LATVIAN JOURNAL OF PHYSICS
AND TECHNICAL SCIENCES
2025, N 5

DOI: 10.2478/lpts-2025-0035

OCULOMOTOR TRAINING IN CHILDREN WITH AMBLYOPIA AND ECCENTRIC FIXATION: CLINICAL OBSERVATIONS AND OUTCOMES

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This case study evaluates the impact of oculomotor training on visual function and clinical outcomes in children and young adult with amblyopia and eccentric fixation. In this consecutive case series, a total of three patients were included. One was a 6-year-old with bilateral amblyopia and eccentric fixation. The other two – a 6-year-old and a 21-year-old – had monocular strabismic amblyopia with eccentric fixation. An oculomotor training program was developed to enhance fixation stability, targeting the improvement of eccentric fixation. Over three months, the patients participated in intensive visual training sessions, scheduled once every month. Each session was designed to assess progress and optimise training strategies. Visual acuity and eccentric fixation were evaluated at each session to monitor progress. After completing the training, the patients demonstrated significant improvements in visual acuity and a marked reduction in eccentric fixation. This case study demonstrates the potential of oculomotor training as an effective treatment for amblyopia with eccentric fixation. While further research is required to standardise oculomotor training protocols and assess long-term outcomes, the findings suggest that oculomotor training could serve as a valuable adjunct or alternative to traditional therapies for amblyopia with eccentric fixation.

Keywords: *Amblyopia, amblyopia therapy, eccentric fixation, oculomotor training, visual training, visuoscopy.*

1. INTRODUCTION

Amblyopia, recognised as the primary etiology of visual impairment among pediatric and young populations, is characterised by unilateral or bilateral diminution of visual acuity without discernible ocular pathologies [1]. It is the most common cause of preventable childhood blindness, with a prevalence of 1–5 %, and it is still considered one of the most frequent causes of unilateral visual impairment in adulthood [2]. Amblyopia is associated with an increased risk (at least three times higher than in the general population) of serious vision loss in the fellow eye [3]. In more than 50 % of cases, the cause of blindness is trauma [4].

Amblyopia is characterised by multiple visual impairments that affect monocular and binocular visual functions. While amblyopia is most recognised by reduced visual acuity, it is often accompanied by a range of other visual deficits. These include impaired accommodation [5], [6], binocular dysfunction [7], and interocular suppression [8], [9]. Additional associated abnormalities involve atypical ocular movements [10], positional uncertainty [11], and diminished contrast sensitivity [12], [13], [14]. Spatial distortions [10], [15] and unstable fixation [16], [17] have also been frequently observed.

1.1. Eccentric Fixation

Bilateral amblyopia – although less common than unilateral cases – presents a unique challenge, especially when combined with eccentric fixation. Eccentric fixation, typically associated with strabismic amblyopia, involves the use of a non-foveal retinal locus for fixation and can significantly limit visual rehabilitation outcomes [18]. Eccentric fixation develops due to the loss of central visual acuity in one eye and exists both monocularly and binocularly. Why is it important to know about eccentric fixation?

Eccentric fixation in amblyopia occurs when the central visual acuity is reduced or lost in the amblyopic eye for a long time [19]. It occurs in about 44 % of all patients with amblyopia [20] and in 30 % of patients with strabismic amblyopia [21]. The angle of eccentric fixation is directly proportional to the degree of amblyopia [19].

It has traditionally been classified by cause as follows: strabismic, refractive, anisometropic, visual deprivation, occlusion [22]. Amblyopia is also classified according to the type of fixation: central, variable, non-central fixation – para foveolar, macular, peripheral (stable or unstable), non-fixation amblyopia (see Fig. 1).

