

Evaluation of the impact of an optometric intervention on vision-related quality of life in two educational institutions in the Cartagena District in 2023

Evaluación del impacto de una intervención optométrica en la calidad de vida relacionada con la visión en dos Instituciones Educativas del Distrito de Cartagena en el año 2023

Jorge Romero-Polo^{1a*}, Wesly Escobar-Vergara^{2a}, Arturo Hernández-Sandoval^{3a},
Jeidys Banquez-Mendoza^{4a}, Carlos Alfonso-Rojas^{5a}, Jaime Plazas-Román^{6a}

SUMMARY

Objective: To evaluate the impact of an optometric intervention on vision-related quality of life in students from two educational institutions in the Cartagena district, Colombia. **Methods:** A quasi-experimental before-and-after study was conducted. Sixty-seven students aged 8-15 years with visual correction needs were included. The intervention consisted of visual hygiene education and the provision of corrective lenses. The NEI VFQ-25 Scale was administered one month after the intervention. McNemar's test was applied to analyze significant changes. **Results:** Significant improvements were observed across multiple domains. Moderate difficulty in reading text decreased from 25.4% to 4.5% (95% CI: 12.5-29.3%; $p=0.0001$). Difficulty in finding objects on shelves decreased significantly (95% CI: 7.8-32.2%; $p=0.004$). The sensation of frustration decreased significantly (95% CI: 3.7-17.3%; $p=0.002$), with 85% of participants reporting no frustration after the

intervention. **Conclusions:** The optometric intervention demonstrated significant effectiveness in improving vision-related quality of life, with positive changes in visual function, autonomy, and emotional well-being among students.

Keywords: Optometry, Quality of Life, Therapeutics, Evaluation of Results of Therapeutic Interventions, Schools

RESUMEN

Objetivo: Evaluar el impacto de una intervención optométrica en la calidad de vida relacionada con la visión de estudiantes de dos instituciones educativas del distrito de Cartagena, Colombia. **Métodos:** Se realizó un estudio cuasiexperimental de tipo antes y después. Se incluyeron sesenta y siete estudiantes de entre 8 y 15 años con necesidades de corrección visual. La intervención consistió en educación en higiene visual y en la provisión de lentes correctivos. Se administró la escala NEI VFQ-25 antes y un mes después de la intervención. Se aplicó la prueba de McNemar para analizar los cambios significativos. **Resultados:** Se observaron mejoras significativas en múltiples dominios. La dificultad moderada para leer texto disminuyó del 25,4% al 4,5% (IC del 95%: 12,5-29,3%; $p = 0,0001$). La dificultad para encontrar objetos en los estantes disminuyó significativamente

ORCID:

¹ [0000-0002-2150-8351](https://orcid.org/0000-0002-2150-8351)

² [0009-0003-7986-6308](https://orcid.org/0009-0003-7986-6308)

³ [0009-0001-0512-2010](https://orcid.org/0009-0001-0512-2010)

⁴ [0009-0006-8644-907X](https://orcid.org/0009-0006-8644-907X)

⁵ [0009-0004-6454-7707](https://orcid.org/0009-0004-6454-7707)

⁶ [0000-0002-5040-6899](https://orcid.org/0000-0002-5040-6899)

a Universidad del Sinú, Cartagena, Colombia

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*Corresponding Author: Jorge Andrés Romero Polo.
E-mail: jorge.romero@unisinu.edu.co. Address: Av. El Bosque, Transv. 54 N° 30-453, Cartagena, Colombia

(IC del 95%: 7,8-32,2%; $p = 0,004$). La sensación de frustración mostró una reducción significativa (IC del 95 %: 3,7-17,3 %; $p = 0,002$), y el 85 % de los participantes reportaron ausencia de frustración tras la intervención.

Conclusiones: La intervención optométrica demostró una eficacia significativa en la mejora de la calidad de vida relacionada con la visión, con cambios positivos en la función visual, la autonomía y el bienestar emocional de los estudiantes.

