NEUROLENS®

Enhanced Patient Outcomes with Neurolens

A Retrospective Real-World Clinical Comparison to Conventional Prism and Control Lenses

Sumeer Singh Bsc Optometry, M.Phil, PhD

Newton

Abstract

This retrospective study analyzed real-world clinical data from 96,745 patients to evaluate symptom outcomes with Neurolens compared with conventional prism lenses and controls. Patient-reported symptoms were assessed using the overall Neurolens Lifestyle Index questionnaire scores and three key subdomains: headache, neck and shoulder stiffness, and tired eyes.
Neurolens was associated with statistically significant symptom improvement compared with both comparison groups.

Relative to conventional prisms, Neurolens demonstrated a 28% greater improvement in overall symptom scores, including 41% greater improvement in headaches, 53% greater improvement in neck and shoulder stiffness, and 27% greater improvement in tired eyes. These findings suggest that Neurolens contour prism lens design may offer greater symptom relief than conventional prism lenses in routine clinical practice.

Key Highlights

96,745

Patient records analyzed from a large real-world clinical dataset.

53%

Greater improvement in neck and shoulder stiffness

28%

Greater improvement in overall symptom scores with Neurolens compared to conventional prism correction.

27%

Greater improvement in tired eyes

41%

Greater improvement in headache symptoms

Results provide clinically relevant information to guide lens selection for symptomatic patients with binocular vision anomalies.

Introduction

The accommodative and vergence systems of the eye play a critical role in ensuring that images perceived by each eye are clear and fused into a single image during binocular viewing. The accommodative system adjusts the focal power of the natural crystalline lens by altering its curvature, allowing objects at varying distances to be brought into clear focus. The vergence system coordinates the slow, conjugate movements of the eyes so that they align accurately on a viewed object, enabling proper image fusion and single, clear vision. Together, accommodation and vergence are essential components of normal binocular vision.

Accurate alignment of the visual axes of both eyes is required for effective binocular vision. A tendency for the eyes to deviate from proper alignment is classified as latent when fusion maintains alignment, and manifest when fusion fails to do so. A latent deviation is referred to as heterophoria, whereas a manifest deviation is known as heterotropia or strabismus.[1]

With regard to diagnosing misalignment, manifest deviations are generally easier to identify because they are visibly apparent, whereas phorias are more challenging to detect since they remain hidden under normal binocular viewing conditions. Phorias become evident only when binocular fusion is disrupted using associated or dissociated testing techniques.[2] In routine optometric practice, the magnitude of deviation is commonly measured in prism diopters, and based on the direction of movement, deviations are categorized as eso, exo, hyper, or hypo, with horizontal phorias (exo and eso) being far more prevalent than vertical phorias (hyper and hypo).[3] The magnitude of horizontal phorias can vary significantly between distance and near measurements. The limitations of traditional diagnostic methods are well documented, and a recent study has highlighted that objective measures demonstrate lower inter-examiner variability than conventional techniques.[4]

Uncorrected binocular vision anomalies can cause digital eye strain, double vision, visual fatigue toward the end of the day, headaches, neck and shoulder stiffness, and tired eyes.[5] Binocular vision anomalies are also common in systemic conditions such as Parkinson's disease, stroke, and in patients with a history of traumatic brain injury.[6] If left untreated, these anomalies have been shown to negatively impact both productivity and quality of life.

Once the type of misalignment is diagnosed, common treatment options include eye exercises, in-office vision therapy, and prescribing optical prisms, a widely available and frequently used treatment option. Prisms are used for both diagnostic and therapeutic purposes. Traditional prisms are conventional prisms, in which the amount of prism does not vary across the lens surface. A major limitation of conventional prisms is that, due to the different prism requirements for distance and near vision, they are often prescribed as two separate pairs of lenses. Additional concerns include longer adaptation times and a tendency for patients, once adapted to the prescribed prisms, to require increasing amounts of prism at subsequent visits, a phenomenon commonly referred to in clinical practice as "prism creep."