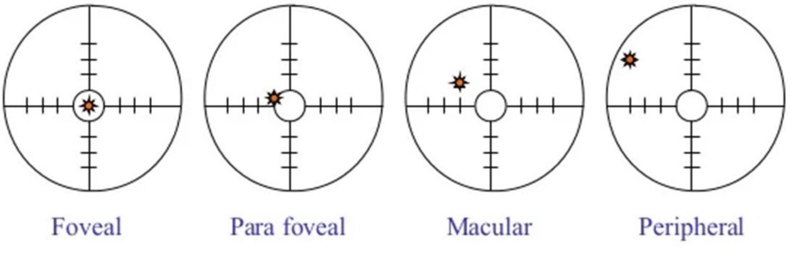

Fig. 1. Fixation evaluation.

1.2. Methods for Testing Eccentric Fixation

Afterimage Method

This method relies on the idea that if an afterimage is created in one eye, its projection can be transferred to the amblyopic eye. A highly dissociative orthoptic test uses a battery-powered camera flash to create a vertical afterimage in one eye and a horizontal afterimage in the other eye. A card is placed in front of each eye – with a horizontal slit in front of the better-seeing eye and a vertical slit in front of the amblyopic eye. The subject's task is to assess the position of the afterimage in relation to the fixation target.

1. Record direction and amount of the eccentric fixation, if it exists.
2. Record each eye separately.
3. Record the test distance.
4. Draw a dot to represent the fixation point.
5. Calculate the magnitude in prism dioptres (1cm=1△ at 1m test distance).

Microperimetry

Microperimetry is a non-invasive test that evaluates retinal sensitivity and fixation behaviour by projecting light stimuli onto specific retinal locations while simultaneously tracking eye movements. Microperimetry is a technique used to assess the preferred retinal locus (PRL) and fixation stability. It allows precise mapping of the PRL in amblyopic patients, identifying whether fixation is central or eccentric. During the test, the patient fixates on a visual target while light stimuli are presented across the macula. The test provides both functional and structural data, making it useful for understanding how amblyopic patients use their retina for fixation [23].

Macular Integrity Tester (MIT)

Haidinger's brushes can be used to determine whether amblyopic patients fixate with the fovea or exhibit eccentric fixation, as the fovea always corresponds to the centre of the hourglass pattern and the centre of rotation of Haidinger's brushes. Haidinger's brushes are clinically important because they form only on the foveola. In a patient with a normal foveola, the brushes will rotate around the fixation point. Any process that interferes with this orientation may lead to the disappearance of the brush image, even if the photoreceptor layer is intact.

1. The test is conducted in a moderately dark room.
2. The amblyopic eye is covered, or the test begins with the better-seeing eye.
3. If the patient sees the Haidinger's brushes, fixation assessment continues.
4. The patient is instructed to look at the central dot and simultaneously assess where the "propeller" appears in relation to the observed point.
5. In the case of central fixation, the brushes should appear around the black dot.
6. The test should be performed for ~ 10 s to evaluate fixation stability.

Fig. 2. MIT equipment.

The optometrist can then measure the distance between these two points and convert the millimetre shift into prismatic dioptres based on the test distance. The direction and magnitude of the eccentric fixation can be estimated by asking the patient to report the position of the propeller relative to the fixation point (see Fig. 2) [24].

Visuoscopy

Visuoscopy is used to assess the presence of monocular fixation. The assessment of eccentric fixation should be performed monocularly (covering one eye) with or without pupil dilation. It is useful to assess the better-seeing eye first to compare with the amblyopic eye. During the procedure, the patient is asked to look at the centre of the target while the eye specialist assesses which part of the retina the patient is fixating with. A green filter can be used in the beginning to avoid overwhelming the patient with bright light. The test should be conducted for approximately 5–10 s to assess fixation stability. It is important to evaluate the type of eccentricity, its direction, and its stability [24].

