

EFFECT ON ACCOMMODATIVE AND BINOCULAR FUNCTION OF A NOVEL SPECTACLE LENS DESIGNED TO SLOW MYOPIA PROGRESSION BASED ON PERIPHERAL ASYMMETRIC MYOPIC DEFOCUS.

Álvarez M¹. Alvarez-Peregrina C². Sánchez-Tena MÁ^{2,3}. Andreu-Vázquez C⁴. Martínez-Perez C³. González A¹. Chamorro E¹. Villa-Collar C⁴. ¹Indizen Optical Technologies S.L. Spain. ²Universidad Complutense de Madrid. Spain. ³ISEC-LISBOA-Instituto de Educação e Ciências. Portugal. ⁴Universidad Europea de Madrid. Spain. | **Corresponding author (Marta Álvarez): malvarez@iot.es**

INTRODUCTION

The understanding of accommodation and binocular vision's role in myopia development remains incomplete despite ongoing research. Factors such as accommodation lag, near tasks, and short distances are implicated, yet precise mechanisms are unclear^{1,2}.

Most ophthalmic treatments investigated to address myopia progression and prevent its associated complications are based on the common premise that inducing off-axis myopic blur can significantly slow its advancement. These treatments often incorporate a peripheral zone of higher power surrounding a clear central zone, aiming to induce peripheral myopic blur while maintaining clear focus and vision along the central axis^{3,4}. However, these designs may potentially interfere with the binocular and accommodative system, particularly in myopic children who may under-accommodate when looking through the relative positive zones, further compromising their already diminished accommodative function due to myopia⁵. Assessing the accommodative and convergence systems is crucial in managing myopia, especially in young myopic individuals and those at risk of myopia development, to ensure optimal patient care by preserving a clear retinal image.

MATERIALS & METHODS

Study type: Double-blind, randomized, clinical trial in a population of myopic children conducted at the Novovisión clinic in Madrid (Spain) to compare the accommodative and binocular functions of a new ophthalmic lens design with myopic and asymmetric peripheral defocus (MyoLess) developed by IOT for myopia management in children, compared to a control group with SVL (single-vision lens).

Procedure: Accommodative amplitude (AA) and accommodative lag (Alag) of the right (RE) and left eye (LE), distance (DP) and near phorias (NP) values at baseline and after 12 months of follow-up were compared in a population of 82 children aged between 5 to 12 years old.

AA was assessed utilizing the Sheard method, Alag was evaluated employing MEM retinoscopy, and DP and NP were determined using Von Graefe's technique.

Participants were randomly assigned to a control group (n=41), which received SVL, or to a treatment group (n=41), which received MyoLess (IOT, Spain) myopia management lenses. A total of 2 visits were performed: baseline and after 12 months.

Ophthalmic lenses: The MyoLess lens, features a central ovoidal area of 7mm width free of blur, surrounded by a progressive power distribution inducing asymmetric positive/myopic defocus. Along the horizontal meridian, asymmetric additions are induced towards the nasal and temporal sides. The nasal zone has an addition value of +1.50D at 25mm, while the temporal part reaches +1.80D at 25mm. The bottom of the lens also presents positive power, reaching +2.00D addition (Figure 1). MyoLess lenses were manufactured using free-form technology in index 1.6 material with anti-reflective coating, considering children's prescriptions, monocular pupil distances, and pupil heights. The FreeFormDesigner software (IOT, Spain) was used for lens calculation.

