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Original Article

Role of Prism Adaptation in Intermittent Exotropia: Evaluating Control and Binocular Function

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ABSTRACT

Background: Intermittent exotropia is a childhood binocular vision disorder characterized by fluctuating outward ocular deviation, reduced fusional stability, impaired control, and possible deterioration of stereoacuity. Prism adaptation may reduce fusional demand and support binocular alignment, but its short-term clinical effect on combined motor, functional, and sensory outcomes requires clearer evaluation. Objective: To assess changes in ocular deviation, control scores, and stereoacuity after six weeks of prism adaptation therapy among school-aged patients with intermittent exotropia. Methods: This quasi-experimental pre-test/post-test study was conducted at Mayo Hospital, Lahore, among children and adolescents with basic-type or divergence-excess intermittent exotropia. Of 59 initially recruited participants, 30 completed prism adaptation therapy and follow-up assessment. Participants received individualized Fresnel press-on or ground-in prisms according to measured deviation and were assessed at baseline and after six weeks. Outcomes included distance and near deviation, distance and near control scores, and stereoacuity. Results: Mean distance deviation decreased from 25.60 ± 6.80 PD to 14.20 ± 4.50 PD, while near deviation decreased from 22.40 ± 5.50 PD to 12.50 ± 3.80 PD. Distance control score decreased from 3.20 ± 1.15 to 1.40 ± 0.85, near control score decreased from 2.80 ± 1.05 to 1.10 ± 0.75, and stereoacuity improved from 215.50 ± 110.20 to 85.50 ± 45.20 seconds of arc. Conclusion: Prism adaptation was associated with short-term improvement in motor alignment, functional control, and stereoacuity among completers; however, controlled studies with longer follow-up are needed to confirm its comparative effectiveness. Keywords: Intermittent exotropia; prism adaptation; binocular vision; stereoacuity; Newcastle Control Score; ocular deviation; sensory fusion.

INTRODUCTION

Intermittent exotropia is a common childhood binocular vision disorder characterized by episodic outward deviation of one eye while the fellow eye maintains fixation. Unlike constant exotropia, the deviation is not continuously present and may become more evident during fatigue, illness, inattention, daydreaming, distance viewing, or prolonged visual effort. This fluctuating nature makes intermittent exotropia clinically challenging because a child may demonstrate acceptable alignment during examination but experience frequent breakdown of control during daily visual activities. Stable binocular vision depends on coordinated motor alignment, adequate fusional vergence, and intact sensory fusion; disruption of this coordination can lead to reduced stereoacuity, suppression, asthenopia, intermittent diplopia, difficulty with near tasks, and functional limitations during school-related activities (1).

The clinical importance of intermittent exotropia extends beyond ocular appearance. Children with intermittent outward deviation may experience impaired depth perception, unstable fusion, visual fatigue, headaches, poor near fixation, and difficulty sustaining attention during reading, writing, screen use, or copying from a classroom board. Stereoacuity is particularly important because it reflects the ability of the visual cortex to fuse slightly disparate retinal images into depth perception. Previous work has shown that distance stereoacuity may be reduced in intermittent exotropia even when visual acuity is otherwise normal, indicating that sensory dysfunction can persist despite apparently preserved monocular vision (2). Similarly, clinical assessment of control is essential because the measured angle of deviation alone may not represent the functional severity of the condition. Standardized office-based control scales therefore provide clinically useful information by estimating how frequently and how easily binocular alignment breaks down during examination and recovery (3).

Management of intermittent exotropia is influenced by the type of deviation, severity of motor misalignment, degree of control, sensory status, symptoms, and risk of deterioration. Basic-type intermittent exotropia is generally characterized by comparable deviation at distance and near fixation, whereas divergence excess is associated with a larger distance deviation. Some children remain stable for prolonged periods, while others show worsening fusional control, increasing deviation, or sensory deterioration. Although surgery may be considered for selected patients with poor or deteriorating control, current clinical decision-making increasingly recognizes the need for careful selection and individualized conservative management, particularly when the aim is to preserve binocular function and avoid premature invasive correction (4). Clinical studies have also emphasized that stereopsis is an important functional marker in intermittent exotropia and should be evaluated alongside motor alignment when determining disease severity and response to treatment (5).

