

Visual Acuity Assessment through the School Health Program: impacts and proposals for improvement

Avaliação de Acuidade Visual pelo Programa Saúde na Escola: impactos e proposições para aprimoramento

Evaluación de la Agudeza Visual en el marco del Programa Salud en la Escuela: Impactos y Propuestas de Mejora

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Abstract

Introduction: Refractive errors are very common in childhood and are often detected and treated late, impairing health and academic development. The Visual Acuity Assessment of the School Health Program (AAV-PSE; Avaliação da Acuidade Visual do Programa Saúde na Escola) aims to conduct an ophthalmological screening and alert parents to the need for further investigation. The Porto Olhar Alegre (PPOA) project provides free eyeglasses to children and adolescents in the city of Porto Alegre, state of Rio Grande do Sul, Brazil. **Objective:** To determine the prevalence of visual impairments among elementary school students at a public school through the AAV-PSE conducted at a Health Unit and the follow-up action (referral for an ophthalmological consultation and to the PPOA). **Methods:** This is a descriptive observational study involving 135 students in the 1st and 3rd grades who were systematically evaluated using the Snellen chart in Porto Alegre in 2022 and 2023. Additionally, in 2023, 42 students from other grades were evaluated after pre-screening (selectively referred by teachers). Referrals to ophthalmology and the PPOA for students with abnormal AAV-PSE results were reviewed based on the Appointment Management System of the Unified Health System and data provided by the Municipal Health Secretariat. **Results:** Among the 49 first- and third-year students with abnormal screening results (36.2% of those evaluated), 32 received a referral for an ophthalmology consultation following active search, and 24 had a confirmed appointment. Six were consulted in the private sector, and four obtained eyeglasses through the PPOA. Regarding students in other grades, 21 (50% of those evaluated) had abnormal AAV-PSE results; eight were referred to an ophthalmologist through the Unified Health System, four had consultations, and two obtained eyeglasses through the PPOA. **Conclusions:** The AAV-PSE visual screening detected a high number of children with untreated visual impairments, reinforcing the importance of this initiative by health units, especially in contexts of greater vulnerability. The additional and selective evaluation of students from other grade levels referred by teachers expanded detection rates. The active search for children with visual impairments reinforced the recommendation that parents seek referral to ophthalmology, resulting in increased demand for the service. The joint effort by the school and the Health Unit to publicize the availability of free eyeglasses through the PPOA needs to be strengthened. Strengthening of eye health policies, such as monitoring systems and facilitating access to specialized consultations and the PPOA, could be developed by the Municipal Health Secretariat through a school eye health care pathway.

Keywords: Mass screening; Visual acuity; School health promotion; Ophthalmology; Primary health care.

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Resumo

Introdução: Erros refrativos são muito comuns na infância e frequentemente tardam em ser detectados e tratados, prejudicando a saúde e o desenvolvimento escolar. A Avaliação da Acuidade Visual do Programa Saúde na Escola (AAV-PSE) visa realizar uma triagem oftalmológica e alertar os pais para a necessidade de investigação adicional. O projeto Porto Olhar Alegre (PPOA) fornece óculos gratuitamente a crianças e adolescentes da cidade de Porto Alegre, estado do Rio Grande do Sul. **Objetivo:** Verificar a prevalência de alterações visuais em estudantes do ensino fundamental de uma escola pública por meio da AAV-PSE de uma Unidade de Saúde e o desdobramento da ação (encaminhamento à consulta oftalmológica e ao PPOA). **Métodos:** Trata-se de um estudo observacional descritivo com 135 alunos do 1º e 3º anos escolares avaliados sistematicamente com a tabela de Snellen, em Porto Alegre, em 2022 e 2023. Adicionalmente, em 2023, 42 alunos de outros anos foram avaliados após pré-triagem (seletivamente indicados pelos professores). Foram revisados os encaminhamentos à oftalmologia e ao PPOA de estudantes com resultados alterados na AAV-PSE com base no Sistema de Gerenciamento de Consultas do Sistema Único de Saúde e nos dados fornecidos pela Secretaria Municipal de Saúde. **Resultados:** Entre os 49 estudantes de 1º e 3º anos com triagem alterada (36,2% dos avaliados), 32 receberam encaminhamento para consulta oftalmológica após busca ativa e 24 tiveram atendimento confirmado. Seis consultaram no setor privado e quatro obtiveram óculos pelo PPOA. Em relação aos alunos de outros anos, 21 (50% dos avaliados) tiveram alteração na AAV-PSE, oito foram encaminhados ao oftalmologista via Sistema Único de Saúde, quatro realizaram consulta e dois adquiriram óculos pelo PPOA. **Conclusões:** A triagem visual da AAV-PSE detectou elevado número de crianças com distúrbios visuais não tratados, reforçando a importância desta iniciativa implementada pelas unidades de saúde, em especial em contextos de maior vulnerabilidade. A avaliação adicional e seletiva de alunos de outros anos escolares, indicados pelos professores, ampliou a detecção. A busca ativa das crianças com alterações reforçou aos pais a indicação de procurar encaminhamento à oftalmologia, refletindo no aumento da procura pelo serviço. O esforço conjunto da escola e da Unidade de Saúde em divulgar a gratuidade de óculos pelo PPOA necessita ser reforçado. O fortalecimento de políticas de saúde ocular, como sistemas de monitoramento e facilitação do acesso às consultas especializadas e ao PPOA, poderia ser desenvolvido pela Secretaria Municipal de Saúde por meio de uma linha de cuidado em saúde ocular escolar.

Palavras-chaves: Programas de rastreamento; Acuidade visual; Serviços de saúde escolar; Oftalmologia; Atenção primária à saúde.