Palabras clave: Optometría, calidad de vida, terapéutica, evaluación de resultados de intervenciones terapéuticas, escuelas

INTRODUCTION

Refractive errors have experienced a significant increase in their incidence and prevalence worldwide, becoming a public health problem with important economic and social repercussions (1). This phenomenon has reached epidemic proportions in many developed and developing countries, representing one of the leading causes of visual impairment globally. The World Health Organization (WHO) estimates that approximately 2.6 billion people worldwide have uncorrected refractive errors, with myopia alone affecting nearly 30% of the global population. This issue particularly affects the school population, negatively impacting students' academic, social, and psycho-emotional development (2).

The progression of these visual alterations is associated with complex interactions among genetic, congenital, and environmental factors (3). Modern lifestyle changes, including increased near-work activities, prolonged screen time, reduced outdoor activity, and urbanization, have been identified as significant contributors to the growing prevalence of refractive errors, particularly myopia. The consequences include difficulties with daily activities such as school, work, and social activities, resulting in complications in maintaining an adequate quality of life (4). Students with uncorrected refractive errors often experience academic difficulties, reduced participation in sports and recreational activities, and decreased self-esteem, which can have long-lasting effects on their personal and professional development.

International studies have documented the magnitude of this problem across different geographical regions and populations. In Spain, a strong association between socioeconomic status and refractive errors has been identified, as well as correlations with factors such as parental smoking, prematurity, and low birth weight. Research has shown that children from lower socioeconomic backgrounds are more likely to have uncorrected refractive errors due to limited access to eye care services and financial constraints. In the United States, approximately 80% of adolescents in secondary education present with myopia in urban areas, with prevalence rates of hyperopia and astigmatism of 4.6% and 14.9%, respectively, in the Asian population. The ethnic disparities in refractive error prevalence highlight the complex interplay between genetic predisposition and environmental factors.

In the Latin American context, Mexico reports prevalence rates of myopia, hyperopia, and astigmatism ranging between 4.6-60.2%, 0.0-25.0%, and 4.4-53.0%, respectively (5). These wide ranges reflect the heterogeneity of populations studied and the varying methodologies employed across different research initiatives. In Colombia, specifically in Cartagena, previous studies have identified that 20% of the population treated in public institutions presents with refractive errors that affect their visual quality and quality of life. This situation is particularly concerning given the limited resources and infrastructure available for comprehensive eye care in many Latin American countries.

Optometric interventions represent a comprehensive strategy to address visual alterations, both preventively and therapeutically, thereby improving community quality of life. These interventions typically include educational components focusing on visual hygiene, early detection through screening programs, and the provision of appropriate optical correction. The systematic evaluation of these interventions using validated instruments, such as the NEI VFQ-25 Scale, enables objective quantification of their impact (6). Understanding the effectiveness of such interventions is crucial to developing

evidence-based policies and programs to address the growing burden of refractive errors in school populations.

The NEI VFQ-25 (National Eye Institute Visual Function Questionnaire-25) is an internationally validated instrument for measuring vision-related quality of life (7-9). This questionnaire has demonstrated excellent psychometric properties and has been widely used in clinical research to evaluate the impact of visual interventions on patients' daily functioning and emotional well-being (10). The instrument assesses multiple domains, including general vision, ocular pain, near activities, distance activities, social functioning, mental health, role difficulties, dependency, and color vision. Its comprehensive nature makes it particularly suitable for evaluating the multifaceted impact of optometric interventions on quality of life.

Given the growing concern about refractive errors in school populations and the need for evidence-based interventions, this study was designed to provide valuable insights into the effectiveness of comprehensive optometric care in improving vision-related quality of life among students in Cartagena, Colombia.

This study aimed to evaluate the impact of an optometric intervention on vision-related quality of life in students from two educational institutions in the Cartagena district during 2023.

MATERIALS AND METHODS

Study Design and Setting

A quantitative, quasi-experimental pre-post study without a control group was conducted from March to September 2023. This design enabled analysis of the visual quality-of-life changes following optometric intervention, focusing on the impact on users who were effectively treated. This pragmatic approach assessed the real-world effectiveness of optometric interventions in resource-limited settings. The study was conducted in two public educational institutions

in the urban district of Cartagena, which together represent diverse socioeconomic backgrounds typical of the regional student population.

The target population consisted of students enrolled in two strategically selected educational institutions in the Cartagena district in 2023. Institutions were chosen based on willingness to participate, accessibility for follow-up assessments, and representation of typical socioeconomic characteristics. Non-probabilistic convenience sampling was used, including students aged 8-15 years identified with visual correction needs through comprehensive optometric screening by qualified professionals.