Treatment of amblyopia and eccentric fixation is usually associated with therapeutic problems [25]. The magnitude and persistence of eccentric fixation are important factors in determining both the passive and active treatment options needed to restore foveal fixation and normal visual acuity, as visual acuity is reduced in the periphery, and it is not possible to obtain its maximum value [26]. Most patients are screened and treated independently of their fixation behaviour, and this raises many questions and clinical issues before they reach an age when a reliable diagnosis of eccentric fixation becomes possible. Recent data on the prevalence of eccentric fixation is lacking, and as we see and treat individuals with amblyopia at a much younger age than previously, it may seem that eccentric fixation is less common. In Latvia, amblyopia is carefully treated in various clinics, but the diagnosis of eccentricity is relatively rare. To address these issues, we propose an individualised and adaptive therapeutic approach that explicitly accounts for fixation characteristics. By incorporating detailed assessments of fixation location and stability into the treatment protocol, visual training can be precisely directed to stimulate the foveal or parafoveal region. This strategy is designed to promote a gradual shift from eccentric to central fixation, which is essential for achieving optimal visual acuity. Early identification and tailored intervention based on fixation behaviour may significantly enhance the effectiveness and timing of amblyopia therapy, particularly in young children, where neuroplasticity is at its peak and intervention windows are limited.

1.3. Case Report I: Bilateral Amblyopia with Eccentric Fixation

A 6-year-old female was referred from an ophthalmologist for the assessment of intermittent exotropia and potential future therapies. The mother did not notice the child's strabismus daily; only occasionally did one eye "drift" away. However, she observed that the child took longer to focus and started holding books closer to the eyes. The child has poor spatial orientation, often loses sight of the parents, is inattentive, trips frequently, and seems unsteady.

Despite standard refractive error, her visual acuity was significantly below expectations. Binocular vision testing revealed intermittent exotropia and convergence insufficiency, indicating alignment and motor control issues. Examination of the ocular structures indicated normal findings, but optical coherence tomography revealed abnormal macular thickness and unstable eccentric fixation. Visuoscopy confirmed eccentric fixation, contributing to her reduced visual acuity and slow motor responses (see Table 1).

Table 1. Clinical and Functional Findings of the Examined Patient

Information about the patient			
Visual acuity	Distance	Near	Comments
OD sc	0.4	0.63	Letter "E" (decimal units)
OS sc	0.4	0.63	
Binocular functions			
Suppression	BSV	BSV	Worth/TNO
Stereoacuity		+	Titmus Fly
Ocular motility		mOI hyperfunction	
Convergence		11/15 21	Push-up method, dot card (cm)
Cover test	XT (OS)	XP	
Prism cover test	10	9	Δ BI
Visuoscopy		OD/OS 1.5-2 Δ, unstable	
OD, right eye; OS, left eye; sc, without correction; cc, with correction; BSV, binocular single vision; mOI, muscle inferior oblique; XT, exotropia; XP, exophoria; BI, base in			

1.4. Case Report II: Unilateral Amblyopia with Eccentric Fixation

A 21-year-old female presented for visual function assessment due to persistent visual acuity deficits in her right eye. She reported a history of occlusion therapy during childhood for amblyopia associated with esotropia. Despite early intervention, the amblyopia persisted into adulthood. She continues to experience difficulties with fine depth perception, prolonged visual processing time, and reduced confidence in visually guided tasks, particularly in unfamiliar or crowded environments. Refraction revealed a moderate myopic with astigmatism prescription, and best-corrected visual acuity remained significantly reduced in the amblyopic eye.

Binocular vision testing revealed intermittent esotropia, poor stereoacuity. MIT and visuoscopy confirmed eccentric fixation, contributing to her reduced visual acuity (see Table 2). These findings suggest that the persistence of amblyopia in this case may be due to longstanding eccentric fixation and cortical adaptation, despite early occlusion therapy and structurally healthy ocular anatomy. This highlights the need to reconsider therapeutic options in adult patients, including sensory and oculomotor rehabilitation strategies, to optimise visual function and quality of life.