Resumen

Introducción: Los errores refractivos son frecuentes en la infancia y a menudo se detectan y tratan tardíamente, afectando la salud visual y el rendimiento escolar. La Evaluación de Agudeza Visual del Programa Salud en la Escuela (AAV-PSE) tiene como objetivo realizar un tamizaje oftalmológico y alertar a los padres sobre la necesidad de una evaluación adicional. El proyecto *Porto Olhar Alegre* (PPOA) proporciona gafas de forma gratuita a niños y adolescentes en la ciudad de Porto Alegre. **Objetivo:** Verificar la prevalencia de alteraciones visuales en estudiantes de enseñanza primaria de una escuela pública mediante la AAV-PSE realizada por una Unidad de Salud (US), así como los desdoblamientos de la acción (derivación a consulta oftalmológica y al PPOA). **Métodos:** Estudio observacional descriptivo con 135 alumnos de primer y tercer años escolares evaluados sistemáticamente con la tabla de Snellen, en Porto Alegre, en 2022 y 2023. Adicionalmente, en 2023, 42 alumnos de otros años fueron evaluados después de preselección (indicados selectivamente por los profesores). Se revisaron las derivaciones a oftalmología y al PPOA de los alumnos con alteraciones visuales detectadas en la AAV-PSE mediante el Sistema de Gestión de Consultas del SUS, además de los datos proporcionados por la Secretaría Municipal de Salud (SMS). **Resultados:** Entre los 49 estudiantes de primer y tercer año con tamizaje alterado (36,2% de los evaluados), 32 recibieron derivación para consulta oftalmológica tras búsqueda activa y 24 tuvieron la consulta confirmada. Seis consultaron en el sector privado y cuatro obtuvieron gafas por el PPOA. Entre los estudiantes de otros grados, 21 (50%) presentaron alteraciones en la AAV-PSE, 8 fueron derivados al oftalmólogo por el SUS, 4 realizaron la consulta y 2 obtuvieron gafas por medio del PPOA. **Conclusiones:** El tamizaje visual de la AAV-PSE identificó un alto número de alteraciones visuales no tratadas, destacando la relevancia de esta acción por parte de las US, especialmente en contextos vulnerables. La evaluación selectiva de alumnos de otros grados, indicados por los docentes, amplió la detección de casos. El seguimiento activo de los estudiantes con alteraciones reforzó a las familias la importancia de buscar atención oftalmológica. Es necesario fortalecer la difusión del beneficio del PPOA. La SMS debería desarrollar políticas públicas de salud visual escolar, incluyendo sistemas de monitoreo y acceso facilitado a consultas especializadas y al PPOA, en el marco de una línea de cuidado en salud ocular escolar.

Palabras clave: Tamizaje masivo; Agudeza visual; Servicios de salud escolar; Oftalmología; Atención primaria de salud.

INTRODUCTION

Refractive errors in childhood, especially the myopia epidemic, have become a global concern and, more recently, a Brazilian one.^{1,2} Worldwide, in the age group between 5 to 15 years, about 12.8 million children have some form of visual impairment resulting from uncorrected refractive errors, which are the leading cause of visual impairment among students.³ The Ministry of Health estimates that 20% of schoolchildren have untreated visual difficulties, such as refractive errors (hyperopia, myopia, and

astigmatism), which require correction with eyeglasses.³ Regarding myopia, its prevalence is projected to double between 2000 and 2050.² The prevalence of high myopia will triple over the same period, a condition that can lead to complications (cataracts, glaucoma, retinal detachment, maculopathy) and irreversible blindness in young and adult populations.^{2,4,5}

Brazil lacks national data on the prevalence of refractive errors; however, despite being considered a hyperopia-predominant country, some local studies consistently reflect the global trend of increasing myopia.^{1,6} Recent studies conducted in cities in Ceará and São Paulo identified myopia prevalences of 20.4 and 15.2%, respectively.^{7,8} In the metropolitan region of Porto Alegre, in the state of Rio Grande do Sul, the prevalence of myopia was estimated at 17.4%, with each additional hour of electronic device use significantly increasing the risk of developing myopia by 6.5%.¹

Refractive errors in childhood are a focus of attention for the potential worsening of the condition during childhood and adolescence and due to the significant implications these vision problems can have on children's overall neuropsychomotor development, socialization, quality of life, and academic performance.^{1,9} Several factors appear to contribute to this scenario, such as prolonged exposure to near-vision activities, such as reading, studying, or screen-based leisure activities (especially on increasingly smaller screens), and a decrease in outdoor activities.^{1,6,10} Time spent outdoors is a protective factor that is pathophysiologically linked to increased dopamine release resulting from sunlight exposure, which helps control the axial elongation of the eyeball.¹⁰ Preventive and early intervention strategies are necessary to ensure proper eye health during childhood.¹¹

In 2007, the School Health Program (Programa Saúde na Escola (PSE)) was established¹² with the objective of integrating educational and health activities into the public school system.¹³ Among the activities carried out in the PSE is the Visual Acuity Assessment (Avaliação da Acuidade Visual (AAV)), which consists of a visual screening performed using the Snellen chart. This test can be performed by all health and education professionals, provided they are trained. It is recommended that students between 5 and 16 years be screened annually. In case of abnormalities, the student must be referred for evaluation by an ophthalmologist.^{7,8}

The implementation of AAV in the PSE in Brazil increased by 65% between 2014 and 2019, with Rio Grande do Sul having the highest implementation rate in 2019 (18.7%).¹⁴ In 2021, the Porto Olhar Alegre Program (Programa Porto Olhar Alegre (PPOA)) was launched in Porto Alegre, the capital of Rio Grande do Sul, which provides free eyeglasses for children, adolescents, and students enrolled in the Youth and Adult Education (Educação de Jovens e Adultos (EJA)) program. To access the eyeglasses, only an identification document, proof of residence in Porto Alegre, and a prescription issued within the last six months—by a Unified Health System (Sistema Único de Saúde (SUS)) or private ophthalmologist—are required.¹⁵

Despite investments at the national, state, and municipal levels in the program, and the recommendation to evaluate its effectiveness and impact on eye health, there are few studies on the topic.^{14,16} For example, analyses of the number of students who accessed eye care through the program are rare, and there are no studies evaluating its relationship with the implementation of the PPOA. This lack of knowledge regarding the obstacles encountered in the implementation of the AAV and its subsequent outcomes hinders program improvement by the Municipal Health Secretariat (Secretaria Municipal de Saúde (SMS)) and may discourage its implementation by health and school teams, as its effectiveness remains uncertain. Thus, the evaluation and monitoring of these activities are indispensable.