Sample size was calculated based on previous NEI VFQ-25 studies in similar populations, assuming a moderate effect size of 0.5, $\alpha = 0.05$, and power = 0.80, yielding a minimum required sample of 64 participants. A total of 67 students met the inclusion criteria and completed the study protocol, providing adequate statistical power.

Inclusion Criteria were students aged 8-15 years enrolled in participating institutions; clinical need for optical correction identified through optometric screening; signed informed consent by parents/guardians; verbal assent from minor; ability to understand questionnaire items in Spanish; commitment to attend follow-up. Exclusion Criteria were previous use of prescribed glasses/contact lenses; complex ocular pathologies requiring specialized management; cognitive impairments preventing adequate comprehension; systemic diseases affecting visual function; and planned relocation during the study period.

The study protocol was reviewed and approved by the Research Ethics Committee of the Faculty of Health Sciences, Universidad del Sinú, Cartagena section, in accordance with the principles of the Declaration of Helsinki and Colombian health research regulations (Resolution 8430 of 1993). Written informed consent was obtained from parents/guardians, and verbal assent was secured from minors after an age-appropriate explanation of procedures. Confidentiality was maintained using coded identifiers.

Measurement Instrument

The NEI VFQ-25 (National Eye Institute Visual Function Questionnaire-25), an internationally validated instrument for measuring vision-related quality of life, was used as the primary outcome measure. The Spanish version, culturally adapted to the Colombian population, was employed, with documented content validity and reliability (Cronbach's $\alpha > 0.85$). The questionnaire consists of 25 vision-specific items generating 12 subscale scores plus an overall composite score. For this pediatric population, driving and contact lens subscales were excluded as not pertinent to children/adolescents, resulting in 17 relevant Likert-type items. The questionnaire assesses domains including general vision, ocular pain, near activities, distance activities, social functioning, mental health, role difficulties, dependency, peripheral vision, and color vision.

Intervention Protocol

Comprehensive optometric intervention was designed as a two-component program delivered by licensed optometrists with specialized pediatric training. The intervention consisted of: 1) Educational component: Two structured 45-minute sessions focused on visual hygiene principles and self-care practices, delivered using age-adapted materials, demonstrations, and practical exercises; 2) Corrective component: Provision of properly fitted spectacles formulated based on comprehensive clinical examination, including visual acuity assessment, refraction, binocular vision evaluation, and ocular health screening, with guidance on use and maintenance.

Data Collection Procedures

The methodological process included three sequential phases implemented over four months: baseline assessment involving comprehensive optometric examination and initial application of the NEI VFQ-25 questionnaire; implementation of the standardized optometric intervention delivered by trained professionals; follow-up assessment

consisting of subsequent application of the same questionnaire exactly one-month post-intervention to evaluate changes in vision-related quality of life.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics version 26.0. The NEI VFQ-25 responses were dichotomized (with difficulty/without difficulty) according to established protocols. McNemar's exact test for related samples was applied to assess the significance of changes between pre- and post-intervention measurements. Absolute differences in proportions were calculated with 95% confidence intervals, and $p < 0.05$ was considered statistically significant.

RESULTS

Population Characteristics

Sixty-seven participants were included, with an equitable gender distribution (55.2% female, 44.8% male). The most represented ages were 11 years (16.4%) and 14 years (25.4%). A total of 86.6% belonged to the subsidized health regime, and 95.5% corresponded to low socioeconomic status (Table 1).

Pre-intervention Evaluation

Before the intervention, participants presented with various visual difficulties. In the visual functionality domain, 62.7% of participants reported some degree of difficulty reading text, while 55.2% reported difficulty finding objects. Regarding emotional well-being, 56.7% reported feeling frustrated about their vision (Table 2).