Table 2. Clinical and Functional Findings of the Examined Patient

Information about the patient			
Visual acuity	Distance	Near	Comments
OD cc	0.5	0.5	(decimal units)
OS cc	1.0($^{-2}$)	1.0	
Binocular functions			
Suppression	Uncrossed diplopia	BSV	Worth/TNO
Stereoacuity		+	Titmus Fly
Ocular motility		Normal	
Convergence		5 8	Push-up method, dot card (cm)
Cover test	EP→ET	EP→ET	
Prism cover test	10	8	Δ BO
Visuoscopy		OD 1.75 Δ, unstable	

OD, right eye; OS, left eye; cc, with correction; BSV, binocular single vision; EP, esophoria; ET, esotropia; BO, base out

1.5. Case Report III: Unilateral Amblyopia with Eccentric Fixation

A 6-year-old female was referred by an optometrist for amblyopia management and a review of her refractive prescription, as her visual acuity had not improved over time. The child wears glasses. On occasion, she also patches one eye, though inconsistently. She has a history of microesotropia. At the time of examination, her visual acuity remained below expected levels despite appropriate refractive correction. Visuoscopy confirmed the presence of unstable eccentric fixation in the amblyopic eye (see Table 3). This finding explains the lack of improvement in visual acuity, as maximum visual acuity cannot be achieved when fixation is displaced from the fovea. The results support the hypothesis that the persistence of amblyopia is due, at least in part, to eccentric fixation, highlighting the need for targeted visual therapy aimed at restoring central fixation.

Table 3. Clinical and Functional Findings of the Examined Patient

Information about the patient			
Visual acuity	Distance	Near	Comments
OD cc	0.63	0.8	(decimal units)
OS cc	0.5	0.5	
Binocular functions			
Suppression	Alternating suppression	Alternating suppression	Worth/TNO
Stereoacuity		No	Titmus Fly/Two Lang pencil test
Ocular motility		Normal	
Convergence		5 8	Push-up method, dot card (cm)
Cover test	ET	ET	
Prism cover test	6	2	Δ BO
Visuoscopy		OS 1.5 Δ, unstable	
OD, right eye; OS, left eye; cc, with correction; ET, esotropia; BO, base out			

2. METHOD AND MATERIALS

An oculomotor training program was designed to improve saccadic accuracy, fixation stability, and vergence control, targeting the improvement of eccentric fixation. Over three months, three patients participated in intensive visual training sessions, scheduled once every month. Each session was designed to assess progress and optimise training strategies. At each session, visual acuity and macular thickness were evaluated to monitor progress.

The core training protocol for each session included a series of visual tasks designed to target saccadic accuracy, fixation stability, and vergence control. Exercises were adapted from established eccentric fixation therapy techniques and included:

- fixation stability tasks using small, centrally presented stimuli to encourage foveal engagement;
- saccadic accuracy tasks requiring precise eye movements between peripheral and central targets;
- fine eye-hand coordination tasks linking visual input to motor response, reinforcing central fixation.

Each participant received an individualized oculomotor training plan based on baseline findings from visual acuity measurement, binocular vision assessment, and visuoscopy. The location, magnitude, and stability of eccentric fixation were the primary parameters guiding the selection and positioning of training stimuli.

The training programs included a variety of structured visual exercises targeting saccadic precision, fixation stability, and vergence adaptation. Patients with unstable fixation began with larger, high-contrast targets before progressing to smaller, lower-contrast stimuli as control improved. In cases of suppression or reduced stereoacuity, partial occlusion of the better-seeing eye was introduced during exercises to enhance stimulation of the amblyopic eye. Although Cases 1 and 2 initially showed a preference for performing the exercises without occlusion therapy, partial occlusion of the better-seeing eye was incorporated during training sessions to enhance stimulation of the amblyopic eye and reinforce fixation control. Progress was reviewed at each visit, and task parameters were adjusted to optimise therapeutic challenge while maintaining patient engagement.