The aim of this study was to determine the prevalence of visual impairments identified by the Snellen chart test among elementary school students at a public school in Porto Alegre, though the application

of AAV-PSE by a Health Unit. Additionally, the study sought to evaluate the outcomes of the intervention, including the number of students subsequently referred for ophthalmological consultation within the SUS and, when necessary, to the PPOA to receive free eyeglasses.

METHODS

Study design

This is a descriptive observational study based on secondary data from AAV using the Snellen chart, conducted as part of the PSE by a Health Unit at a public school in Porto Alegre in 2022 and 2023.

Data collection methodology

Data from the ophthalmological assessment previously conducted by a Health Unit (Unidade de Saúde (US) in Porto Alegre as part of the PSE at a state public school were collected and analyzed in August 2022 and in July, August, and September 2023. The evaluations took place during these months due to organizational issues at the US, which is the period when the staff organize and carry out PSE activities.

The assessment data were recorded by the US in internal spreadsheets on Google Sheets. In November 2024, follow-up information regarding referrals for ophthalmological consultations was collected and analyzed using records from the Appointment Management System (Gerenciamento de Consultas (GERCON) of the state of Rio Grande do Sul. The number of children who accessed the PPOA and received free eyeglasses was also estimated, based on data sent by the SMS of Porto Alegre in October 2024 and on the review of referrals in GERCON in November 2024, since, as of mid-2023, referrals to the PPOA began to be processed via GERCON.

A Google Forms tool was developed to centralize all data. Data consistency and reliability were ensured by standardizing responses on the form, which consisted primarily of multiple-choice questions and a few short-answer questions. The form was completed by one researcher and reviewed by the other. Student identification and profile variables were recorded, and the visual assessment outcome included changes in the Snellen test.

For the care follow-up, information was extracted from GERCON regarding the initial referral to ophthalmology by the US prior to the active search, the conduct of the active search, and any changes in referral status following this intervention. In cases where an appointment was scheduled, the outcome regarding the presence of visual changes after ophthalmological evaluation was recorded, when available. Finally, information regarding referral to the PPOA and receipt of eyeglasses were collected.

Visual Acuity Assessment – a School Health Program activity

The school and US involved in the study are located in the Northern part of the city of Porto Alegre, Rio Grande do Sul. It is important to note that the school is situated at the intersection of several health districts, serving students from the areas of coverage of various neighboring USs.

The AAV was conducted with all 1st- and 3rd-grade students present on the assessment days in 2022 and 2023; that is, it was a systematic assessment. Additionally, only in 2023, students from other

grades (4th to 8th grade) whose teachers suspected a possible visual impairment were also screened, constituting an assessment of students pre-screened by teachers.

The selection of 1st- and 3rd-grade students for the systematic assessment was determined by the US team responsible for the activity. In 1st grade, the goal was to facilitate the detection of visual impairments in younger children, who tend to have a lower ability to recognize and report symptoms. In the 3rd grade, the choice was made because there were no PSE activities during the pandemic years, leading the team to prioritize this grade level, considering that students then in the 2nd grade would be evaluated the following year. Since it was not possible to conduct the AAV throughout elementary school due to time constraints, an agreement was reached with the school to refer students from other grade levels with teacher-suspected visual impairments for targeted evaluation.

Students with visual impairments received a note to take home to their parents with instructions to visit the designated US for evaluation and referral to an ophthalmologist; the note also included information about free eyeglasses through the PPOA, if necessary. The school received a list of students with visual impairments to assist with monitoring and communication with the students' parents.

In November 2023, community health workers from the US conducted active search for students with visual impairments who had not yet attended a consultation to obtain a referral for ophthalmological evaluation. The US team sent an e-mail to all neighboring USs with a list of 1st- and 3rd-grade students belonging to each US, recommending that they conduct active search for their registered users. These teams confirmed receipt of the e-mail and reported that they would conduct or had already conducted the search. Active screening of students from the 4th to the 9th grade was not performed. During the active screening process, some family members reported that students were already wearing eyeglasses, even though they had not been referred to the consultation by SUS, because they had consulted a private ophthalmologist.

Instrument for conducting ophthalmological assessment - Snellen chart and its interpretation

Visual acuity was assessed using the Snellen chart in a well-lit environment, 5 to 6 meters from the chart, with monocular testing (right eye followed by left eye). When applicable, students were assessed while wearing their distance eyeglasses. A positive screening result was defined as visual acuity less than or equal to 0.7 in either eye, a difference of two lines or more between the eyes, strabismus, or other ocular signs or symptoms.¹⁷

For the purposes of this study, the classification based on visual acuity assessed using the Snellen test was adopted: mild impairment (score of 0.7 or the presence of other visual abnormalities in at least one eye), moderate impairment (score between 0.5 and 0.6 in at least one eye), and severe impairment (score of 0.4 or lower in at least one eye).

Statistical analyses

Frequency, mean, and standard deviation calculations were performed using Python, version 3.6.9. The calculated sample size was 144 subjects systematically evaluated to estimate the proportion of the "positive/abnormal screening" outcome—Snellen test score of 0.7 or lower or a difference of two lines or more between the visual acuity of the eyes—with a 10% margin for the confidence interval.¹⁰ The calculation, performed using the PSS Health tool, considered a 95% confidence level and an expected percentage of 10.88% for positive screening.¹⁸

Ethical considerations

The study was approved by opinion No. 6,869,110 issued by the Research Ethics Committee of the Grupo Hospitalar Conceição and by opinion No. 7,076,885 issued by the Research Ethics Committee of the Municipal Health Secretariat of Porto Alegre.

RESULTS

A total of 177 students participated in the AAV using the Snellen Test: 135 children in 1st and 3rd grades who were systematically evaluated and 42 from various classes from 4th to 9th grade who were evaluated after pre-screening (referral by teachers).