Post-intervention Changes

After the intervention, notable improvements were evidenced in all evaluated domains. In the

Table 1. Sociodemographic characteristics of the population (n=67)

Variable	n	%
Age (years)		
8	4	6.0
9	5	7.5
10	8	11.9
11	11	16.4
12	8	11.9
13	9	13.4
14	17	25.4
15	5	7.5
Gender		
<i>Female</i>	37	55.2
<i>Male</i>	30	44.8
School grade		
2nd	3	4.5
3rd	4	6.0
4th	10	14.9
5th	4	6.0
6th	17	25.4
7th	8	11.9
8th	11	16.4
9th	10	14.9
Health regime		
<i>Subsidized</i>	58	86.6
<i>Contributory</i>	9	13.4
Socioeconomic status		
<i>Low</i>	64	95.5
<i>Medium</i>	3	4.5

Data are presented as absolute (n) and relative (%) frequencies

visual domain, the proportion of participants without difficulty reading text increased from 37.3% to 62.7%. For finding objects, this proportion improved from 44.8% to 67.2%. In emotional well-being, the proportion of participants without a sense of frustration increased from 43.3% to 85.1% (Table 3).

Comparative Analysis

Statistical analysis using McNemar's test revealed significant changes in multiple variables. The most notable reduction was observed in limited study time, with a 58.2% decrease (95% CI: -70.6 to -45.8%; $p=0.0001$). Text reading showed an improvement of 25.4% (95% CI: -37.8 to -13.0%; $p=0.0001$), while the ability to find objects improved by 22.4% (95% CI: -36.2 to -8.6%; $p=0.004$). The sensation of frustration was significantly reduced by 10.5% (95% CI: -19.2 to -1.8%; $p=0.002$) (Table 4).

DISCUSSION

The findings of this study provide robust evidence for the effectiveness of optometric interventions in improving vision-related quality of life among school-aged children. The significant changes observed across multiple functional domains confirm the positive impact of visual correction combined with ocular hygiene education. These results underscore the importance of early detection and timely intervention in school settings, where uncorrected refractive errors and visual dysfunctions can directly affect academic performance and daily functioning.

The complete elimination of extreme difficulty in reading and the significant reduction in moderate difficulty ($p = 0.0001$) are consistent with previous reports (15). Vaughn et al. similarly documented substantial improvements in reading-related visual function following targeted optometric interventions (16). These convergent findings reinforce the notion that appropriate refractive correction and visual support strategies can substantially reduce barriers to reading and learning. However, the emergence of new difficulties in near-vision activities in a subset of participants, comparable to the observations of Jiménez et al., in Medellín (17), suggests that a uniform intervention approach may not be sufficient. This highlights the need for individualized assessment and follow-up, particularly in children with complex visual demands or coexisting visual anomalies, to ensure

Table 2. Vision-related quality of life before intervention (n=67)

Evaluated dimension	No difficulty n (%)	Mild/Moderate difficulty n (%)	Extreme difficulty/Stopped doing n (%)
Visual functionality			
Reading texts	25 (37.3)	36 (53.7)	6 (9.0)
Near vision activities	28 (41.8)	32 (47.8)	7 (10.4)
Finding objects	30 (44.8)	31 (46.3)	6 (9.0)
Reading street names	35 (52.2)	24 (35.8)	8 (11.9)
Going downstairs (low light)	32 (47.8)	33 (49.3)	2 (3.0)
Noticing side objects	32 (47.8)	34 (50.7)	1 (1.5)
Social participation			
Visiting people	47 (70.1)	20 (29.9)	0 (0.0)
Recreational activities	37 (55.2)	28 (41.8)	2 (3.0)
Emotional well-being			
Frustration due to vision	29 (43.3)	33 (49.3)	5 (7.5)
Control over daily life	30 (44.8)	26 (38.8)	11 (16.4)
Dependence on others	32 (47.8)	23 (34.3)	12 (17.9)

Data are presented as absolute (n) and relative (%) frequencies

Table 3. Vision-related quality of life after intervention (n=67)

Evaluated dimension	No difficulty n (%)	Mild/Moderate difficulty n (%)	Extreme difficulty/Stopped doing n (%)
Visual functionality			
Reading texts	42 (62.7)	25 (37.3)	0 (0.0)
Near vision activities	37 (55.2)	30 (44.8)	0 (0.0)
Finding objects	45 (67.2)	22 (32.8)	0 (0.0)
Reading street names	42 (62.7)	21 (31.3)	4 (6.0)
Going downstairs (low light)	40 (59.7)	27 (40.3)	0 (0.0)
Noticing side objects	27 (40.3)	40 (59.7)	0 (0.0)
Social participation			
Visiting people	27 (40.3)	40 (59.7)	0 (0.0)
Recreational activities	53 (79.1)	13 (19.4)	1 (1.5)
Emotional well-being			
Frustration due to vision	57 (85.1)	10 (14.9)	0 (0.0)
Control over daily life	22 (32.8)	33 (49.3)	12 (17.9)
Dependence on others	41 (61.2)	19 (28.4)	7 (10.4)

Data are presented as absolute (n) and relative (%) frequencies

that interventions remain adequately tailored over time.