A total of 20 structured oculomotor exercises were developed for use by the study participants. These exercises were based on simple saccadic and/or eye–hand coordination tasks and were designed to be performed at home without the need for specialized equipment, thereby facilitating the reduction of eccentric fixation in a non-clinical setting.

Each day, two exercises were to be performed in a random order. The vision exercises were arranged so that tasks were evenly distributed over the prescribed training period, preventing any single task from being disproportionately represented within the overall program. The patient engaged in various daily exercises for 15–20 minutes, with follow-up training sessions conducted approximately once a month. This duration was chosen to maintain attention and ensure high-quality engagement without inducing visual fatigue. The combination of individualised tasks and strategic occlusion allowed for gradual reinforcement of central fixation and contributed to measurable improvements in visual performance over time.

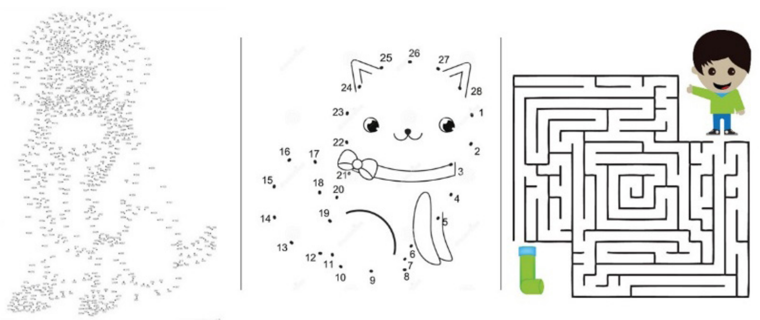

Fig. 3. The examples of exercises for eccentric fixation.

Exercises should be performed regularly, as consistent practice leads to neuroplastic changes over time. It is recommended to start with easier tasks (for example, kitten) and gradually increase the difficulty (dog) as fixation improves (see Fig. 3). These exercises are designed to promote the use of central vision by requiring precise hand movements linked to accurate visual input, helping shift eccentric fixation toward the fovea. Unlike passive therapeutic approaches applied in isolation, these active vision exercises have the potential to shorten the overall treatment time required to achieve optimal visual acuity.

3. RESULTS

Following the completion of the individualised oculomotor training program, all patients demonstrated notable improvements in visual function (see Table 4). Visual acuity in the amblyopic eye improved relative to baseline measurements, with gains observed after each session. Fixation stability, as assessed through visuoscopy, showed measurable enhancement, and the degree of eccentric fixation was reduced in three cases.

Table 4. Visual Acuity and Visuoscopy Assessment in Three Cases: Pre- and Post-Therapy

Comparison between results			
Case I			
Visual acuity OD sc OS sc	Before therapy 0.4 0.4	After therapy $1.0(^{-2})$ $1.0(^{-2})$	Comments (decimal units)
Visuoscopy	OU central, unstable		
Case II			
Visual acuity OD cc OS cc	0.5 1.0	$0.9(^{-2})$ 1.2	(decimal units)
Visuoscopy	OD 0.5 Δ, unstable		
Case III			
Visual acuity OD cc OS cc	0.63 0.5	$1.0(^{-2})$ 0.8	(decimal units)
Visuoscopy	OS 0. 5Δ, unstable		
OD, right eye; OS, left eye; sc, without correction; cc, with correction;			

In comparison with pre-training assessments, where fixation was unstable and located significantly off-centre, post-training evaluations revealed more centralised and consistent fixation behaviour. This improvement correlated with increased reading fluency, better eye-hand coordination, and greater confidence in visually guided tasks, as reported subjectively by patients and caregivers.

These findings support the effectiveness of targeted oculomotor training, even in cases where amblyopia has persisted despite earlier occlusion therapy.