Regarding the 135 students in 1st and 3rd grades, 79 children participated in 2022 and 56 children in 2023. Overall, considering both grades and both years, 135 out of a total of 183 enrolled students (73.7%) were present on the days the AAV was conducted and took the test. The demographic characteristics of the 1st- and 3rd-grade classes that participated in the AAV in the study are described in Table 1. The majority (85.0%) of the children were affiliated with three USs, of whom 15.56% lived in the area assigned to the territory of the US that conducted the activity. The remaining participants (15.0%) were affiliated with ten other different units.

Among the 135 students who participated in the AAV, 49 (36.2%) had impaired visual acuity; one (0.7%) of these had difficulty completing the test due to lack of understanding and was also referred for ophthalmological evaluation. The classification of the severity of visual impairment and the general

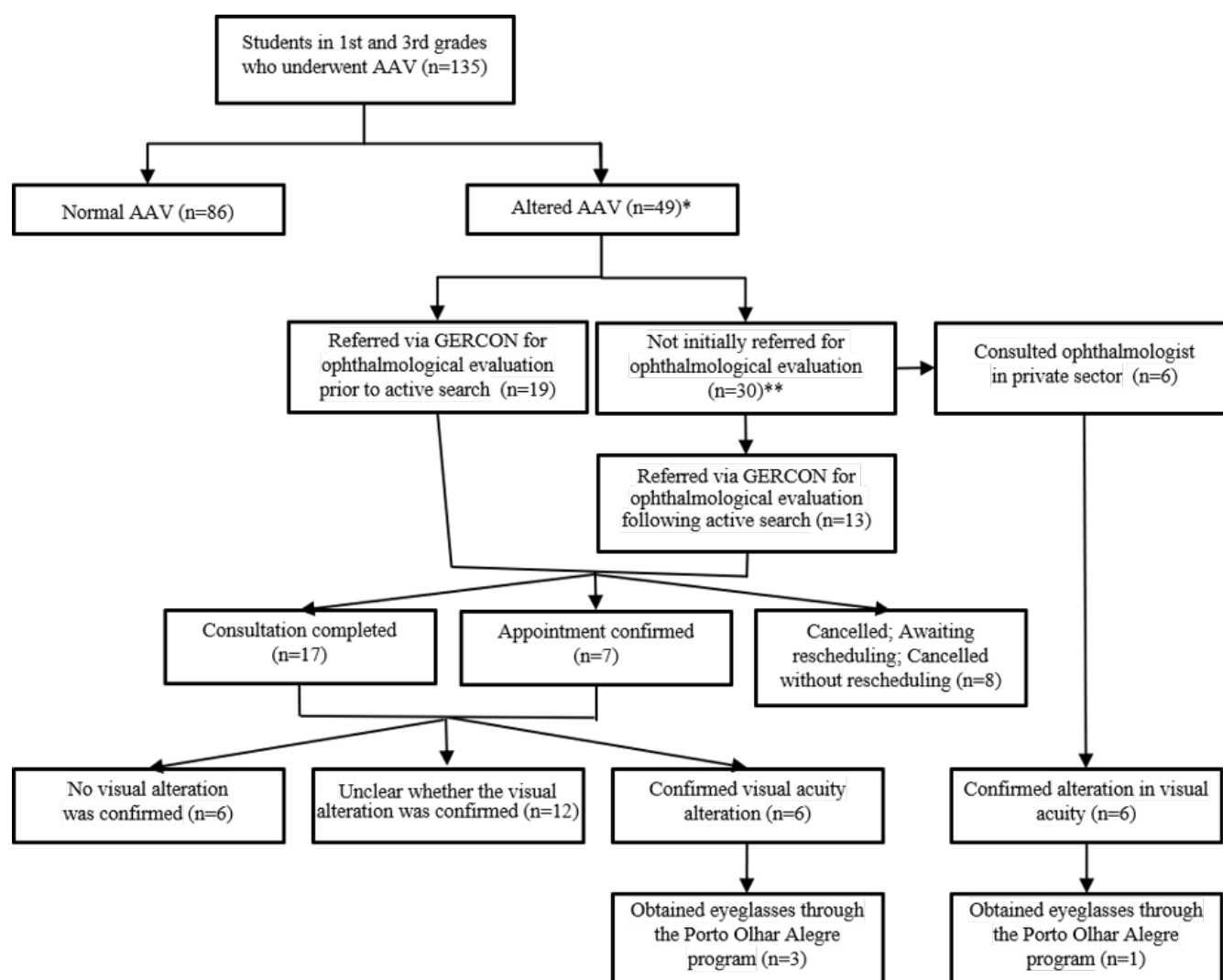
Table 1. Sociodemographic data and severity of visual impairment in 1st- and 3rd-grades of elementary school classes, systematically assessed using the Snellen test.

Variables	1st year (n=65) (%)	3rd year (n=70) (%)
Demographic data (n=135)		
Age (mean and standard deviation)	6.4±0.6	8.7±0.8
Female	38 (58.5)	29 (41.4)
Included in 2022	37 (56.9)	42 (60.0)
Included in 2023	28 (43.1)	28 (40.0)
Snellen test classification*		
No classification**	1 (1.5)	0 (0)
Normal	43 (66.2)	43 (61.4)
Mild	7 (10.8)	7 (10.0)
Moderate	9 (13.8)	6 (8.6)
Severe	5 (7.7)	14 (20.0)
Positive visual screening (n=49)		
Age (mean and standard deviation)	6.4±0.6	8.6±0.7
Female	13 (59.1)	10 (37.0)

*Mild: at least one eye with a score of 0.7 or other visual abnormalities (a difference of two lines or more between the eyes, strabismus, and other ocular symptoms); Moderate: a score between 0.5 and 0.6 in at least one eye; Severe: a score of 0.4 or less in at least one eye. **One student who had difficulty completing the test was included in this analysis, as an ophthalmological evaluation was also recommended. For this reason, this student was not classified according to predefined criteria.

characteristics and data related to the referral to ophthalmology for the 49 children with visual impairment on the Snellen test are presented in Table 1 and Figure 1.