The improvements in object-finding ($p = 0.004$) and reading street names ($p = 0.016$) demonstrate that the intervention had a tangible functional impact on everyday activities beyond the classroom. These results align with international studies reporting enhanced performance on specific visual tasks following optical correction and structured visual care (18). Likewise, the significant reduction in difficulties when going downstairs in low-light conditions ($p = 0.002$) is consistent with the findings of Molina and Pupiales in Ecuador (19), suggesting that improved contrast sensitivity and spatial perception may be relevant mechanisms. In contrast, the discrepancy with Rivera's results in Mexico (20) may be attributable to methodological differences, such as variations in the type of optical correction, duration of follow-up, or the instruments used to assess functional outcomes. This divergence underscores

the importance of standardizing outcome measures and clearly describing intervention protocols to facilitate meaningful comparisons across studies.

The significant reduction in the sensation of frustration ($p = 0.002$) is particularly noteworthy, as it highlights the psycho-emotional dimension of optometric care. Visual difficulties in children are not limited to functional impairment; they can also generate frustration, low self-esteem, and disengagement from academic and social activities. The observed improvement in emotional well-being is consistent with the findings of Choi et al. (21), who reported significant gains in quality-of-life following appropriate visual interventions. Taken together, these results suggest that optometric interventions should be conceptualized not only as corrective procedures but as integral components of child health and educational support, with the potential to positively influence emotional regulation, participation, and overall quality of life.

Table 4. Pre-post intervention comparative analysis using McNemar's test

Variable	Pre-intervention with difficulty n (%)	Post-intervention with difficulty n (%)	Absolute difference (95% CI)	p-value
Reading texts	42 (62.7)	25 (37.3)	-25.4% (-37.8 to -13.0)	0.0001*
Near vision activities	39 (58.2)	30 (44.8)	-13.4% (-28.5 to 1.7)	0.012*
Finding objects	37 (55.2)	22 (32.8)	-22.4% (-36.2 to -8.6)	0.004*
Reading street names	32 (47.8)	25 (37.3)	-10.5% (-22.7 to 1.7)	0.016*
Going downstairs (low light)	35 (52.2)	27 (40.3)	-11.9% (-25.4 to 1.6)	0.002*
Limited time for studying	43 (64.2)	4 (6.0)	-58.2% (-70.6 to -45.8)	0.0001*
Sensation of frustration	17 (25.4)	10 (14.9)	-10.5% (-19.2 to -1.8)	0.002*
Control over daily life	28 (41.8)	44 (65.7)	+23.9% (7.2 to 40.6)	0.009*
Need for help	14 (20.9)	4 (6.0)	-14.9% (-25.2 to -4.6)	0.035*

$p < 0.05$ considered statistically significant; CI: Confidence interval

From a broader perspective, the present study reinforces the need to integrate optometric screening and follow-up into school health programs to ensure early identification of visual problems and continuity of care. Future research should explore long-term outcomes, the cost-effectiveness of school-based optometric interventions, and the differential impact on subgroups with specific visual or learning needs. Additionally, incorporating qualitative approaches could provide deeper insight into children's subjective experiences and the ways in which improved vision reshapes their academic, social, and emotional trajectories.

Study limitations

This study presents several limitations to consider when interpreting the findings. First, the absence of a control group restricts the ability to attribute the observed improvements exclusively to optometric intervention, as natural adaptation or external factors cannot be fully ruled out. Second, the relatively small sample size limits the statistical power and may reduce the generalizability of the results to broader school-aged populations. Third, the short follow up period of one month provides only an initial view of the intervention's impact; longer-term studies are needed to determine the durability of the improvements in visual function and quality of life.