Non-surgical management options include observation, refractive correction, orthoptic or vision therapy, overminus lenses, and prism correction, depending on the patient's age, deviation pattern, symptoms, and binocular potential. Binocular vision anomalies require treatment strategies that address both motor and sensory components rather than focusing only on cosmetic alignment (6). The natural history and treatment response of intermittent exotropia can vary substantially across patients, which supports the need for careful monitoring of control, deviation magnitude, and sensory outcomes over time (7). Standardized clinical assessment improves interpretation of change in control and helps clinicians distinguish true deterioration or improvement from ordinary variability in the intermittent deviation (8). Vision therapy and other conservative interventions have been investigated for improving fusional vergence, binocular coordination, and stereopsis, particularly when treatment targets both sensory fusion and motor control (9). Classification-based management also supports individualized treatment because intermittent exotropia does not present uniformly across children or clinical settings (10).

Prism correction is an optical strategy used to reduce fusional demand by shifting the perceived image position and supporting binocular alignment. In intermittent exotropia, base-in prism correction may reduce the effort required to maintain single binocular vision and may help selected patients sustain alignment during visually demanding tasks. Because control in intermittent exotropia can vary with fatigue, attention, fixation distance, and prolonged visual work, prism-based management may be particularly relevant for children whose deviation becomes more apparent during school activities or sustained near and distance tasks (11). Previous pediatric treatment outcome studies suggest that non-surgical management can have a clinically meaningful role when directed toward stabilizing ocular alignment, improving visual comfort, and delaying or reducing the need for surgery in appropriately selected cases (12). Conservative binocular interventions are therefore increasingly considered not merely symptomatic strategies but potential methods for supporting functional visual stability (13).

Prism adaptation refers to the visual system's response to sustained optical displacement introduced by prism lenses. This adaptation may involve improved fusional capacity, motor vergence adjustment, and sensory recalibration, although the extent of recovery depends on the duration, severity, and control of

the strabismic deviation. Evidence from strabismus treatment more broadly indicates that improved ocular alignment may support recovery of binocular function, but sensory improvement is variable and influenced by patient characteristics and baseline binocular potential (14). Prism adaptation has also been used diagnostically before surgery to identify the maximum angle of deviation that may be masked by fusional compensation (15). In intermittent exotropia, prism adaptation testing and monocular occlusion have been reported as useful approaches for detecting the maximum deviation angle, suggesting that prism-based assessment may have both diagnostic and therapeutic relevance (16). Other optical interventions, including overminus lenses combined with prism, have also been explored in children with intermittent exotropia, further supporting the need to evaluate conservative optical strategies using standardized outcomes (17).

Recent evidence indicates that sensory function may improve when ocular alignment becomes more stable. Improvements in binocular summation after successful alignment suggest that binocular visual processing can recover when the visual axes are better coordinated (18). Longitudinal work in adolescent intermittent exotropia has similarly highlighted the importance of evaluating binocular rehabilitation rather than relying only on postoperative or post-treatment motor alignment (19). Vergence and accommodative responses are also involved in maintaining control of intermittent exotropia, and abnormal interaction between these systems may affect the child's ability to sustain alignment across fixation distances (20). A recent systematic review and network analysis of non-surgical therapies further suggests that conservative treatment may provide benefit, although outcomes appear to depend on treatment modality, patient selection, and therapeutic protocol (21).

Despite growing interest in conservative treatment, important evidence gaps remain. Existing studies vary in prism type, prescribed prism power, daily wear duration, treatment duration, follow-up timing, and outcome measures. Some studies have focused on prism adaptation as a preoperative diagnostic procedure, while others have evaluated isolated motor or sensory outcomes without combining deviation angle, control score, and stereoacuity within the same clinical framework. Because intermittent exotropia differs across patients and may fluctuate during examination, treatment evaluation requires standardized and reproducible measurement of both motor and sensory endpoints (22). Office-based control scales can improve consistency in clinical assessment (23), and selected studies of prism correction suggest potential benefit for alignment and binocular comfort in appropriate patients (24). Contemporary management strategies increasingly recommend balancing surgical and non-surgical options according to individual clinical presentation, functional impairment, and binocular potential (25).