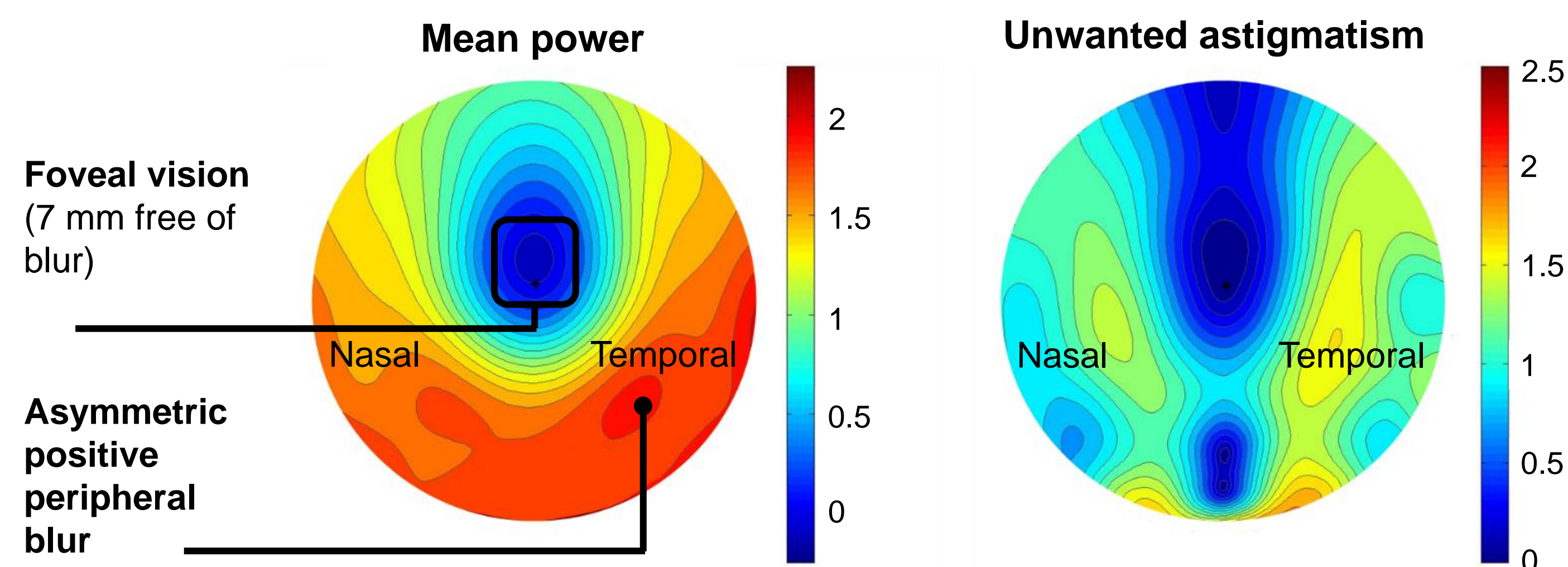


Figure 1: Mean power and unwanted astigmatism maps for a 0 diopters prescription of MyoLess lens.

Statistical analysis: Paired t-test with Bonferroni correction was applied to compare accommodative and binocular functions before and after wearing the lenses for 12 months. Statistical analysis was performed using Statgraphics Centurion XVI.II software with a significance level of p-value <0.004.

RESULTS

Accommodative amplitude and accommodative lag

Comparison between baseline and 12-month measurements for the SVL control and MyoLess treatment groups revealed no statistically significant differences in AA and Alag (Figure 2). Variations for both variables were similar for both eyes, AA_RE and Alag_RE were 1.08 ± 3.14D; 0.10 ± 0.42D for the SVL group and -0.52 ± 2.91D; 0.10 ± 0.35D for the MyoLess group.

