



Iseikonic Lenses Effect in Patients with Anisometropic Amblyopia

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Abstract

•**PURPOSE:** The following is an analysis of the data that aims to assess the effect of Iseikonic lenses on a group of 15 amblyopic subjects. The Iseikonic lens is primarily used for treating Aniseikonia as a result of anisometropia in order to reduce the magnification difference and suppression. The effect of Iseikonic lenses in improving binocularity is not a well-established area in literature; however, the study conducted determines the functional effect of these lenses on binocularity and eye movement.

•**PROCEDURE:** Detailed binocular vision parameters were measured for participants that were tested with a regular CR39 lens, followed by testing with an Iseikonic lens. Measurements for saccades, pursuits, circular smooth pursuits, fusional ranges, accommodative facility, and reading speed were conducted. Visual evoked potential, monocular and binocular vision tests were also conducted to measure possible immediate improvement. Some of the subjects were strabismic and anisometropic in the sampled data. The age chosen to focus on in order to conduct this study were patients 6 years and older. Reading speed was also measured using the eye tracker.

•**Results:** Comparison and analysis between the results with and without the aid of an Iseikonic lens showed an immediate improvement in three parameters: vergence ranges, binocular accommodative facility P0.058 and horizontal saccade speed P0.037. The binocular VEP improved slightly after wearing Iseikonic lenses P0.087. Furthermore, improvement was shown in horizontal pursuits, circular smooth pursuits and reading speeds, but it was not statistically significant. There was some improvement in the reading speed of 5 subjects out of the 15 subjects tested.

•**CONCLUSIONS:** The aid of Iseikonic lenses is potentially valuable to immediately improve binocularity, accommodative facility and horizontal saccades. Follow up evaluations will show if visual acuity will improve to reflect the improvement in binocularity and if other parameters will continue to improve.

Introduction

The study aims to assess the effect of Iseikonic lenses on a group of 15 amblyopic subjects. The Iseikonic lens is primarily used for treating Aniseikonia as a result of anisometropia in order to reduce the magnification difference and suppression. The effect of Iseikonic lenses in improving binocularity from a functional prospective is not a well-established area in literature; the study conducted determines the functional effect of these lenses on binocularity and eye movement. Aniseikonia is a condition affecting binocular vision where in a patient's eyes process the same image differently. Static aniseikonia involves a difference in magnification power, resulting in different image sizes between retinas. Dynamic aniseikonia causes the eyes to track at different rates when moving between points on the image. Aniseikonia is often linked to anisometropia (eyes with unequal refractive power), high myopia (nearsightedness), high hyperopia (farsightedness), or congenital differences in the eyes.

Aniseikonia can cause a myriad of detrimental effects (e.g., double vision, blurriness, headaches, dizziness, etc.). For pediatric patients, aniseikonia is associated with lazy eye and can impeded reading, comprehension, depth perception, etc. Conventional corrective lenses are ineffective against aniseikonia because the lens shape for each eye is specified independently (i.e., on a monocular basis). To counteract this, iesokonic lenses like Shaw lenses take that into consideration. In theory, the resulting 'iesokonic Lenses' can correct for anisometropia while simultaneously correcting for static and dynamic aniseikonia.

Procedure

Detailed binocular vision parameters were measured for participants that were tested with a regular CR39 lens, followed by testing with an Iseikonic lens. Measurements for pursuits, saccades, and fusional ranges utilising the HTS testing module, pursuits, circular smooth pursuits utilised the Right eye measurement eye tracker, and accommodative facility for near. Visual evoked potential, monocular and binocular vision tests were also conducted to measure possible immediate improvement. The measurement done for 5 sizes of targets with 100% contrast Some of the subjects were strabismic and anisometropic in the sampled data of 15 subjects. The age chosen to focus on in order to conduct this study was for patients 6 years and older. Reading speed was also measured using the (RtEye) eye tracker. The anisometropia was ranging from 1 to 10 diopter in the subjects with 2 subjects being anisometropic strabismic and amblyopic