Therefore, the present study was designed to evaluate whether prescribed prism adaptation is associated with short-term improvement in motor alignment, functional control, and sensory binocular function among school-aged patients with basic or divergence excess intermittent exotropia. Using a quasi-experimental pre-test/post-test design, the study compared distance and near angle of deviation, distance and near control scores, and stereoacuity before and after a six-week period of prism wear. The primary research objective was to determine whether prism adaptation produced measurable improvement in ocular deviation control and binocular function in children and adolescents with intermittent exotropia.

MATERIAL AND METHODS

This study was conducted as a quasi-experimental pre-test/post-test clinical study to evaluate changes in ocular deviation, functional control, and sensory binocular function after prism adaptation therapy in patients with intermittent exotropia. The design was selected because each participant served as their own comparator, allowing direct assessment of pre-intervention and post-intervention clinical measurements. The study was carried out at Mayo Hospital, Lahore, Pakistan, among school-aged children and adolescents diagnosed with intermittent exotropia. Baseline assessment was performed before prism prescription, and follow-up assessment was conducted after six weeks of prism wear using

the same clinical outcome measures to ensure comparability between pre-treatment and post-treatment observations.

The study population consisted of children and adolescents aged 6 to 18 years with clinically diagnosed intermittent exotropia. Participants were considered eligible if they had basic-type or divergence-excess intermittent exotropia confirmed by cover test and prism cover test, best-corrected visual acuity of 6/12 or better in both eyes, sufficient cooperation for binocular vision testing, no previous strabismus surgery, and willingness to use prism glasses and attend follow-up assessment. Patients were excluded if they had constant exotropia, other forms of strabismus, ocular pathology such as cataract, retinal disease, or optic nerve abnormality, previous ocular trauma or surgery, uncorrected refractive error affecting reliable assessment, amblyopia severe enough to compromise binocular testing, neurological or developmental conditions affecting binocular vision, or poor cooperation during examination. These criteria were applied to reduce clinical heterogeneity and improve the reliability of pre-treatment and post-treatment comparisons.