Additionally, cycloplegia was not employed during the refractive examination due to operational and ethical considerations in the school setting. This may have influenced the precision of refractive measurements, particularly in younger children with high accommodative tone. Future studies should consider incorporating cycloplegic refraction when feasible, or at minimum, comparing outcomes between cycloplegic and non cycloplegic assessments to better understand potential measurement bias.

Clinical Implications

The findings of this study indicate that comprehensive optometric interventions—

integrating precise optical correction with structured education on ocular hygiene and visual habits—can substantially improve vision related quality of life in school aged children. The consistent improvements across functional domains suggest that these interventions not only address refractive errors but also enhance children's ability to perform essential academic and daily activities.

These results support the implementation of similar programs in other educational settings, particularly in communities with limited access to pediatric optometric care. Incorporating routine visual screening, timely correction of refractive errors, and age appropriate educational strategies into school health services may facilitate early detection of visual problems and prevent long term functional consequences. Furthermore, establishing follow up mechanisms—whether through periodic reassessments or digital monitoring tools—could strengthen adherence and ensure continuity of care.

Overall, the study underscores the value of integrating optometric services into school based health programs as a cost effective and impactful strategy to promote children's visual health, academic performance, and overall well being.

CONCLUSIONS

This study demonstrated that the implemented optometric intervention had a significant and positive impact on the vision-related quality of life of participating students. Marked improvements were observed in reading ability, reductions in difficulties with near-vision tasks, and a substantial decrease in frustration associated with visual problems. These findings highlight the effectiveness of combining optical correction with structured education on ocular hygiene and visual habits.

Overall, the results underscore the value of school based optometric programs as a practical and impactful strategy for addressing uncorrected visual problems in children. By

improving functional vision and emotional well being, such interventions have the potential to enhance academic performance, daily functioning, and overall quality of life. Future initiatives should consider integrating routine screening, individualized follow up, and educational components to ensure sustained benefits and equitable access to visual health services within educational settings.

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Conflict of interest

The authors declare no conflicts of interest related to this manuscript.

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Conflicts of interest

The authors declare that they have no conflicts of interest that could influence or bias the work presented in this study. No financial or personal relationships with other people or organizations exist that could inappropriately influence this research.

Ethics

This study was approved by the Research Ethics Committee of the Faculty of Health Sciences of Universidad del Sinú, Cartagena section, in accordance with the principles of the Declaration of Helsinki—ethics committee approval reference number: [Reference number to be provided by the institution]. Informed consent

was obtained from all participants' guardians, and verbal assent was obtained from minors before inclusion in the study.

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AUTHORS' CONTRIBUTIONS

JRP: Conceptualization, methodology, data curation, formal analysis, investigation, software, writing - original draft, writing - review and editing.

WEV: Data collection, methodology, writing - original draft, visualization, supervision, validation.

AHS: Writing - review and editing, formal analysis and visualization, critical revision of manuscript, final approval.

JBM: Conceptualization, writing - original draft, critical revision of manuscript.

CAR: Writing - review and editing, critical revision of manuscript, final approval.

JPR: Supervision, project administration, critical revision of manuscript, final approval.

All authors have read and agreed to the published version of the manuscript.

REFERENCES

1. Rey-Rodríguez DV, Álvarez-Peregrina C, Moreno-Montoya J. Prevalence and factors associated with myopia in young adults. *Rev Mex Oftalmol*. 2017;91(5):223-8.
2. Gómez-González M, Ossa Zapata H. Prevalence of amblyopia in school population, Pereira, Colombia, 2014. *Investig Andin*. 2015;18(32):1443-54.
3. Fernando J, Domínguez R, Angulo AC. Public service coverage in visual health in Bogotá,