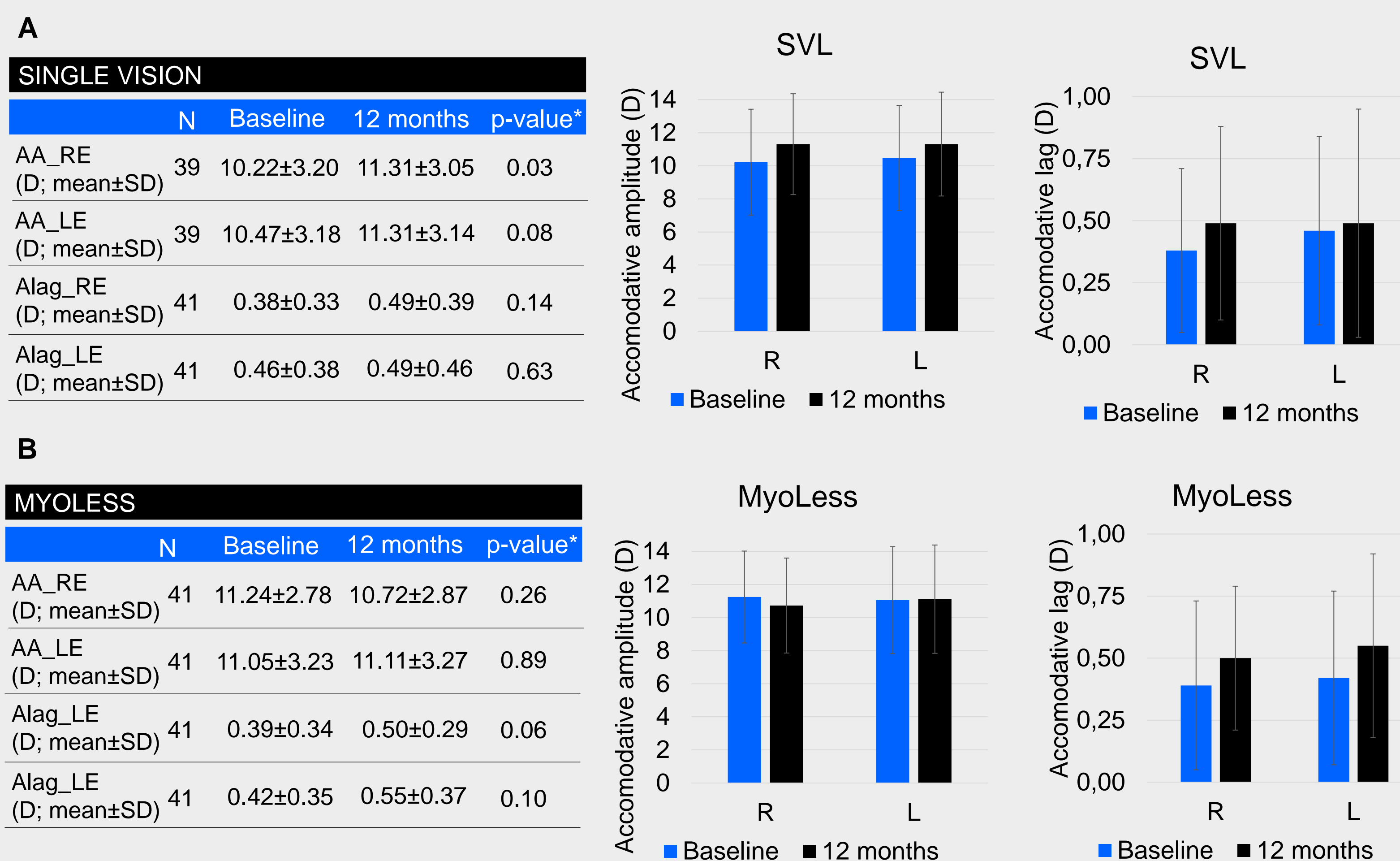


Figure 2 : AA and Alag data of both eyes at baseline and after 12 months for SVL control group (A) and MyoLess treatment group (B).

PURPOSE

To determine how novel spectacle lenses for myopia management with peripheral asymmetric myopic defocus affect accommodative and binocular functions over time.

Near and distance phorias

Baseline and 12-month measurements in the MyoLess treatment group exhibited similar changes to those observed in the SVL control group in DP and NP (Figure 3). The differences of DP and NP were -1.18 ± 4.04Δ; 2.61 ± 6.48Δ for the SVL group and -0.23 ± 3.36Δ; 2.64 ± 5.52Δ for the MyoLess group.