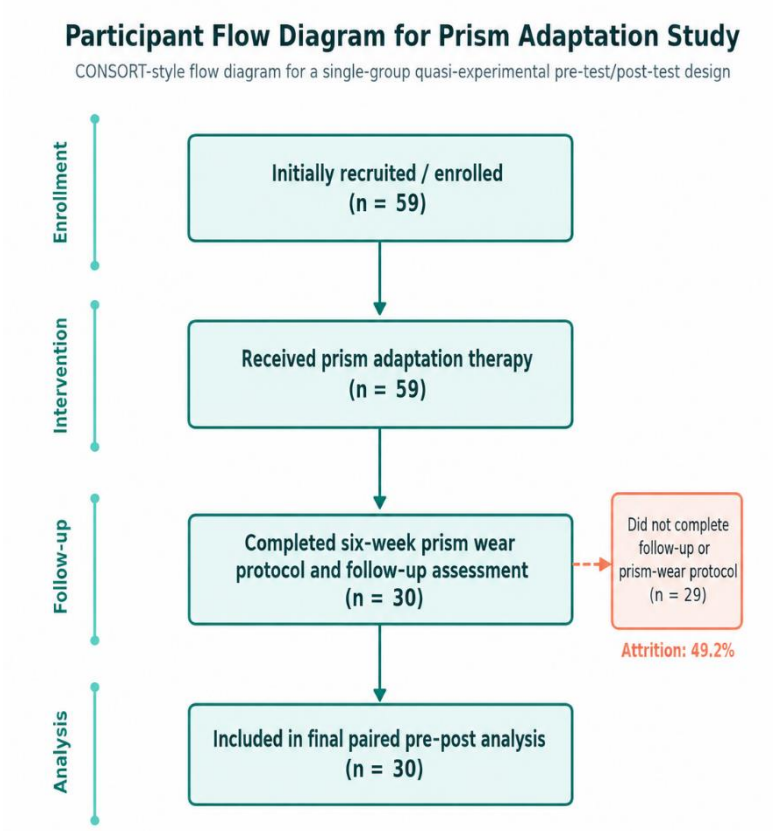

Figure 1 CONSORT Flowchart

Participants were selected using non-probability purposive sampling because the study required patients with a specific clinical diagnosis and measurable intermittent exodeviation suitable for prism adaptation. The calculated sample size was 59 participants using a single-population proportion approach with a 95% confidence level and an estimated population proportion. A total of 59 eligible children were initially recruited; however, 30 participants completed the six-week prism adaptation protocol and follow-up assessment and were included in the final paired analysis. Participants who did not complete follow-up or did not comply with the prism-wearing schedule were not included in the final pre-post comparison. Attrition was therefore treated as a potential source of bias, and final analyses were interpreted as completer-based findings rather than intention-to-treat estimates.

After eligibility screening and consent, each participant underwent a complete ophthalmic and binocular vision assessment. Demographic and clinical information, including age, gender, educational level, type of intermittent exotropia, relevant ocular history, and treatment-related information, was

recorded on a structured proforma. Visual acuity was assessed under standardized clinical conditions, and refractive status was evaluated to ensure that optical correction was appropriate before measuring deviation. The angle of ocular deviation was measured at distance and near fixation using cover test and prism cover test. Functional control of deviation was assessed using the Newcastle Control Score separately for distance and near fixation. Stereoacuity testing was performed to assess sensory binocular function, with results recorded in seconds of arc. The same measurement procedures were repeated at the six-week follow-up visit after prism adaptation.

Prism adaptation therapy was prescribed according to each participant's measured angle of deviation and clinical requirements. Base-in prism correction was used to reduce fusional demand and support binocular alignment. Fresnel press-on prisms were preferred for most participants because they are lightweight, adjustable, removable, and suitable for temporary clinical adaptation; ground-in prisms were used when clinically appropriate. Prism power was selected on the basis of baseline deviation measured during prism cover testing, with the aim of reducing the functional demand on fusional vergence while allowing continued binocular engagement. The prescribed prism range included lower and higher powers according to individual deviation magnitude, and the final prescription was individualized rather than uniform across participants. Participants were instructed to wear the prescribed prism correction during waking hours, especially during schoolwork, reading, writing, screen use, and other visually demanding tasks. Daily wear duration was recorded during follow-up to assess compliance with the intervention protocol.

The primary outcomes were change in distance deviation, near deviation, distance control score, near control score, and stereoacuity from baseline to six-week follow-up. Distance and near deviation were operationally defined as the magnitude of exodeviation in prism diopters measured using prism cover testing at the respective fixation distances. Control score was operationally defined using the Newcastle Control Score, with lower scores indicating better clinical control of intermittent deviation. Stereoacuity was operationally defined as the measured threshold of depth perception in seconds of arc, with lower values indicating better sensory binocular function. Intervention-related variables included prism type, prescribed prism power, and reported daily prism wear duration.

Several steps were incorporated to reduce measurement bias and improve data integrity. Baseline and follow-up measurements were performed using the same clinical procedures and outcome definitions. Refractive correction was checked before binocular testing to minimize confounding from uncorrected refractive error. Eligibility criteria excluded ocular, neurological, developmental, and surgical factors that could independently affect binocular vision outcomes. Data were recorded on a structured proforma, and variables were coded consistently before analysis. Final analysis was restricted to participants with complete paired baseline and follow-up data for the relevant outcome, and the number of analyzed participants was reported for transparency.