With advancements in optical lens design, the limitations of conventional prisms have been addressed by Neurolens through the incorporation of contour prism lens design technology (Figure 1). In this design, the amount of prism varies from distance to near, as the eyes move from distance to near viewing. This allows for the prescription of a single pair of lenses and is the only design shown to improve quality of life among headache sufferers compared to standard optical lenses.[7]

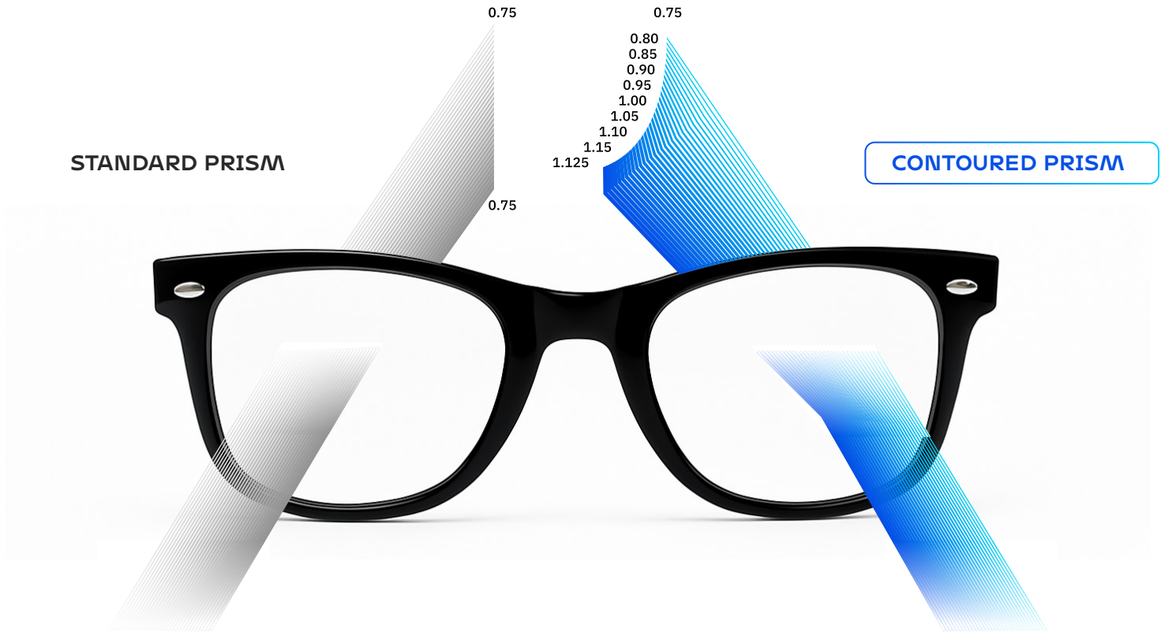

Figure 1 Contoured Neurolens design Vs conventional prism

The aim of this large retrospective data was to evaluate improvements in patient symptoms by comparing three patient groups, Neurolens, conventional prisms, and controls.

Methods

This retrospective, real-world analysis was conducted using a large clinical dataset extracted from Neurolens provider locations between September 2023 and October 2025. The dataset included patients who met the inclusion criteria for any one of three study groups. Group assignment was based on data from two visits in which patients presented to the same clinic.

Specifically, lens type and prescription worn at Visit I were determined based on values entered in the Neurolens portal at the time of Neurolens device measurements. The same parameters were evaluated at Visit II. This approach enabled classification of patients into one of the three study groups based on changes in their prescribed lenses between visits.

Neurolens group

Patients who were not wearing Neurolens or conventional prisms at Visit I but were wearing Neurolens at Visit II, indicating that Neurolens was prescribed following the first visit.

Conventional prism group

Patients who were not wearing Neurolens or conventional prisms at Visit I but were wearing conventional prism lenses at Visit II, indicating that conventional prisms were prescribed following the first visit.

Control group

Patients who did not meet the above criteria for the Neurolens group or the conventional prism Group and who were not wearing Neurolens or conventional prism lenses at both Visit I and Visit II.

This level of categorization for Neurolens and conventional prism groups helps evaluate the therapeutic effect of the prescribed lenses from the time they are prescribed, with changes from Visit I moving forward referred to as change from baseline. Given that routine optometric examinations typically occur at 12-month intervals, long-term therapeutic effects of both conventional prisms and Neurolens are evaluated. A control group in which no prism (either Neurolens and conventional prism) was prescribed was included to evaluate the benefits of Neurolens compared with this group and with conventional prism lenses.

Data analysis

The primary analysis involved comparing the change from baseline in the overall Neurolens Lifestyle Index questionnaire scores between Neurolens group vs. control group and Neurolens group vs. conventional prism group. The Neurolens Lifestyle Index questionnaire consists of seven domains, where participants rate each domain on a scale from 1 (no symptoms) to 5 (severe symptoms). Therefore, the overall score is calculated by summing the scores across all seven domains, with a maximum possible score of 35.

The secondary analysis focused on comparing three key subdomains between the study groups: headache, stiffness/pain in the neck and shoulders, and tired eyes.

