



EDITORIAL

Advances in Research in Binocular Vision



Over the last two decades, the study and treatment of binocular vision has undergone a remarkable transformation.

A number of recent studies have described the importance of binocular vision and the negative impact on quality of life suffered by individuals with binocular vision disorders.¹

Binocular vision therapy has a long tradition that began in the 20th century in association with the treatment of vergence problems, with and without strabismus. Of particular interest are figures such as Mary Maddox, a pioneer of orthoptic and pleoptic training; and her father, Ernest Maddox, ophthalmologist and inventor of different instruments to investigate binocular vision.² These seminal investigations provided us with valuable knowledge about the motor and sensory substrate of the visual system that we still use today in our daily clinical practice. Contemporary understanding of the vergence system, analysis of visual sensory status (suppression and normal or anomalous sensorial correspondence), and foveal fixation (eccentric or central), is the result of the research effort of professionals who practiced paediatric ophthalmology or optometry over half century ago.

However, the study and treatment of binocular vision through orthoptic therapy, so popular in the first half of the 20th century, was undervalued in ophthalmological practice.² Amblyopia, for example, was considered to be a problem related exclusively to visual acuity and binocular vision was not treated at all, despite the anecdotal presence of stereo acuity in anomalies such as strabismic amblyopia.³ The importance of suppression in amblyopia was eventually demonstrated in the research works of Hess, Thompson, Mansouri et al.⁴ These studies concluded that suppression was the cause of the loss of visual acuity and that binocularity should therefore be addressed at the beginning of treatment by penalizing the signal from the dominant eye (dichoptic stimulation).⁵ Subsequently, stimulation models that penalized the signal from the dominant eye were developed for use with a tablet and anaglyph. The preliminary research obtained good results, even better than with occlusion, for both visual and stereo acuity. However, dichoptic stimulation has obtained disappointing outcomes when subjected to clinical trials. Lack of

adherence to the game, poor compliance or the characteristics of the stimulus may have been the cause of these poor outcomes.⁶

The scientific community accepts that amblyopia is a binocular anomaly, yet the current evidence-based treatment involves optical correction and subsequent occlusion or penalization of the dominant eye. To date, no binocular treatment has improved on the results of occlusion, in terms of either visual acuity or binocular vision.⁶ There is therefore a need for a shift in efforts towards the development of novel stimulation systems based on perceptual learning and dichoptic stimulation, using technologies such as virtual reality, tablets, computers, and even mobile phones.⁷

Likewise, further research is required to clarify the role of dichoptic treatment as either a substitute for occlusion or a coadjuvant in amblyopia therapy.

Pseudo-therapies linked to the concept of behavioural optometry have further obstructed the efforts of the scientific community to demonstrate the value of binocular therapy and perceptual learning techniques in the treatment of amblyopia. Misleading messages – such as non-occlusion of the dominant eye or correction of the amblyopic eye according to values obtained with impressive-sounding lenses (e.g., neuro-functional lenses) rather than under cycloplegia – distort the message that optometrists must convey to the scientific community.⁸

Another area of binocularity in need of improvement is the type of tests we must perform in order to establish a correct diagnosis in subjects with strabismus or heterophoria. A clinical definition of the anomaly requires standardized tests and evaluation procedures with high intra- and inter-observer repeatability to ensure that diagnoses are based on objective criteria and not on impressions.

Once diagnosed, the patient has the right to know the probability of success of the proposed therapy. A similar level of evidence to that already obtained for the treatment of convergence insufficiency is therefore needed for other non-strabismic dysfunctions such as symptomatic phorias, strabismus as intermittent exotropia, microstrabismus, and adult-acquired diplopia.

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Disclaimer

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