Data were analyzed using SPSS version 26. Categorical variables were summarized as frequencies and percentages, while continuous variables were summarized as mean and standard deviation when distributional assumptions were acceptable. Pre-treatment and post-treatment values were compared because measurements were obtained from the same participants before and after prism adaptation. For approximately normally distributed paired continuous outcomes, paired-samples t-tests were used to compare baseline and follow-up means. For ordinal outcomes such as control scores, and for outcomes with potentially skewed distributions such as stereoacuity, non-parametric paired analysis using the Wilcoxon signed-rank test was considered as a sensitivity approach where distributional assumptions were not met. Mean change, 95% confidence intervals, test statistics, and p-values were planned for all primary outcomes where valid calculation was possible. Effect sizes were considered for paired comparisons to support clinical interpretation beyond statistical significance. A p-value of less than 0.05 was considered statistically significant, with cautious interpretation because multiple related outcomes were assessed and the study did not include a parallel control group.

The study was conducted after obtaining consent from participants or their guardians as applicable. Participant confidentiality was maintained by recording study data on structured forms without unnecessary identifying information in the analytic dataset. Clinical assessments and prism prescriptions were performed as part of supervised ophthalmic and binocular vision evaluation, and participants were followed after the adaptation period to document treatment response and compliance. The study findings were interpreted within the methodological limits of a single-group quasi-experimental design, particularly the absence of randomization, absence of a non-prism control group, and exclusion of non-completers from the final paired analysis.

RESULTS

A total of 59 eligible children with intermittent exotropia were initially recruited for prism adaptation therapy. Of these, 30 participants completed the six-week prism wear protocol and post-treatment clinical assessment and were included in the final paired analysis. The final analysis was therefore based on complete pre-treatment and post-treatment data from 30 participants.

Table 1. Participant Flow and Final Analytical Sample

Recruitment Stage	n	%
Initially recruited	59	100.0
Completed prism adaptation protocol	30	50.8
Did not complete follow-up or prism-wear protocol	29	49.2
Included in final paired analysis	30	50.8

The final analysis included 30 participants who completed both baseline and follow-up assessments. Non-completion occurred in 29 of the 59 initially recruited participants, representing an attrition proportion of 49.2%. Because only completers were included in the final analysis, the findings should be interpreted as completer-based pre-post outcomes rather than intention-to-treat estimates.

Table 2. Demographic and Clinical Characteristics of Participants Included in the Final Analysis

Variable	Category	n	%
Age group	6–10 years	13	43.3
	11–14 years	10	33.3
	15–18 years	7	23.3
Gender	Male	13	43.3
	Female	17	56.7
Educational level	Primary school	14	46.7
	Middle school	10	33.3
	High school	6	20.0
Type of intermittent exotropia	Basic type	18	60.0
	Divergence excess type	12	40.0

The final sample consisted mainly of younger school-aged participants, with 13 children aged 6–10 years and 10 aged 11–14 years. Females represented 56.7% of the analyzed sample. Most participants were enrolled in primary or middle school, and basic-type intermittent exotropia was more frequent than divergence-excess intermittent exotropia, accounting for 60.0% of cases.

Table 3. Prism Adaptation Intervention Characteristics

Variable	Category	n	%
Prism type	Fresnel press-on prism	21	70.0
	Ground-in prism	9	30.0
Prism power	5–10 PD	4	13.3
	11–15 PD	15	50.0
	16–20 PD	8	26.7
	>20 PD	3	10.0
Daily wear duration	4–5 hours	5	16.7
	6–7 hours	18	60.0
	≥8 hours	7	23.3

Abbreviation: PD, prism diopters.

Most participants received Fresnel press-on prisms, which were used in 21 of 30 cases. The most common prescribed prism power category was 11–15 PD, reported in 50.0% of participants. Daily wear duration was highest in the 6–7 hour category, which included 18 participants, while 7 participants reported wearing prisms for 8 hours or more per day.

Table 4. Baseline and Post-Treatment Clinical Outcomes After Prism Adaptation

Outcome	Baseline Mean ± SD	Post-Treatment Mean ± SD	Mean Change	Direction of Change
Distance deviation, PD	25.60 ± 6.80	14.20 ± 4.50	11.40	Reduction
Near deviation, PD	22.40 ± 5.50	12.50 ± 3.80	9.90	Reduction
Distance control score	3.20 ± 1.15	1.40 ± 0.85	1.80	Reduction
Near control score	2.80 ± 1.05	1.10 ± 0.75	1.70	Reduction
Stereoacuity, seconds of arc	215.50 ± 110.20	85.50 ± 45.20	130.00	Reduction

Abbreviation: PD, prism diopters. Lower control scores and lower stereoacuity values indicate better clinical status.