Before the active search, 19 students (38.78%) had been referred for ophthalmological evaluation via GERCON. After active screening, 13 received new referrals, and five had changes in their referral status in GERCON (a change being defined as the issuance of a referral, as well as a re-referral in cases in which the appointment was “canceled” or “pending reversal”). At the end of the process, 32 students (65.3%) were referred. With regard to the six students for whom no visual change was confirmed after consultation with the ophthalmologist, five were 6 years old and one was 8 years old.



AAV: Visual Acuity Assessment using the Snellen chart. GERCON: Appointment Management System used in the state of Rio Grande do Sul. Porto Olhar Alegre: program that provides free eyeglasses to children, adolescents, and students in the EJA (Youth and Adult Education) in the city of Porto Alegre. *Visual acuity was considered abnormal when a score of 0.7 or lower occurred in at least one eye or when other visual abnormalities were present (a difference of two lines or more between the eyes, strabismus, and other ocular symptoms). One student who had difficulty completing the test due to lack of understanding was included, as an ophthalmological evaluation was also recommended. **All students underwent active screening, with the exception of three who scored 0.7 in both eyes and were initially and erroneously considered to have no visual impairment on the test.

Figure 1. Flowchart of the Visual Acuity Assessment of the School Health Program conducted with 1st- and 3rd-grade classes.

Among the 42 students in grades 4 through 9 who were pre-screened—that is, selectively referred by their teachers for the AAV—21 (50.0%) presented with visual impairment (42.8% moderate and 57.1% severe). Sociodemographic data, details regarding referrals, and the provision of eyeglasses are presented in Table 2 and Figure 2.

DISCUSSION

Of the 135 students in the 1st and 3rd grades of elementary school who participated in the AAV, there was a considerable rate of abnormalities in the visual screening test (49 children; 36.2%). Compared to the literature, which reports a 10.88% rate of abnormalities in screening programs in the northeastern region of Rio Grande do Sul and 14.22% in an inland city of São Paulo state,^{18,19} the result found in this study is high. Some hypotheses can be raised:

- a higher prevalence in the region (myopia alone accounts for 17.4% in the metropolitan area);¹
- high social vulnerability in the study setting; and
- difficulty understanding the test among first-grade children because of their young age.

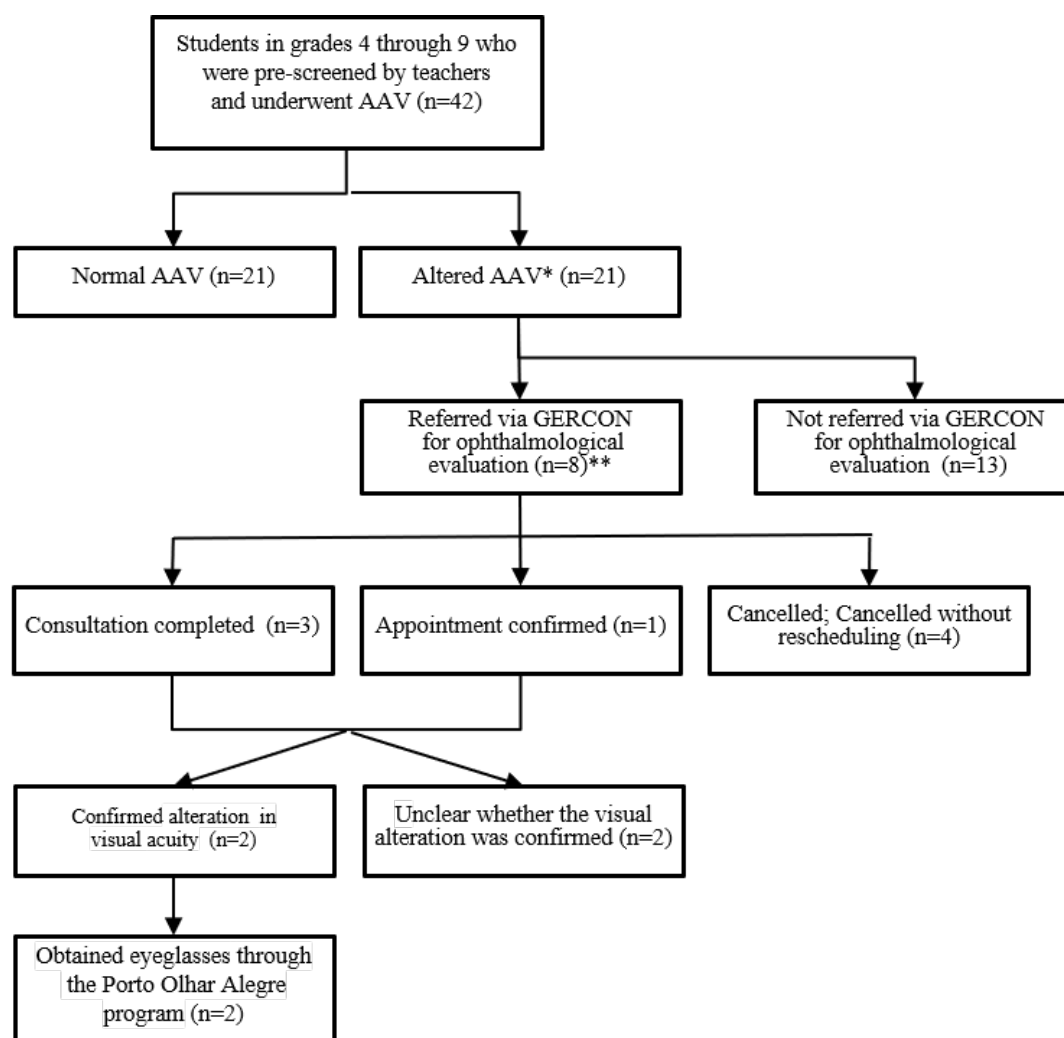
This hypothesis is supported by the fact that visual impairment was not confirmed after the specialist consultation in six children (five of whom were 6 years old). The lack of information regarding whether or not visual impairment was confirmed after ophthalmological consultation in another 12 children also compromises this assessment. Furthermore, the school absenteeism rate on the day of the AAV was approximately one-quarter of the class, which may have affected the estimated the estimated percentage of students with visual impairments.

