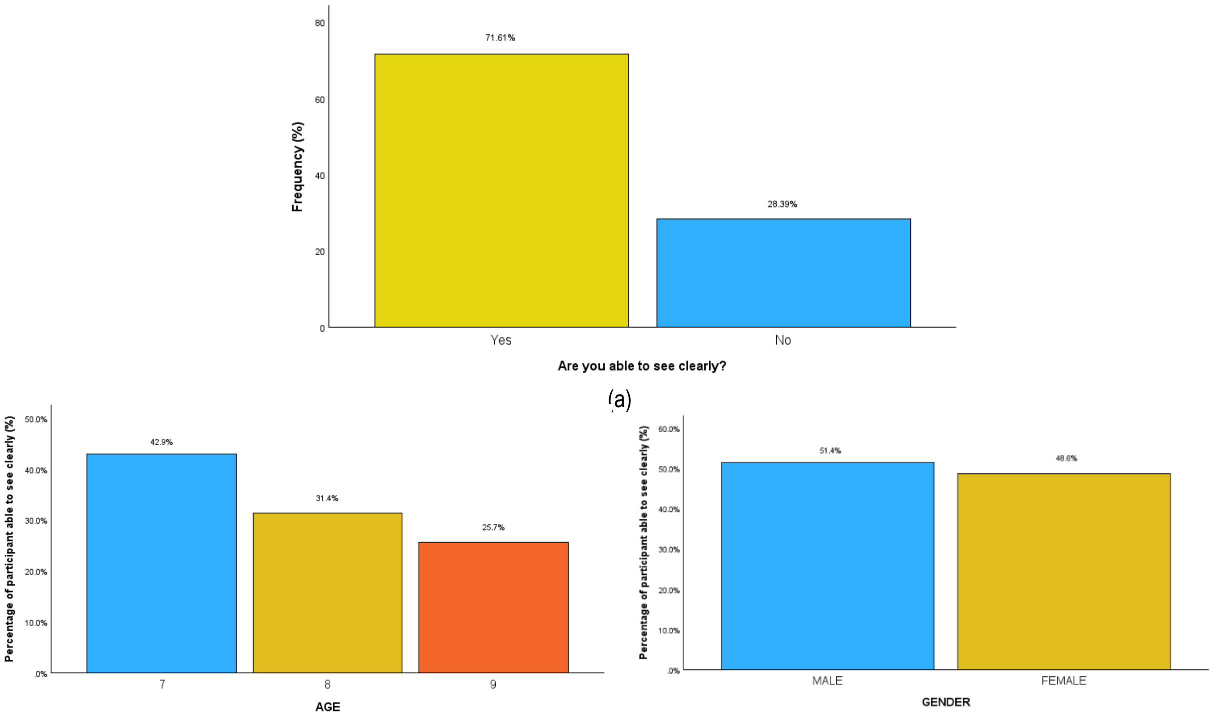
Variables	RE (%)
Emmetropia	187 (20.1)
Myopia	368 (39.6)
Hyperopia	241 (25.9)
Antimetropia	65 (7.0)
Astigmatism	69 (7.4)

4.4 Self-Reported Visual Clarity

The findings on self-reported visual clarity indicate that most participants reported being able to see clearly. Specifically, 71.61% of participants answered “Yes” when asked whether they could see clearly, while 28.39% answered “No” as depicted in Fig. 4 .1 (a). This shows that over two-thirds of the sampled participants perceived their visual clarity as adequate.

Moreover, when examined by age group, some variations were observed. Fig. 4.1 (b) shows that participants aged 7 years had the highest proportion of clear vision (42.9%). This was followed by participants aged 8 years, who accounted for 31.4%, and participants aged 9 years, who represented 25.7% of those reporting clear vision. The distribution indicates that the highest representation of clear vision was among the youngest age group within the sample.

Furthermore, analysis by gender showed relatively balanced proportions of male and female participants, as depicted in Fig. 4.1 (c). Male participants accounted for 51.4% of those reporting clear vision, while female participants accounted for 48.6%. The difference between genders was minimal, indicating a near-equal distribution of self-reported visual clarity across male and female participants. Overall, the findings demonstrate that most participants reported clear vision, with slight variations observed across age groups and minimal variation between genders.



(b) (c)

Fig. 4.1: The percentage of participants able to see clearly by (a) overall, (b) age group, and (c) gender.