All measured clinical outcomes showed improvement after prism adaptation among completers. Mean distance deviation decreased from 25.60 PD at baseline to 14.20 PD after treatment, while mean near deviation decreased from 22.40 PD to 12.50 PD. Functional control also improved, with distance control score decreasing from 3.20 to 1.40 and near control score decreasing from 2.80 to 1.10. Stereoacuity improved numerically from 215.50 to 85.50 seconds of arc, indicating better sensory binocular function after the six-week prism adaptation period.

The paired analysis showed a statistically significant reduction in distance deviation after prism adaptation. The mean paired reduction was 11.40 PD, with a 95% confidence interval from 9.72 to 13.08 PD. Distance control score also decreased significantly, with a mean paired reduction of 1.80 points and a 95% confidence interval from 1.49 to 2.11. These findings indicate measurable improvement in both motor alignment at distance fixation and functional control among participants who completed the prism adaptation protocol.

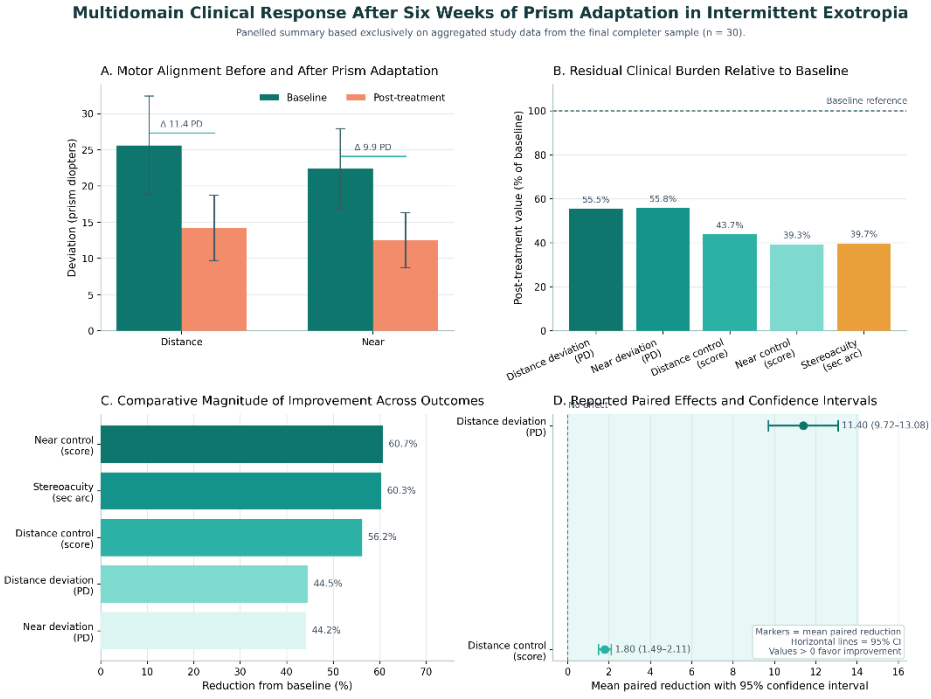

Figure 1. Multidomain Clinical Response After Six Weeks of Prism Adaptation in Intermittent Exotropia

The panelled figure demonstrates coordinated improvement across motor, functional, and sensory domains after six weeks of prism adaptation. Distance deviation decreased from 25.60 ± 6.80 PD to 14.20 ± 4.50 PD, while near deviation decreased from 22.40 ± 5.50 PD to 12.50 ± 3.80 PD. When post-treatment values were expressed relative to baseline, the residual burden was 55.5% for distance deviation, 55.8% for near deviation, 43.8% for distance control score, 39.3% for near control score, and 39.7% for

stereoacuity. The largest proportional reductions were observed in near control score (60.7%), stereoacuity (60.3%), and distance control score (56.2%), suggesting that prism adaptation was associated with greater relative improvement in functional control and sensory binocular performance than in motor deviation magnitude alone. Reported paired-test precision supported the distance deviation reduction, with a mean paired change of 11.40 PD and 95% CI of 9.72 to 13.08, and the distance control score reduction, with a mean paired change of 1.80 and 95% CI of 1.49 to 2.11.