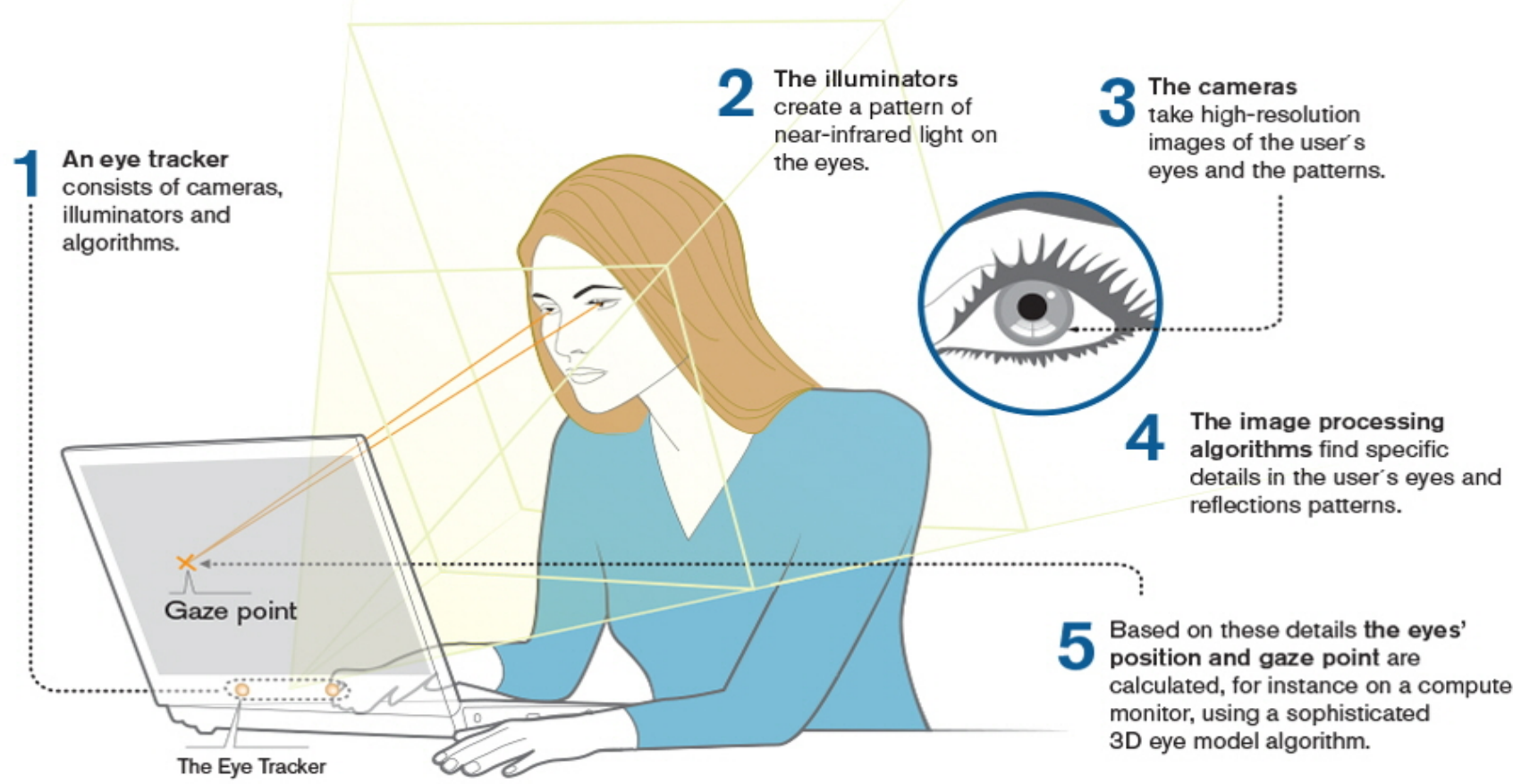


Fig1 Right Eye tracker that tracks eye movement in free space

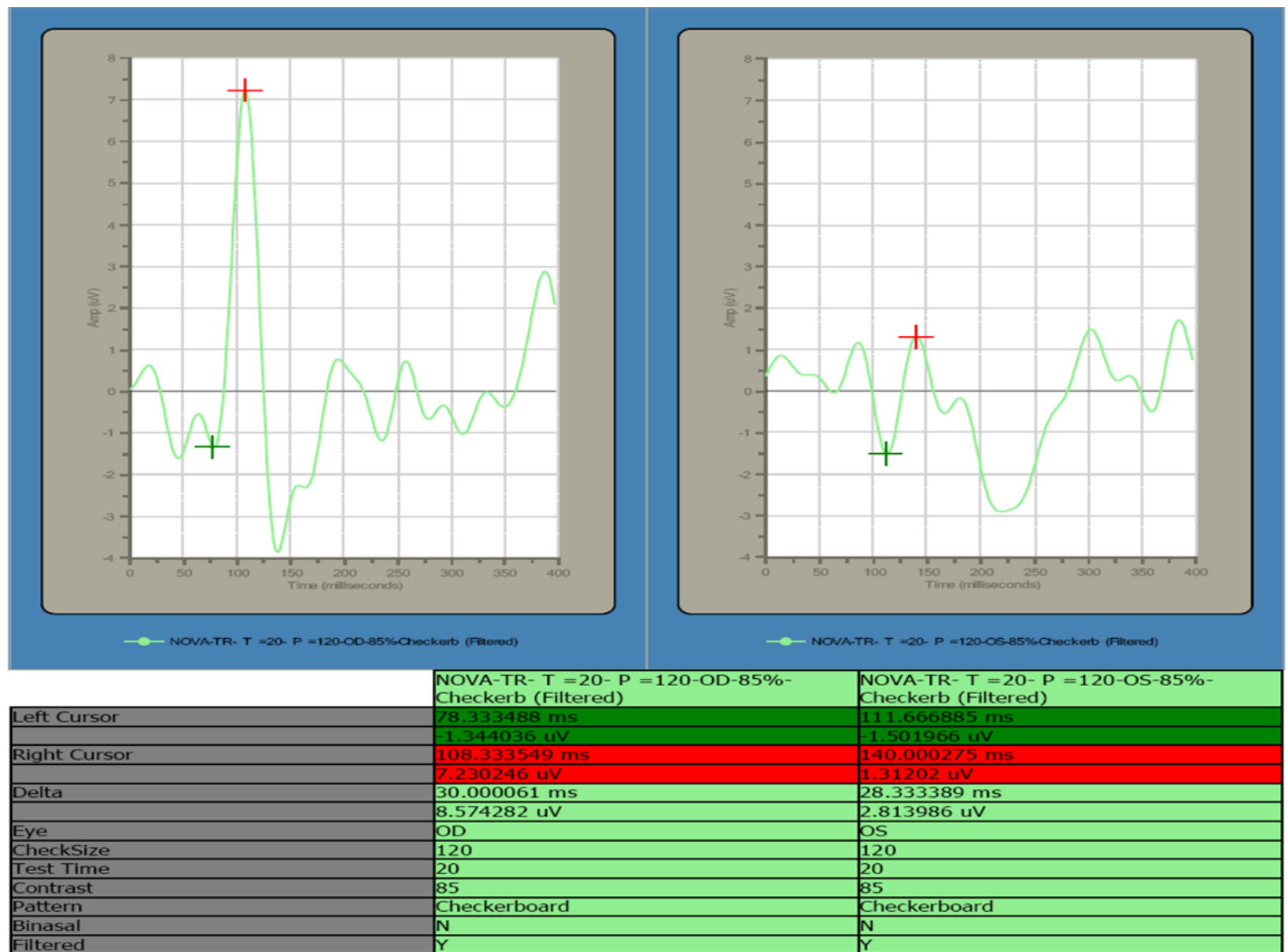


Fig 2 VEP measure for amblyopic patient

Results

Comparison and analysis between the results with and without the aid of an Iseikonic lens showed an immediate improvement in three parameters: vergence ranges, binocular accommodative facility P0.058 and horizontal saccade speed P0.037. The binocular VEP improved slightly after wearing Iseikonic lenses P0.087. Furthermore, improvement was shown in horizontal pursuits, circular smooth pursuits and reading speeds in 30 % of subjects. The second testing after a year results is still being collected.