- cosmopolitan capital. *Cienc Tecnol Salud Vis Ocul*. 2018;16(1):45-71.
4. Ortiz MI, Campuzano Revilla GP, Muñoz Pérez V, Cuevas Suárez CE. Prevalence of myopia, hyperopia and astigmatism in Mexico: A systematic review. *Educ Salud Bol Científico*. 2022;10(20):202-10.
 5. Palencia Flórez DC, Camacho López PA, Cáceres Manrique FdeM. Reliability of the NEI VFQ-25 scale in a Colombian population with chronic ocular disease. *Rev Mex Oftalmol*. 2016;90(4):174-81.
 6. Cole SR, Beck RW, Moke PS, Gal RL, Long DT. The National Eye Institute Visual Function Questionnaire: experience of ONTT. *Invest Ophthalmol Vis Sci*. 2000;41(5):1017-21.
 7. Mangione CM, Lee PP, Gutierrez PR, Spritzer K, Berry S, Hays RD; National Eye Institute Visual Function Questionnaire Field Test Investigators. Development of the 25-item National Eye Institute Visual Function Questionnaire. *Arch Ophthalmol*. 2001;119(7):1050-8.
 8. Pesudovs K, Gothwal VK, Wright T, Lamoureux EL. Remediating serious flaws in the National Eye Institute Visual Function Questionnaire. *J Cataract Refract Surg*. 2010;36(5):718-32.
 9. Wan Y, Zhao L, Huang C, Xu Y, Sun M, Yang Y, et al. Validation and comparison of the National Eye Institute Visual Functioning Questionnaire-25 (NEI VFQ-25) and the Visual Function Index-14 (VF-14) in patients with cataracts: a multicentre study. *Acta Ophthalmol*. 2021;99(4):e480-e488.
 10. Nassiri N, Mehravaran S, Nouri-Mahdavi K, Coleman AL. National Eye Institute Visual Function Questionnaire: usefulness in glaucoma. *Optom Vis Sci*. 2013;90(8):745-53.
 11. Ryan B, Court H, Margrain TH. Measuring low vision service outcomes: Rasch analysis of the seven-item National Eye Institute Visual Function Questionnaire. *Ophthalmic Epidemiol*. 2008;15(2):67-74.
 12. Stelmack JA, Stelmack TR, Massof RW. Measuring low-vision rehabilitation outcomes with the NEI VFQ-25. *Invest Ophthalmol Vis Sci*. 2002;43(9):2859-68.
 13. Marella M, Pesudovs K, Keeffe JE, O'Connor PM, Rees G, Lamoureux EL. The psychometric validity of the NEI VFQ-25 for use in a low-vision population. *Invest Ophthalmol Vis Sci*. 2010;51(6):2878-84.
 14. Vaughn W, Maples WC, Hoenes R. The association between vision quality of life and academics as measured by the College of Optometrists in Vision Development Quality of Life questionnaire. *Optometry*. 2006;77(3):116-23.
 15. He M, Abdou A, Naidoo KS, Sapkota YD, Thulasiraj RD, Varma R, et al. Prevalence and correction of near vision impairment at seven sites in China, India, Nepal, Niger, South Africa, and the United States. *Am J Ophthalmol*. 2012;154(1):107-16.e1.
 16. Tavazzi S, Vlasak N, Zeri F. Effects of lens-induced astigmatism at near and far distances. *Clin Exp Optom*. 2020;103(6):735-44.
 17. Choi K, Wong H, Cheung H, Tseng J, Chen C, Wu C, et al. Impact of visual impairment on balance and visual processing functions in students with special educational needs. *PLoS One*. 2020;15(12):e0249052.
 18. Klein R, Moss SE, Klein BE, Gutierrez P, Mangione CM. The NEI-VFQ-25 in people with long-term type 1 diabetes mellitus: the Wisconsin Epidemiologic Study of Diabetic Retinopathy. *Arch Ophthalmol*. 2001;119(5):733-40.
 19. Saboo US, Amparo F, Abud TB, Schaumberg DA, Dana R. Vision-Related Quality of Life in Patients with Ocular Graft-versus-Host Disease. *Ophthalmology*. 2015;122(8):1669-74.
 20. Vélez CM, Ramírez PB, Oviedo-Cáceres MDP, Lugo Agudelo LH, Posada AM, Hernández-Padilla ML, et al. Psychometric Properties of Scales for Assessing the Vision-related Quality of Life of People with Low Vision: A Systematic Review. *Ophthalmic Epidemiol*. 2023;30(3):239-248.
 21. Trento M, Durando O, Lavecchia S, Charrier L, Cavallo F, Costa MA, et al. Vision related quality of life in patients with type 2 diabetes in the EUROCONDOR trial. *Endocrine*. 2017;57(1):83-88.