Overall, prism adaptation was associated with improvement across motor, functional, and sensory outcomes in the completer sample. The largest absolute numerical change was observed in stereoacuity, followed by distance deviation and near deviation. Because the study used a single-group pre-test/post-test design and final analysis was limited to participants who completed follow-up, the findings should be interpreted as short-term within-participant improvement rather than definitive comparative evidence of treatment superiority.

DISCUSSION

This quasi-experimental pre-test/post-test study evaluated short-term clinical changes after prism adaptation therapy among school-aged patients with intermittent exotropia who completed the intervention and follow-up assessment. The findings showed improvement across motor alignment, functional control, and sensory binocular outcomes after six weeks of prism wear. Among the 30 participants included in the final paired analysis, mean distance deviation decreased from 25.60 PD to 14.20 PD, and mean near deviation decreased from 22.40 PD to 12.50 PD. Functional control also improved, with distance control score decreasing from 3.20 to 1.40 and near control score decreasing from 2.80 to 1.10. Stereoacuity improved from 215.50 to 85.50 seconds of arc. These findings suggest that prism adaptation was associated with clinically observable short-term improvement in ocular alignment, control of intermittent deviation, and sensory binocular function among completers. However, because the study did not include a non-prism control group and the final analysis was limited to participants who completed follow-up, the findings should be interpreted as within-participant improvement rather than definitive evidence of treatment superiority.

The reduction in distance and near deviation is clinically relevant because intermittent exotropia is characterized by fluctuating outward deviation that may become more apparent during distance fixation, fatigue, inattention, or sustained visual demand. Stable ocular alignment requires adequate motor coordination and fusional vergence, and children with intermittent exotropia may show variable control across clinical and real-world conditions (1). In the present study, the decrease in mean distance deviation by 11.40 PD and mean near deviation by 9.90 PD indicates that prism adaptation reduced the measured magnitude of exodeviation over the follow-up period. This is consistent with the optical rationale of prism correction, in which base-in prisms reduce fusional demand by shifting the image toward a position that is easier for the visual system to fuse. Previous clinical discussions of intermittent exotropia emphasize that management should not rely solely on cosmetic appearance or angle size but should also consider stability of control and binocular performance (3,8).

Improvement in control scores is particularly important because intermittent exotropia is not defined only by the size of the deviation but also by the frequency and ease with which alignment breaks down. The Newcastle Control Score and related office-based control measures are used to quantify functional control and provide a standardized way to monitor change over time (3,8,23). In this study, distance control score decreased from 3.20 to 1.40, while near control score decreased from 2.80 to 1.10. These changes indicate that participants were less likely to demonstrate spontaneous breakdown of alignment after the adaptation period. The improvement was more pronounced proportionally for control scores than for deviation magnitude, suggesting that the intervention may have had a greater observable effect on functional stability than on complete motor neutralization. This distinction is important because a residual deviation may remain measurable while day-to-day binocular control improves.

The observed improvement in stereoacuity further supports the importance of evaluating sensory binocular outcomes in intermittent exotropia. Stereoacuity reflects cortical fusion of binocular visual input and is often affected when ocular alignment is unstable. Previous literature has reported that distance stereoacuity can be impaired in intermittent exotropia even when visual acuity is preserved, demonstrating that sensory function may be compromised despite apparently adequate monocular vision (2). In the present study, mean stereoacuity improved from 215.50 to 85.50 seconds of arc, suggesting better sensory binocular performance after prism adaptation among completers. This finding is consistent with the broader concept that improved alignment stability may support binocular sensory processing, although the present design cannot determine whether the change resulted specifically from prism adaptation, practice effects, natural variation, improved attention at follow-up, or combined mechanisms (14,18,19).