Figure 3. Pursuit circular eye movement and reading eye movement. Regular lenses, Shaw lenses and Shaw with vision therapy in case of amblyopia and myopic anisometropia 10.0 D difference

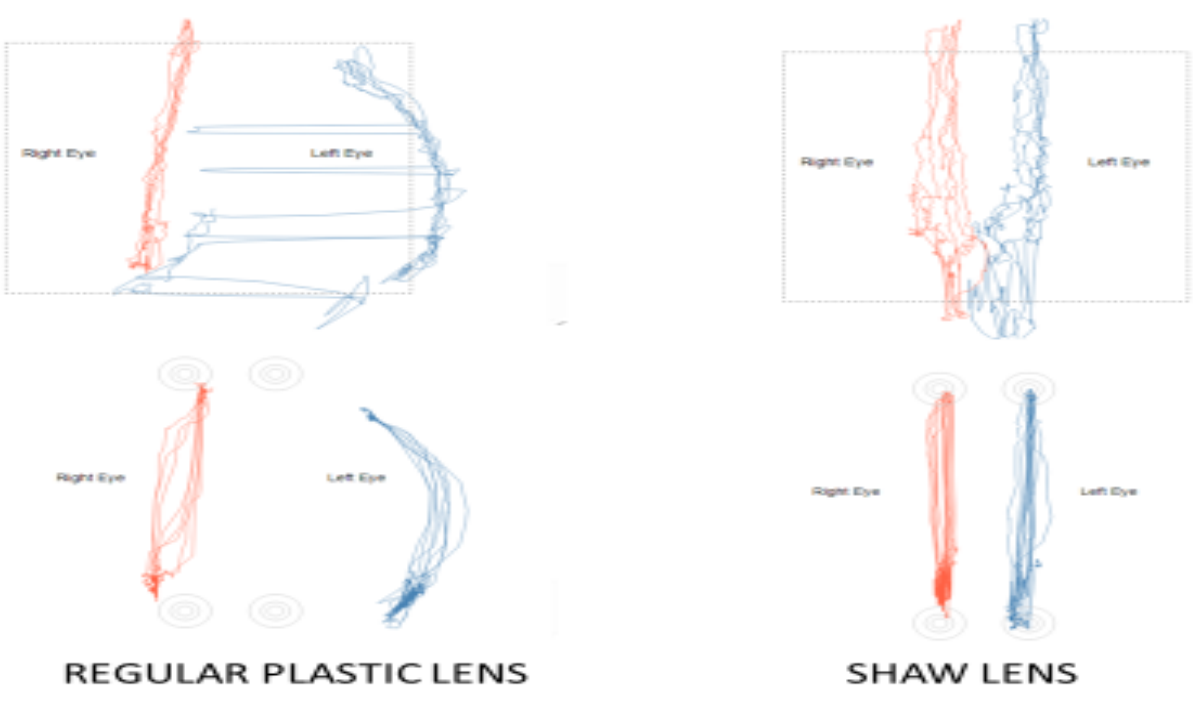


Figure 4. Vertical Pursuit eye movement and reading eye movement. Regular lenses, Shaw lenses .