Table 2. Sociodemographic data and severity of visual impairment among students in the 4th, 5th, 6th, 7th, 8th, and 9th-grade elementary school participating in the vision screening.

Variables	4th grade (n=3) (%)	5th grade (n=5) (%)	6th grade (n=13) (%)	7th grade (n=4) (%)	8th grade (n=6) (%)	9th grade (n=11) (%)
Demographic data (n=42)						
Age (mean and SD)	9.3±0.6	11.2±1.3	11.8±1.1	13±0	14±1.1	14.7±0.9
Female	3 (100)	1 (20.0)	9 (69.2)	3 (75.0)	4 (66.7)	5 (45.5)
Included in 2022	0	0	0	0	0	0
Included in 2023	3 (100)	5 (100)	13 (100)	4 (100)	6 (100)	11 (100)
Snellen test score*						
Normal	1 (33.3)	2 (40.0)	8 (61.5)	1 (25.0)	3 (50.0)	6 (54.5)
Mild	0	0	0	0	0	0
Moderate	0	0	3 (23.1)	2 (50.0)	1 (16.7)	3 (27.3)
Severe	2 (66.7)	3 (60.0)	2 (15.4)	1 (25.0)	2 (33.3)	2 (18.2)
Positive visual screening (n=21)						
Age (mean and SD)	9.5±0.7	11.3±1.5	12±1.4	13±0	15±0	15±1.0
Female	2 (100)	1 (33.3)	4 (80.0)	3 (100)	3 (100)	3 (60.0)

SD: standard deviation.

*Mild: at least one eye with a score of 0.7 or other visual abnormalities (a difference of two lines or more between the eyes, strabismus, and other ocular symptoms); Moderate: a score between 0.5 and 0.6 in at least one eye; Severe: a score of 0.4 or less in at least one eye.



AAV: Visual Acuity Assessment using the Snellen test. GERCON: Appointment Management system used in the state of Rio Grande do Sul. Porto Olhar Alegre: a program in the city of Porto Alegre that provides free eyeglasses to children, adolescents, and students in the EJA (Youth and Adult Education). *Visual acuity was considered abnormal when a score of 0.7 or lower occurred in at least one eye or when other visual abnormalities were present (a difference of two lines or more between the eyes, strabismus, and other ocular symptoms). **No active screening was performed.

Figure 2. Flowchart of the Visual Acuity Assessment of the School Health Program conducted with 4th through 9th grade classes.

More than half of the children in 1st and 3rd grades with visual impairments (65.3%) were referred for an ophthalmological consultation via GERCON-SUS following active screening, a figure below the desired level. The active screening initiative significantly increased the number of children referred. However, since the school studied serves students from various USs, the active search process and the monitoring conducted by each Primary Health Care team were heterogeneous, which partly explains the low demand from families of 1st and 3rd graders for referrals of their children to ophthalmology. Few children sought care in the private sector, a number that may be underestimated since this information was not systematically assessed in this study but rather obtained incidentally.

Even fewer children (24 students, representing 48.9% of those with visual abnormalities identified during screening) had their specialist consultation confirmed or scheduled. This figure is similar to the rate of attendance at specialized consultations following screening in the northeastern region of the state of Rio

Grande do Sul (51.16%),¹⁸ and is lower than the rate found in a municipality in an inland city of São Paulo state (81.25%).¹⁹ Among the students referred in this study, the median wait time until the consultation was 145.5 days. This wait may compromise the children's development.

Few children were referred to the PPOA and received eyeglasses free of charge. The shift in the referral flow to PPOA via the coordination office to GERCON represents an improvement in the referral process; however, it is observed that further measures are necessary to improve dissemination and streamline access to the service after obtaining a prescription for eyeglasses from an ophthalmologist.

In the comparison between the systematic screening of the entire class and the screening of students pre-screened by teachers, the former identified mild, moderate, or severe visual impairments in 36.2% of the students, while the latter identified only moderate and severe impairments in 50.0% of those screened. Thus, systematic screening likely presents a lower risk of failing to identify visual changes, especially mild cases, whereas the teacher-led pre-screening strategy proved more time-efficient by concentrating a higher proportion of cases with visual changes among the examined individuals. Given the time constraints for evaluating all students in the school aged 5 to 16, teacher referral constituted, in this study, a feasible alternative for expanding the AAV, with a focus on detecting moderate to severe cases.

Furthermore, regarding the 4th- to 9th-grade classes, although abnormalities were found in half of those evaluated, less than half were referred for specialized consultation, most likely due to the lack of active search after screening for this group. This finding, compared to the higher percentage of students referred to ophthalmology in the 1st and 3rd-grade groups that underwent active screening, demonstrates the importance of conducting active screening of students following the initial triage process. The responsibility of the US teams to contact families directly, rather than relying solely on the note that the student will take home to their parents with instructions to visit their US for referral, must be reinforced.

PSE was conceived from the outset as a cross-sectoral policy, established in 2007 under the joint auspices of the Ministries of Health and Education. This confers on PSE an intrinsically interdisciplinary and holistic perspective on the human being,²⁰ in order to address the vulnerabilities that may compromise the full development of Brazilian children, adolescents, and young people.²¹ At its core, the PSE seeks to strengthen the comprehensiveness of care and education for students in the public basic education system. Among the various initiatives for expanded student care are those related to health promotion, prevention, and care in the areas of sexuality education, nutrition education, physical activity, violence prevention, substance use prevention, oral health, vaccination updates, *Aedes aegypti* prevention, and AAV, among others.²²

The AAV-PSE has clear benefits for students' vision and learning and represents a cost-effective solution for preventing blindness. In addition to the impact on academic performance, uncorrected visual impairments in childhood can compromise overall development, affecting fine and gross motor skills, environmental exploration, participation in play, and autonomy in daily activities, with potential cumulative repercussions throughout the developmental cycle.⁹ From a psychosocial perspective, conditions such as strabismus and amblyopia are associated with stigma, difficulties in social interaction, and a poorer health-related quality of life, including emotional and self-image dimensions.^{9,23,24} Furthermore, children and adolescents with visual impairments have a lower quality of life in domains such as physical well-being and social support among peers, as well as reduced participation in life situations.²⁵

Despite the program's enormous potential, the lack of follow-up represents a major barrier to achieving its objectives.^{26,27} A guide from the International Agency for the Prevention of Blindness recommends the implementation of monitoring and evaluation systems as a significant step in the adoption of school-based

screening programs.^{16,27} Primary Health Care coordinates care by identifying students' ophthalmological needs, ensuring specialized evaluation and free access to eyeglasses, conducting active screening, and providing comprehensive care that takes into account family, psychological, and social needs. The program's results, however, must be the result of the synchronized work of teams from Primary Health Care, Basic Education, and municipal administration, with an emphasis on the monitoring role of the latter.