The intervention pattern may also help explain the observed clinical response. Most participants received Fresnel press-on prisms, which are clinically useful for temporary adaptation because they are lightweight, adjustable, and suitable for modification during treatment. The most common prescribed prism power category was 11–15 PD, and most participants reported daily wear for 6–7 hours. This level of wear likely overlapped with school and near-task periods, during which children frequently perform reading, writing, screen use, and classroom board-copying activities. Because intermittent exotropia may worsen during fatigue or sustained visual demand, consistent prism use during visually demanding hours may have supported better binocular control in functional contexts (11). Nevertheless, compliance was based on reported wear duration, and objective monitoring of prism use was not available, which should be considered when interpreting the results.

The findings are aligned with the increasing interest in conservative and individualized management strategies for intermittent exotropia. Non-surgical options, including optical correction, vision therapy, overminus lenses, and prism-based approaches, are often considered in selected patients to improve binocular function, visual comfort, and control before surgical intervention is pursued (6,9,12,13,17,21). Surgical treatment remains appropriate for selected cases with poor control, progressive deviation, or functional deterioration, but treatment decisions should be guided by deviation magnitude, control, symptoms, stereopsis, age, and patient-specific binocular potential (4,10,25). The present study contributes preliminary local clinical evidence suggesting that prism adaptation may be a useful conservative strategy for selected children with basic-type or divergence-excess intermittent exotropia, particularly when the therapeutic aim is to improve short-term control and binocular function.

Several limitations should be considered. First, the study used a single-group pre-test/post-test design without a randomized or non-prism comparison group. As a result, the observed improvements cannot be attributed exclusively to prism adaptation, and alternative explanations such as measurement variability, regression to the mean, learning effects during repeated testing, natural fluctuation in control, or increased clinical attention cannot be excluded. Second, although 59 participants were initially recruited, only 30 completed the six-week protocol and were included in the final analysis. This attrition may have introduced selection bias if participants who adhered to prism wear or returned for follow-up differed systematically from those who did not complete the study. Third, the short follow-up duration limits conclusions about durability of response, long-term control, recurrence, or later need for surgery. Fourth, outcome assessment was not reported as masked, and control scores include a degree of clinical judgment, which may introduce observer bias. Fifth, complete paired-test outputs were available only for selected outcomes in the supplied manuscript, and future reporting should provide confidence intervals, test statistics, and effect sizes for all primary outcomes.

Despite these limitations, the study has clinical value as a preliminary evaluation of prism adaptation in a pediatric intermittent exotropia population. It assessed multiple clinically relevant domains, including distance and near deviation, distance and near control, and stereoacuity, rather than relying on motor alignment alone. The results suggest that prism adaptation may be associated with short-term

multidomain improvement among children who complete the intervention protocol. Future research should use a prospective controlled design, larger sample size, standardized prism prescription algorithm, objective compliance monitoring, masked outcome assessment, longer follow-up, and complete analysis of attrition. Comparative studies against observation, refractive correction alone, overminus therapy, vision therapy, or surgical management would help clarify which patients are most likely to benefit from prism adaptation and whether the observed improvements are sustained over time.

CONCLUSION

Prism adaptation therapy was associated with short-term improvement in motor alignment, functional control, and sensory binocular function among school-aged patients with intermittent exotropia who completed the six-week intervention protocol. Mean distance and near deviation decreased after prism wear, control scores improved at both fixation distances, and stereoacuity showed numerical improvement, suggesting better binocular performance among completers. However, because the study used a single-group quasi-experimental design, had substantial attrition from initial recruitment to final analysis, and did not include a control group, the findings should be interpreted cautiously as preliminary within-participant evidence. Prism adaptation may be considered a conservative management option for selected children with basic-type or divergence-excess intermittent exotropia, but controlled studies with standardized protocols and longer follow-up are required before stronger conclusions can be made about its comparative effectiveness or long-term clinical role.

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