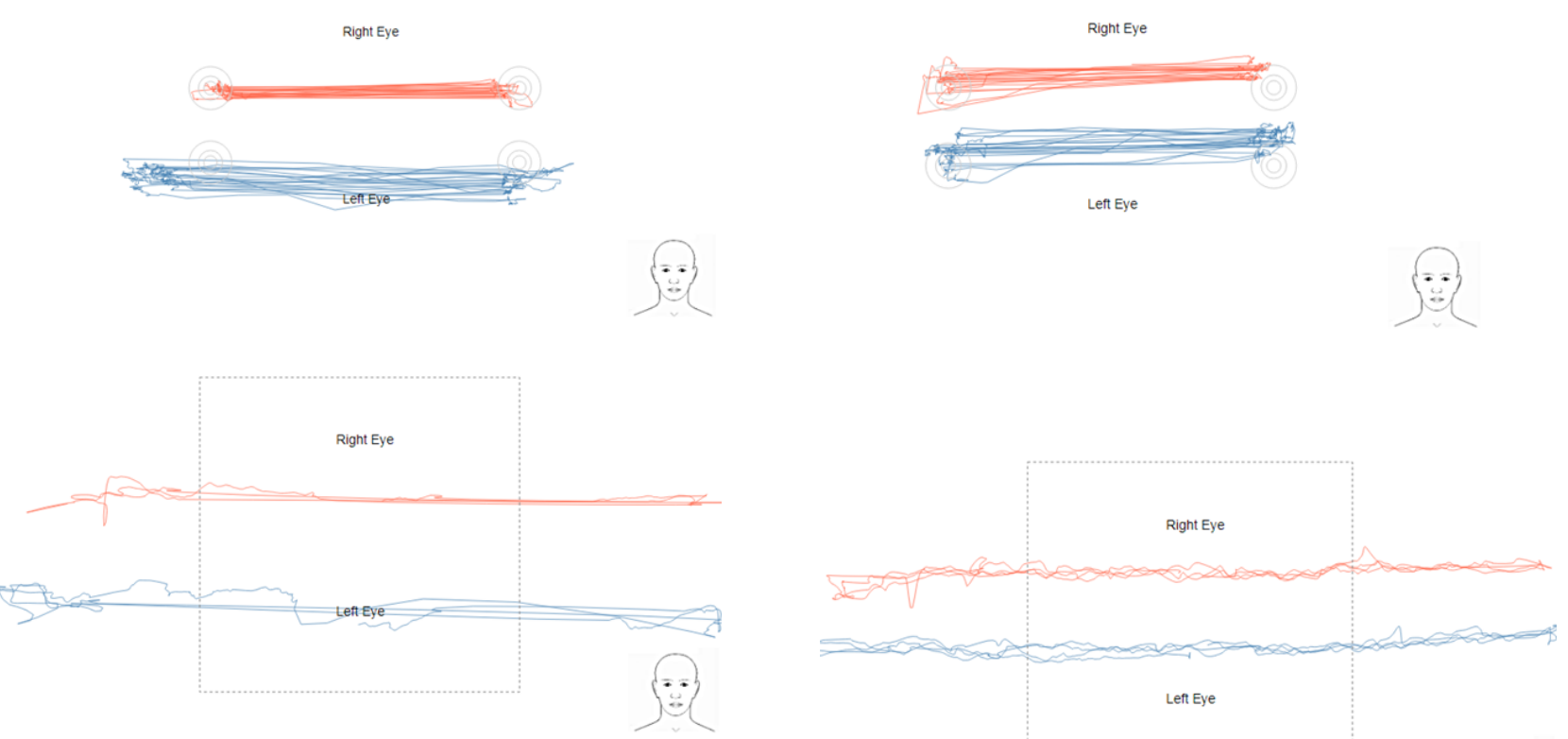


Figure 5. Pursuit circular eye movement and reading eye movement. Regular lenses, Shaw lenses in amblyopia

Discussion

Through this independent, internally-funded study, we seek to validate the efficacy of the Iseikonic lenses and understand the effect on static and dynamic aniseikonia.

No previously published data existed that objectively showed improvements in aniseikonia through the use of 'Shaw Lenses' in pediatric optometric patients.

It was unknown whether the lens design would also show simultaneous improvement in more conventional binocular disorders, e.g., anisometropia, lazy eye and strabismus.

- It was uncertain whether both static and dynamic aniseikonia would improve. Based on the results, we have shown immediate improvement in the horizontal vergence measures and accommodative facility in the amblyopic eye and binocular facility. Horizontal and circular pursuits have shown improvement too however, the numbers was not statistically significant in our small sample data of 15 patients. The reading speed and comprehension has also shown improvement as well (Fig1 and 3). Further analysis is ongoing to determine the range of aniesokonia and whether these lenses are beneficial for non-amblyopic cases too. iseikonic lenses are well known however, the functional effect was not totally understood. The subjects are followed for a second examination one year later. The subjects were divided into 2 groups, the first group did vision therapy after as well.

Conclusion

The aid of Iseikonic lenses is potentially valuable to immediately improve binocularity, accommodative facility and horizontal saccades. Follow up evaluations will show if visual acuity will improve to reflect the improvement in binocularity and if other parameters will continue to improve as well.

References

- Ugarte M, Williamson TH. Aniseikonia associated with epiretinal membranes. Br J Ophthalmol. 2005; 89:1576-80
- Modifying postural adaptation following a CVA through prismatic shift of visuo-spatial egocenter. Brain Injury. 2009;23(6):566-576.
- Aniseikonia and Anisophoria. Current Concepts and Clinical Applications. by A. And K. M. Robertson Remole | Jan 1, 1996
- shawlens.com/about_us/dr_shaw_and_the_shaw_lens

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