The systematization and facilitation of processes involving the AAV could be improved by organizing a school eye care pathway linked to the PSE, integrating ophthalmological screening, diagnostic confirmation, and effective access to vision correction. In addition to outreach efforts and initiatives to encourage the implementation of the AAV by the USs and schools, as well as the acquisition of free eyeglasses by the community, it is important for the SMS to create a streamlined pathway to regionalized ophthalmological consultations. It is also necessary for patients to leave the specialist consultation already carrying a referral for receiving eyeglasses. Furthermore, the SMS should assist USs and schools in monitoring these children to ensure that those with visual abnormalities are evaluated and treated appropriately.

The recommendations below are intended to improve this line of school eye care linked to the PSE. It is necessary to refine the process of this care pathway involving schools, the SMS, and Primary Health Care in order to define the role of each sector, conduct continuing education activities with all stakeholders, and monitor the results. Table 3 summarizes the recommendations for implementing the AAV, outlining the roles of the SMS, USs, and schools. Figure 3 is an infographic presenting the main results of this study, along with a practical summary of recommendations based on the discussion in this article, designed to assist in the future implementation of this activity.

The results obtained reinforce the importance of the Snellen test as an essential tool in the PSE, highlighting its role as an initial screening for the early detection of changes in visual acuity among schoolchildren. The inclusion of such an assessment in the PSE is crucial, since undiagnosed visual disorders can negatively impact children's academic performance, psychosocial development, and quality of life. The SMS needs to support USs and schools with strategies for monitoring, expanding and facilitating access to ophthalmological consultations, and the provision of free eyeglasses.

This study is innovative in that it integrates systematized data on the stages following screening, such as referral, the conduct of eye examinations, and the acquisition of eyeglasses through the PPOA. This integration provides a broad view of the gaps between initial diagnosis, monitoring, and effective intervention, as well as weaknesses in the recording of information within the system.

Some limitations of the study include:

- the inability to assess how the teams at each US conducted the active search process for those evaluated systematically and the failure to conduct an active search for students evaluated through teacher pre-screening;
- the inability to systematically assess the follow-up of all patients not entered into GERCON;
- a lack of clarity in the ophthalmological consultation records within the GERCON regarding the outcome of the specialist consultation; and
- the inability to perform sensitivity and specificity analyses to compare the systematic screening and teacher-led pre-screening strategies.

Additionally, the study nearly reached the previously calculated sample size for children screened systematically (135 students screened systematically), as many students were absent from school on the

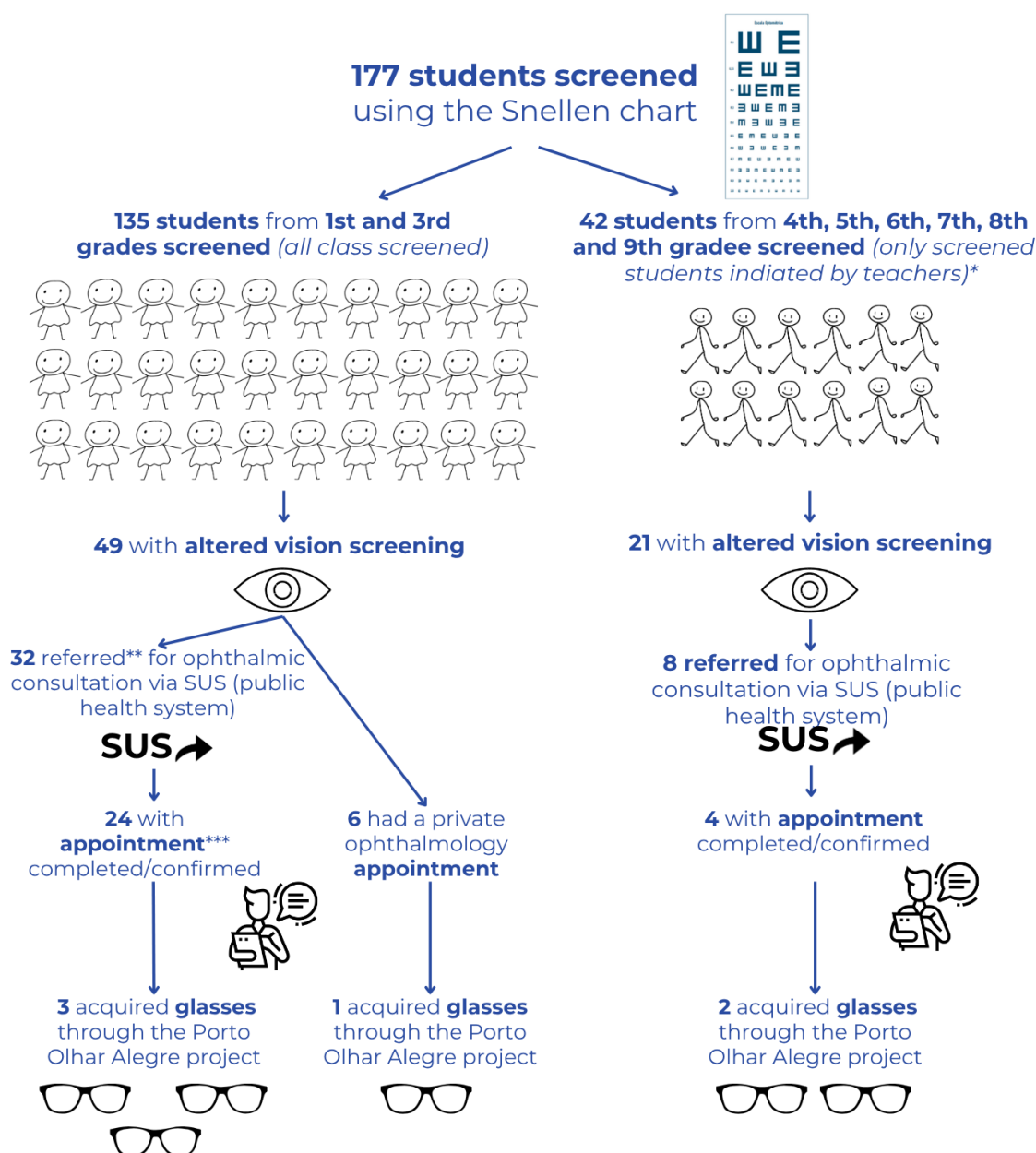
Table 3. Recommendations for improving Visual Acuity Assessment through the School Health Program and the Porto Olhar Alegre project.