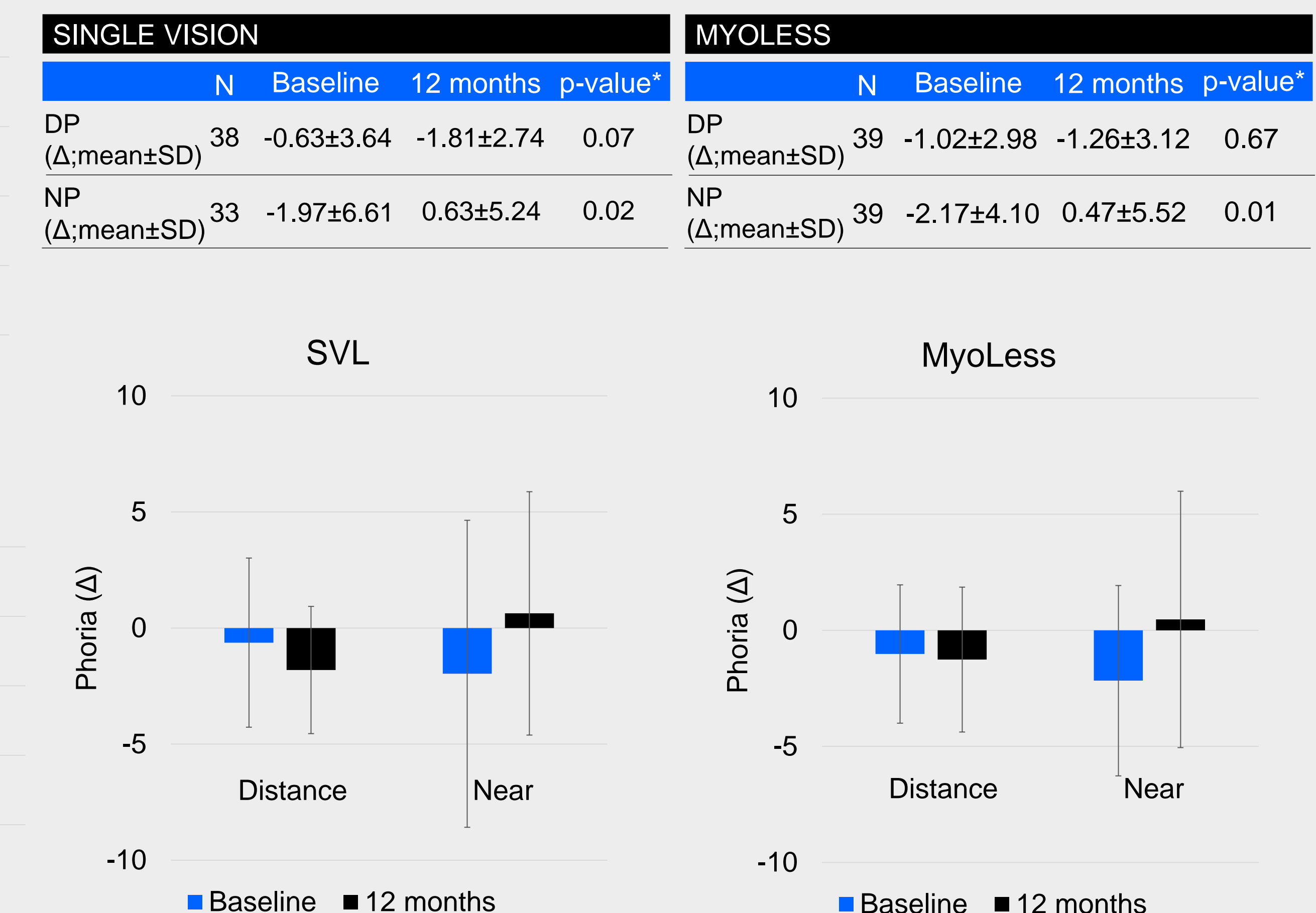


Figure 3: DP and NP data of both eyes at baseline and after 12 months for SVL and MyoLess group.

CONCLUSION

Accommodative and binocular functions are maintained stable in myopic children after 12 months of wearing the tested lens for myopia management lens based on peripheral asymmetric myopic defocus.

References:

1. Logan N.S. et al. Investigative ophthalmology & visual science, 2021.
2. Ip j.J.M. et al. Investigative ophthalmology & visual science, 2008.
3. Sankaridurg P. et al. Investigative Ophthalmology & Visual Science, 2023.
4. Lam C.S.Y. et al. Translational Vision Science & Technology, 2020.
5. Wildsoet C.F. et al. Investigative ophthalmology & visual science, 2019.