One tailed t-test was conducted to compare the groups, and a p-value of less than 0.05 was considered statistically significant.

Results

A total of 96,745 patient records were extracted and analyzed. Of these, 4807 records were from Neurolens group, 1293 from conventional prism group, and 90,645 from control group. Table 1 presents the demographic characteristics and prescription details of participants across all three groups. Across all groups, the prevalence of females was higher than that of males, and the average spherical equivalent was balanced between eyes and similar across groups. More than 60% of participants included in the analysis were wearing single-vision lenses across all three groups. The average prism value in the Neurolens group was 1.19 base in prism diopters, while the average prism value in the conventional prism group was 0.81 base in prism diopters. It should be noted that the prism values for Neurolens group and conventional prism were obtained from Visit II rather than the baseline visit, as participants were not wearing prism at baseline; this was an important study inclusion criterion.

TABLE I Demographics of the included dataset and their prescription details

		NEUROLENS	CONVENTIONAL PRISM	CONTROL
Gender*	Male (N)	1235	405	34343
	Female (N)	3407	867	53061
Age		43.49 ± 18.58	42.37 ± 20.06	43.76 ± 18.69
Average Spherical Equivalent	Right eye	-0.69 ± 1.89	-0.69 ± 1.96	-1.03 ± 2.15
	Left eye	-0.71 ± 1.89	-0.69 ± 1.93	-1.03 ± 2.16
Average addition		2.11 ± 0.55	2.10 ± 0.58	2.13 ± 0.51
% of prescription	Single vision	67	66	74
	PAL's	33	34	26
Average prescribed prism		1.19 ± 0.90	0.81 ± 1.95	N/A

** Data was presented only for the available dataset, and this information was missing for the remaining data points (missing count, n=3427)*

Table II presents a comparison of the summed Neurolens Lifestyle Index questionnaire scores between the Neurolens group and the control group, demonstrating a statistically significant improvement in the Neurolens group compared with the control group ($p < 0.01$). Similarly, a comparison of the summed Neurolens Lifestyle Index questionnaire scores between Neurolens group and the conventional prism group showed a statistically significant improvement in the Neurolens group compared with participants wearing conventional prisms ($p < 0.01$). In terms of percentage change, the Neurolens group demonstrated a 28% greater improvement in symptoms compared with the conventional prism lens group.

TABLE II shows the Visit I, Visit II and the change in sum of the lifestyle index questionnaire# scores between the visits.

	Visit I (Mean (SD))	Visit II (Mean (SD))	Change from baseline (Mean (SD))
NEUROLENS	20.15 (5.63)	18.50 (5.58)	-1.65 (4.56)
CONVENTIONAL PRISM	18.96 (5.87)	17.66 (5.73)	-1.29 (4.27)
CONTROL	15.88 (5.31)	15.35 (5.12)	-0.53 (3.89)

 # The summed Lifestyle Index questionnaire score represents the total of scores across seven domains: headache, neck and shoulder stiffness, computer use discomfort, tired eyes, dry eye sensation, light sensitivity, and dizziness.

Secondary analysis of the three important domains from the lifestyle index questionnaire being headaches, neck and shoulder stiffness, and tired eyes was performed and the results are presented in table III below.

TABLE III shows the Visit I, Visit II and the change in three of the sub domain questionnaire scores between the visits.

	Visit I (Mean (SD))	Visit II (Mean (SD))	Change from baseline (Mean (SD))
Headache			
NEUROLENS	3.00 (1.18)	2.69 (1.11)	-0.31 (1.00)
CONVENTIONAL PRISM	2.79 (1.20)	2.57 (1.16)	-0.22 (0.94)
CONTROL	2.30 (1.06)	2.20 (1.02)	-0.10 (0.87)
Neck and shoulder stiffness			
NEUROLENS	3.03 (1.23)	2.77 (1.19)	-0.26 (1.08)
CONVENTIONAL PRISM	2.80 (1.23)	2.63 (1.25)	-0.17 (1.02)
CONTROL	2.38 (1.15)	2.30 (1.11)	-0.08 (0.99)
Tired eyes			
NEUROLENS	3.15 (1.10)	2.86 (1.09)	-0.28 (1.11)
CONVENTIONAL PRISM	3.01 (1.16)	2.79 (1.15)	-0.22 (1.07)
CONTROL	2.48 (1.07)	2.37 (1.03)	-0.11 (1.00)

A comparison of headache scores between the Neurolens group and the control group demonstrated a statistically significant improvement in the Neurolens group compared with the control group ($p < 0.01$). Similarly, a comparison of headache scores between the Neurolens group and the conventional prism group revealed a statistically significant improvement in the Neurolens group compared with the conventional-prism group ($p < 0.01$), with a 41% greater headache improvement observed in the Neurolens group relative to the conventional prism group.