4.5 Association Between Self-Reported Visual Clarity, Demographic Characteristics, Refractive Error, and Visual Acuity

Table 4.4 demonstrates significant associations between self-reported visual clarity and age, refractive error status, presence of myopia, and presenting visual acuity, while no significant associations were observed for gender, hyperopia, antimetropia, or astigmatism.

A statistically significant association was observed between age and self-reported visual clarity [χ^2 (2, N = 930) = 19.409, $p < 0.001$]. Younger participants showed higher proportions of clear vision, with 7-year-olds reporting the highest clear vision (79.2%), followed by 8-year-olds (69.7%) and 9-year-olds (63.6%). Conversely, unclear vision reporting increased with age, highest among 9-year-olds (36.4%), followed by 8-year-olds (30.3%) and 7-year-olds (20.8%). These findings indicate an age-related shift in perceived visual clarity, with older children reporting relatively poorer perceived vision.

No statistically significant association was found between gender and self-reported visual clarity [χ^2 (1, N = 930) = 1.452, p = 0.228], with 73.4% of males and 69.8% of females reporting clear vision, indicating comparable perceived visual clarity between genders.

A significant association was identified between refractive error and self-reported visual clarity [χ^2 (1, N = 930) = 5.637, p = 0.018]. Participants without refractive error were more likely to report clear vision (78.6%) compared to those with refractive error (69.9%), while unclear vision was more frequently reported among those with refractive error (30.1% vs 21.4%). This indicates that refractive error negatively influences perceived visual clarity.

Among refractive error subtypes, only myopia showed a statistically significant association [χ^2 (1, N = 555) = 11.333, p < 0.001]. Participants with myopia reported lower proportions of clear vision (64.7%) than those without myopia (78.6%), suggesting that myopia has a stronger functional impact on perceived visual clarity. No significant associations were observed for hyperopia [χ^2 (1, N = 428) = 0.723, p = 0.395], antimetropia [χ^2 (1, N = 252) = 0.625, p = 0.429], or astigmatism [χ^2 (1, N = 256) = 0.307, p = 0.579].

Presenting visual acuity showed strong statistically significant associations for both eyes. In the right eye, visual acuity worse than 6/9 represented the majority in reporting unclear vision compared with those with VA 6/9 or better [χ^2 (1, N = 930) = 65.645, p < 0.001]. Similar patterns were also observed in the left eye [χ^2 (1, N = 930) = 64.103, p < 0.001]. However, a notable proportion of participants with reduced visual acuity still reported clear vision (61.1%), indicating partial discordance between subjective and objective measures.

Overall, self-reported visual clarity was significantly associated with age, presence of refractive error, specifically myopia, and presenting visual acuity, while gender and other refractive error subtypes showed no significant influence.

Table 4.4: The Association of Self-Reported Visual Clarity, Refractive Error and Visual Acuity

Variables	Self-Reported Visual Clarity				Total		X^2	p-values
	No		Yes					
	n	%	n	%	n	%		
Age								
7	75	20.8	286	79.2	361	100.0	19.409	<0.001*
8	91	30.3	209	69.7	300	100.0		
9	98	36.4	171	63.6	269	100.0		
Gender								
Male	124	26.6	342	73.4	466	100.0	1.452	0.228
Female	140	30.2	324	69.8	464	100.0		
Presence of refractive error								
Yes	224	30.1	519	69.9	743	100.0.	5.637	0.018*
No	40	21.4	147	78.6	187	100.0		
Types of refractive error								
Myopia								
Yes	130	35.3	238	64.7	368	100.0	11.333	<0.001*
No	40	21.4	147	78.6	187	100.0		
Hyperopia								
Yes	60	24.9	181	75.1	241	100.0	0.723	0.395
No	40	21.4	147	78.6	187	100.0		
Antimetropia								
Yes	17	26.2	48	73.8	65	100.0	0.625	0.429
No	40	21.4	147	78.6	187	100.0		
Astigmatism								
Yes	17	24.6	52	75.4	69	100.0	0.307	0.579
No	40	21.4	147	78.6	187	100.0		
Presenting visual acuity								
RE								
6/9 and better	60	14.8	346	85.2	406	100.0	65.645	<0.001*
Worse than 6/9	204	38.9	320	61.1	524	100.0		
LE								
6/9 and better	62	15.1	349	84.9	411	100.0	64.103	<0.001*
Worse than 6/9	202	38.9	317	61.1	519	100.0		