Suggested Actions for the Municipal Health Department	
1 Training	Assess the capacity of screeners and conduct annual training sessions for refresher courses and skill development.
2 Outreach	Expand outreach to schools and the general public regarding School Health Program initiatives and the provision of free eyeglasses through the Porto Olhar Alegre project.
3 Monitoring/ Surveillance	Create a list of children with abnormal visual screening results and conduct periodic monitoring of referrals for ophthalmological consultations and for the Porto Olhar Alegre project. The spreadsheet would be populated by the health unit staff and also updated by the regional coordinators of the Municipal Health Secretariat, in collaboration with the unit, to actively track missing children and cases with canceled appointments.
4 Comprehensive Care	Reinforce the need for secondary care to provide appropriate counter-referral information, thereby enabling the monitoring spreadsheet to be updated.
5 Access	Expand and streamline, on a regional basis, access to ophthalmological consultations and optimize the workflow so that patients leave the consultation with a scheduled date to receive free eyeglasses. One strategy is to conduct four-monthly campaigns targeting students referred by the School Health Program.
Suggested Actions for the Health Unit	
1 Determine which students to screen	Conduct the Visual Acuity Assessment annually for students aged 5 to 16. If it is not possible to screen everyone, select one or more classes for comprehensive screening and ask the school to have teachers and guardians identify students with suspected visual difficulties for evaluation.
2 Records	Record students with abnormal visual screening results in a spreadsheet, including their Snellen visual acuity scores, and include this information on the note given to guardians to facilitate prioritization of referrals when they visit the health clinic.
3 Active follow-up	Conduct active follow-up to ensure that students with abnormal screening results attend the health center, are referred, and undergo an eye exam, and, following a prescription, are directed to the Porto Olhar Alegre project to receive free eyeglasses. Monitor and intervene in cases of canceled appointments and other administrative obstacles.
4 Outreach	Raise awareness within the community about the importance of eye health and the Porto Olhar Alegre Project, which provides free eyeglasses to children, adolescents, and adult education students.
Suggested Actions for the School	
1 Outreach	Collaborate with the health clinic to inform students and guardians about the importance of eye health and the date of the Visual Acuity Assessment, with the goal of reducing absenteeism. Also provide information about the Porto Olhar Alegre project, which offers free eyeglasses, and guide students through the process of obtaining them via a referral from their health clinic.
2 Referral	If the health unit is unable to conduct screening in all classes, select students with suspected vision problems identified by teachers and school staff for evaluation.
3 Monitoring	Assist in monitoring students and encourage families to visit the health clinic, ensuring referrals and attendance at eye exams and, when indicated, access to free eyeglasses. Maintain communication with the health clinic to flag cases requiring additional support to facilitate referrals.

day of the activity. This reduces the study's statistical power. Finally, data collection took place over two different years, but at very similar times of the year, so the collection period is not expected to influence the comparability of the results. Further studies in other contexts are necessary to elucidate and externally validate these data, contributing to the development of effective public policies for eye health.

School Vision Screening Porto Olhar Alegre Project

2022 and 2023



*2023 only.

**Among these, 13 were referred after an active search that occurred heterogeneously (children belonging to various Healthcare Units).

***Among these, 6 children had a normal ophthalmological evaluation after a specialized consultation with an Ophthalmologist.

Figure 3. Visual Acuity Assessment at a state public school by a health clinic in the Northern Zone of Porto Alegre through the Porto Olhar Alegre project of the School Health Program and recommendations for its improvement.

Lessons from this research – to implement!

There are many children with conditions waiting to be detected by visual screening!

We need to increase the number of screened children who reach their ophthalmological consultation and receive free eyeglasses!



Suggestions for Health Units, schools, and municipal management.*

Who should be screened?

Ideally, all children between 5 and 16 years old, once a year.

If it is not possible to screen all students:

- Choose one or more grades to screen (preferably children aged 7 or older);
- School teachers/staff should refer students they notice might have visual difficulties to participate in the screening **(this can greatly increase the detection of children with vision changes!)**.

Active search/outreach:

- Note down the students with abnormalities;
- Note down the Snellen test values to make referrals easier;
- Conduct an active search to ensure they get an appointment at the Healthcare Unit/Clinic and are referred to an ophthalmologist **(this is essential!)**;
- School and Healthcare Unit in communication to support each other in the active outreach.

Promotion - Porto Olhar Alegre:

- Spread the word to the children and the school about the possibility of getting free glasses offered by the city!
- The referral is made via Gercon after an ophthalmological appointment.

To the municipal management:

- Create a **school eye health care pathway** and develop/manage **monitoring** strategies for children with visual impairments;
- Develop strategies to **facilitate** children's **access** to ophthalmological consultations and the receipt of free eyeglasses.

***This is a shortened list of recommendations. Please check the full version in the article.**

Figure 3. Continuation.

CONFLICT OF INTERESTS

Nothing to declare.

AUTHORS' CONTRIBUTIONS

CKM: Data curation, Formal analysis, Investigation, Validation, Visualization, Writing – original draft, Writing – review & editing. RBZ: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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