4. DISCUSSION

Overall, the results of this study demonstrate that individualised oculomotor training can be an effective tool in the management of amblyopia, particularly in cases associated with eccentric fixation. Even when eccentric fixation is not clearly visible during routine examination, its subtle presence may still interfere with optimal visual acuity. This supports previous findings suggesting that fixation may appear central while functionally remaining slightly off-foveal, limiting visual outcomes [27].

The success of the saccadic training program developed in this study highlights its potential clinical value, not only for improving fixation stability and visual acuity but also for uncovering and addressing subclinical fixation anomalies. As such, the implementation of oculomotor training in clinical optometric practice is recommended as a complementary strategy in amblyopia treatment, especially when standard approaches have plateaued or proven insufficient.

5. CONCLUSION

The assessment of eccentric fixation in children holds significant clinical value, as it may facilitate the early detection of amblyopia even before visual acuity is formally measured. Given that peripheral vision cannot achieve the same level of acuity as foveal vision, the magnitude and persistence of eccentric fixation are crucial considerations when selecting appropriate treatment strategies. In all three cases, training strategies were adapted at each monthly session based on interim assessment of fixation location and stability, visual acuity, and binocular function, ensuring progressive challenge and individualised therapy goals. These case studies highlight the potential effectiveness of oculomotor training as a therapeutic approach for bilateral amblyopia with eccentric fixation, suggesting its possible role as a complementary or alternative intervention to conventional methods.

Furthermore, the traditionally accepted relationship between visual impairment and the degree of eccentric fixation warrants revaluation, as it influences both our understanding of amblyopia's underlying mechanisms and the development of more targeted therapies. Ultimately, early identification and intervention remain paramount, as timely treatment significantly enhances the likelihood of restoring normal visual acuity.

REFERENCES

1. Pai, A., & Mitchell, P. (2012). Prevalence of Amblyopia and Strabismus. *Ophthalmology*, *117* (10), 2043–2044.
2. Gunton, K. B. (2013). Advances in Amblyopia: What Have We Learned from PEDIG Trials? *Pediatrics*, *131* (3), 540–547.
3. Rahi, J. S., Logan, S., Timms, C., Russell-Eggitt, I., & Taylor, D. (2002). Risk, Causes, and Outcomes of Visual Impairment after Loss of Vision in the Non-amblyopic Eye: A Population-Based Study. *The Lancet*, *360* (9333), 597–602.
4. Tommila, V., & Tarkkanen, A. (1981). Incidence of Loss of Vision in the Healthy Eye in Amblyopia. *British Journal of Ophthalmology*, *65* (8), 575–577.
5. Ale Magar, J.B., & Shah, S.P. (2022). Accommodative Lag Persistence in Treated Anisometropic, Strabismic, and Mixed Amblyopia. *Journal of Ophthalmology*, 133731.
6. Toor, S., Horwood, A., & Riddell, P. (2019). The Effect of Asymmetrical Accommodation on Anisometropic Amblyopia Treatment Outcomes. *J AAPOS*, *23*, 203.e1-e5.
7. Birch, E.E. (2013). Amblyopia and Binocular Vision. *Prog. Retin. Eye Research*, *33*, 67–68.
8. Li, J., Thompson, B., Lam, C.S.Y., Deng, D., Chan, L. Y. L., Maehara, G., … & Hess, R. F. (2011). The Role of Suppression in Amblyopia. *Investigate Ophthalmology Vision Science*, *52*, 4169–4176.
9. Elfadaly, D., Abdelaziz, S.T., Eid, A.M., & Dahlmann-Noor, A. (2022). Suppression in Amblyopia Literature Review. *NeuroQuantology*, *20* (10), 4234–4235.
10. Sireteanu, R., Thiel, A., Fikus, S., & Iftime, A. (2008). Patterns of Spatial Distortions in Human Amblyopia are Invariant to Stimulus Duration and Instruction Modality. *Vision Research*, *48*, 1150–1163.
11. Fronius, M., Sireteanu, R., Zubcov, A., & Buttner, A. (2000). Preliminary Report: Monocular Spatial Localization in Children with Strabismic Amblyopia. *Strabismus*, *8*, 243–244.