A comparison of neck and shoulder stiffness scores between the Neurolens group and the control group demonstrated a statistically significant improvement in the Neurolens group compared with the control group ($p < 0.01$). Similarly, a comparison of neck and shoulder stiffness scores between the Neurolens group and the conventional prism group revealed a statistically significant improvement in the Neurolens group compared with the conventional-prism group ($p < 0.01$), with a 53% greater improvement in neck and shoulder stiffness observed in the Neurolens group relative to the conventional prism group.

A comparison of tired eye scores between the Neurolens group and the control group demonstrated a statistically significant improvement in the Neurolens group compared with the control group ($p < 0.01$). Similarly, a comparison of tired eye scores between the Neurolens group and the conventional prism group revealed a statistically significant improvement in the Neurolens group compared with the conventional-prism group ($p < 0.01$), with a 27% greater tired eye improvement observed in the Neurolens group relative to the conventional prism group.

Discussion

This retrospective study analyzed one of the largest real-world clinical datasets to date, comprising 96,745 patient records, and demonstrated that Neurolens produced statistically significant symptom improvement compared with both conventional prism and control groups. Conventional prisms are routinely prescribed in clinical practice for therapeutic purposes, therefore, as expected, they outperformed the control group, as shown in Tables II and III. However, when comparing therapeutic benefit directly, Neurolens demonstrated superior outcomes, with more than a 28% greater improvement across both the total Lifestyle Index score and three key subdomains.

The role of Neurolens in improving headache symptoms compared with conventional optical lenses has been previously reported using a double-masked, randomized controlled design, demonstrating statistically significant improvement over conventional lenses.[7] The present study extends these findings by providing the first large-scale comparison between conventional prisms and the Neurolens contoured prism design. In this comparison, Neurolens was associated with a 41% greater improvement in headache symptoms relative to conventional prisms, highlighting the potential clinical advantage of its contoured prism technology.

A key limitation of this study is its retrospective design. Although a prospective randomized controlled trial could provide additional validation, conducting such a study with a large sample size and longitudinal follow-up would be both resource and time-intensive and would likely require multisite enrollment. Nevertheless, the large real-world dataset provides meaningful clinical insight.

In conclusion, this study demonstrates that Neurolens is associated with greater symptom improvement compared with conventional prism lenses in routine clinical practice. These findings suggest that the contoured prism design of Neurolens may offer enhanced therapeutic benefit beyond that achievable with traditional conventional prism correction.

Implications for clinical practice

Based on the findings of this large real-world analysis, clinicians may consider Neurolens as a treatment option for patients presenting with symptoms such as headache and visual discomfort. Given the greater symptom improvement observed relative to conventional prism correction, Neurolens may be particularly useful for patients who continue to experience symptoms with conventional optical approaches. Incorporating Neurolens into clinical management may support improved symptom relief and patient-reported outcomes in appropriate patients.

1. Griffin JR, and Grisham JD. Binocular Anomalies: Diagnosis and Vision Therapy. 4th ed. Amsterdam; Butterworth-Heinemann, 2002.
2. Evans BJ. Nystagmus. Pickwell's binocular vision anomalies, 5th edn. Butterworth-Heinemann Elsevier, Edinburgh. 2007:323-38.
3. Scheiman M, Wick B. Clinical management of binocular vision: heterophoric, accommodative, and eye movement disorders. Lippincott Williams & Wilkins; 2008.
4. Skiadopoulos D, Bandstra A, Kattouf V, van de Pol C, Labhishetty V, Singh S. Inter-examiner repeatability of measuring phorias using three different methods: Neurolens measurement device, the von Graefe method, and prism cover test. PLoS One. 2025 Nov 20;20(11):e0337126.
5. Rosenfield M. Computer vision syndrome: a review of ocular causes and potential treatments. Ophthalmic and Physiological Optics. 2011 Sep;31(5):502-15.
6. Kapoor N, Ciuffreda KJ. Vision disturbances following traumatic brain injury. Current treatment options in neurology. 2002 Aug;4(4):271-80.
7. Labhishetty V, Cortes J, van de Pol C, Maanpaa V, Plumley A, Amin N, Hurley J, Barton T, White T, Szeliga R, Dixon JM. Impact of Neurolens use on the quality of life in individuals with headaches: a randomized double-masked, cross-over clinical trial. Translational Vision Science & Technology. 2024 Jan 2;13(1):27-.