5.0 Discussion

This study investigated the association between self-reported visual clarity, refractive error, and objective visual acuity among primary schoolchildren from vision screening programs. The findings demonstrated that refractive error status, particularly myopia, and presenting visual acuity were significantly associated with self-reported visual clarity, whereas gender and other refractive error subtypes were not. These findings support the role of subjective visual assessment as a supplementary screening indicator while highlighting its limitations when used independently in paediatric populations. This is supported by previous studies, which have shown that self-rated vision is significantly associated with objective visual performance measures, including visual acuity and functional vision outcomes (El-Gasim et al., 2013), although the validity of self-reported ocular conditions may vary compared with clinical examination findings (Foreman et al., 2017).

The predominance of myopia observed in this study is consistent with global epidemiological trends showing increasing myopia prevalence among school-aged children (Goh et al., 2005; Holden et al., 2016; Surico et al., 2024). Environmental and behavioural factors, including increased near work, digital device exposure, and reduced outdoor activity, are recognised contributors to this trend. Similar refractive error distribution patterns have been reported in large epidemiological datasets, where questionnaire-based methods are frequently used to estimate refractive status despite known limitations in self-reported accuracy (Cumberland et al., 2016).

A key finding of this study was that some children reported clear vision despite measurable visual deficits. This highlights a limitation of subjective visual assessment in paediatric populations, where gradual visual blur may go unnoticed due to visual adaptation. Children who have never experienced optimal corrected vision may also perceive suboptimal vision as normal, contributing to discrepancies between subjective visual perception and objective visual measurements, particularly in symptom-based screening settings (El-Gasim et al., 2013).

The association between age and self-reported visual clarity may reflect increasing academic visual demands and progressive refractive error development during school years. The stronger association between myopia and reduced self-reported visual clarity compared to hyperopia and astigmatism may be explained by functional visual impact differences. Myopia primarily affects distance vision, which is essential for classroom learning, whereas hyperopia may be masked by accommodation in younger children, and mild astigmatism may produce less noticeable visual distortion.

From a vision screening perspective, the significant association between presenting visual acuity and self-reported visual clarity supports the potential utility of subjective visual assessment as a rapid preliminary screening tool. However, discordant cases reinforce the need for combined subjective and objective screening approaches to optimise the detection of visual impairment in school-based programmes (Foreman et al., 2017).

The strengths of this study include the use of real-world school screening data, integration of subjective and objective visual assessments, and analysis of refractive error subtypes, enhancing its relevance to public health screening. However, the cross-sectional design limits causal interpretation. Self-reported responses may be affected by reporting bias, especially among younger children. Additionally, the narrow age range may limit generalisability to other paediatric populations.

6.0 Conclusion & Recommendations

Self-reported visual clarity demonstrates meaningful but incomplete agreement with objective visual measures. While subjective vision ratings are influenced by measurable visual performance, they are also affected by functional, behavioural, and psychosocial factors. Therefore, self-reported visual clarity should be considered a complementary indicator rather than a replacement for clinical assessment. The present study contributes to the limited evidence examining subjective visual perception in paediatric populations and highlights the potential role of self-reported measures in population-based school vision screening.

Moreover, future research should include longitudinal designs to evaluate how self-reported visual clarity changes with refractive error progression and treatment. Standardised self-report instruments tailored for paediatric populations should be developed to improve reliability. Additionally, more studies should be conducted in Southeast Asian populations to account for regional differences in refractive error epidemiology and environmental exposure patterns.

Acknowledgement

I would like to express my sincere appreciation to Yayasan Komuniti Negara (YKN) for providing financial support for this study [100-TNCPI/GOV 16/6/2 (064/2024)]. My sincere gratitude also goes to Universiti Teknologi MARA (UiTM) for providing the academic support, facilities, and resources necessary for the successful completion of this study. Special thanks to all individuals involved, and my sincere appreciation to my supervisors and research team members, who contributed to the development and execution of this study, for their endless support and guidance.

Paper Contribution to Related Field of Study

This study extends existing knowledge by examining subjective visual clarity in relation to refractive error and objective visual acuity within a school-aged population. It provides evidence for integrating subjective screening questions into school-based vision programmes and contributes region-specific data relevant to refractive error surveillance and early detection strategies.

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