12. Liao, M., Zhao, H., Liu, L., Li, Q., Dai, Y., Zhang, Y, & Zhou, Y. (2016). Training to Improve Contrast Sensitivity in Amblyopia: Correction of High-order Aberrations. *Sci. Rep*., *6*, 35702.
13. Wang, G., Zhao, C., Ding, Q., & Wang, P. (2017). An Assessment of the Contrast Sensitivity in Patients with Ametropic and Anisometropic Amblyopia in Achieving the Corrected Visual Acuity of 1.0. *Sci. Rep*, *7*, 42043.
14. Pang, Y., Allen, M., Robinson, J., & Frantz, K. A. (2019). Contrast Sensitivity of Amblyopic Eyes in Children with Myopic Anisometropia. *Clinical Experimental Optometry*, *102*, 57–62.
15. Simmers, A. J., & Bex, P. J. (2003). The Representation of Global Spatial Structure in Amblyopia. *Vision Research*, *44*, 523–533.
16. Shaikh, A.G., Otero-Millan, J., Kumar, P., & Ghasia, F.F. (2016). Abnormal Fixational Eye Movements in Amblyopia*. PLoS ONE*, *11*, e0149953.
17. Scaramuzzi, M., Murray, J., Otero-Millan, J., Nucci, P., & Shaikh, A.G. (2019). Fixation Instability in Amblyopia: Oculomotor Disease Biomarkers Predictive of Treatment Effectiveness. *Prog. Brain Research*, *249*, 235–248.
18. Staugaard, C.F., Petersen, A., & Vangkilde, S. (2016). Eccentricity Effects in Vision and Attention. *Neuropsychologia*, *92*, 69–78.
19. Lambertus, S. B. (2017). Highly Sensitive Measurements of Disease Progression in Rare Disorders: Developing and Validating a Multimodal Model of Retinal Degeneration in Stargardt Disease. *PLoS One*, *12* (3), e0174020.
20. Von Noorden, G.K. (1969). The Etiology and Pathogenesis of Fixation Anomalies in Strabismus. *Transactions of the American Ophthalmological Society*, *67*, 698–751.
21. Pasino, L. (1962). On the Factors Leading to an Eccentric Type of Fixation in Strabismic Amblyopia*. Ophthalmologica*, *143* (6), 431–437.
22. Wallace, D. K., Repka, M. X., Lee, K. A., Melia, M., Christiansen, S. P., Morse, C. L., & Sprunger, D. T. (2018). Amblyopia Preferred Practice Pattern. *Ophthalmology*, *125* (1), P105–P142.
23. Morales, M.U., Saker, S., Wilde, C., Rubinstein, M., Limoli, P., & Amoaku, W. M. (2020). Biofeedback Fixation Training Method for Improving Eccentric Vision in Patients with Loss of Foveal Function Secondary to Different Maculopathies. *International Ophthalmology*, *40*, 305–312.
24. Kalnica-Dorosenko, K., Kalnupa, M., Svede, A., & Valeina, S. (2021). Eccentric Fixation Measurements Using Visuoscopy and Macula Integrity Tester (MIT) in Children with Amblyopia. *Proceedings of SPIE*, 11815, Novel Optical Systems, Methods, and Applications XXIV, 118150Y.
25. Barrett, B.T., Bradley, A., & McGraw, P.V. (2004). Understanding the Neural Basis of Amblyopia. *The Neuroscientist*, *10* (2), 106–117.
26. Rouse, M.W. (2004). *Optometric Clinical Practice Guideline: Care of the Patient with Amblyopia.* American Optometric Association.
27. Wright, K.W., & Strube, Y.N.J. (2012). *Handbook of Paediatric Strabismus and Amblyopia.* Springer.