Research & Evidence for Yoked Prisms

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Prisms are said to be yoked when both bases point in the same direction such as both bases up, both bases down, both bases right or both bases left. Since the earliest days of ophthalmic eyewear prisms have been incorporated in glasses primarily as a way to redirect the light into an eye that is turned relative to where it should be pointed in space to work with the other eye. This has helped many people who would have had double vision without this in their glasses.

The history of yoking the prisms is more recent but has a well-established history in the profession of optometry.

The first published references to yoked prisms use in vision training were by Horner 43 years ago in 1973[1], followed by Margach in 1981 [2] [3]

Dr. Robert Kraskin published about the use of yoked prisms in 191-1983 as a series in Curriculum II of the Optometric Extension Program[4]. Soon after Dr Melvin Kaplan published his work entitled, "Vertical Yoked Prisms"[5], in which he discussed his use of low powered prisms with populations of patients on the autism spectrum as well as patients with mild traumatic brain injury (TBI).

Press published an extensive review of yoked prisms, which reconciles many of the apparent differences to historical approaches to prescribing prisms [6].

In 1996, Harris published his paper, "The Behavioral Use of Prisms"[7], which was part of a volume entitled, "Vision Therapy – Tools of Behavioral Vision Care: Prisms", published by the Optometric Extension Program.

A key scientific study of the effects of yoked prism on posture, including postural changes and perceptual shifts induced by yoked prism, was published by Sheedy and Parsons in 1987 [8].

In 1998, Padula[9] published his first theoretical construct for using yoked prisms in a population of patients with mTBI, and in particular for helping to alleviate the postural difficulties which follow as a result of visual field disturbances, in particular right or left hemianopsias.

Subsequently many papers have been published but of note is Harris' chapter, "The Use of Lenses to Improve the Quality of Life Following Brain Injury", which was published in the book, "Visual Rehabilitation – Multidisciplinary Care of the Patient Following Brain Injury"[10] in 2011. And secondly, the landmark work by Padula et al, entitled, "Neuro-Visual Processing Rehabilitation: An Interdisciplinary Approach"[11] also discussed in greater depth the use of yoked prisms for a multitude of conditions.

Vassilis Kokotas authored a masterful Ph.D. thesis (Aston University in the U.K.) on The Effects of Yoked Prisms on Body Posture and Egocentric Perception in a Normal Population. Using posturography and other scientific principles, his research demonstrated changes in body posture, mainly in the upper body and head, that are partially reflected in spatial perception tests and egocentric localisation directly attributable to the effects of yoked prism [12]

Lazarus (1996)[13] examined the effectiveness of yoked base-up prisms together with base-in prisms in alleviating asthenopia associated with computer use. The study employed a double-blind design in which spectacles which combined prism power with plus lens power were compared with those with plus lens power alone. Overall, there was a statistically significant preference for the spectacles containing the prisms

The rationale for use of yoked prism in vision therapy was provided by Fox [14]. Begotka elaborated on the influence of yoked prism on spatial orientation [15].

Since 2002 there has been interest in the possibility that changes in visual input achieved through the use of yoked prisms can produce beneficial postural changes in adolescent patients with idiopathic scoliosis (Wong et al., 2002[16]). While more work can be done, the results show that yoked prisms could cause positive postural changes of significance.

More recently, Howell has compiled a succinct review of the principles and applications of yoked prisms in the textbook Pediatric Vision Care: Current Practice and Future Challenges[17].

A number of researchers have published papers on the effect of vertical and horizontal yoked prisms on normal posture. Huang and Ciuffreda found significant changes in egocentric localisation (sense of visual straight-ahead) and related body posture[18]. Michel et al found that horizontal yoked prisms caused significant changes in posture as a response to horizontal yoked prisms[19].

Horizontal yoked prism can be applied in responsive cases of left visual neglect caused by right posterior parietal lesions, and Redding and Wallace reviewed the concepts and practice in 2006 [20]. Jacquin-Courtois described a case of a unilateral neglect patient who, with horizontal yoked prisms, showed better ability to drive a wheelchair[21].

There are multiple published case studies of the application of yoked prisms in adults, and to date fewer publications of similar use of yoked prisms for children. However, yoked prisms have possible applications in comprehensive management of children with visual and postural problems associated with "…. attentional disorders, dyspraxia and fragile X syndrome" [22]. Howell in his summary of yoked prisms applications discusses a case of Williams syndrome where yoked prisms were considered by all the health care professionals involved to improve posture and visual-spatial-motor abilities.

Yoked prisms applied horizontally have also been suggested in cases of visual hemi-neglect, as well as to improve mobility in cases of Visual Midline Shift Syndrome, where

the egocentric sense of visual straight - ahead shifts to one side, such that there is a mismatch of the visual sense of straight ahead with the facial and body midlines. Visual Midline Shift Syndrome not uncommonly occurs in people who suddenly lose vision of one eye, or experience a hemiplegia and/or hemianopic visual field loss as a result of a stroke or traumatic brain injury. This frequently results in the person having problems with balance, leaning/turning posture to one side, and even veering into the wall when trying to walk down a corridor[23] [24]

Yoked prisms and gait analysis have also been reported to have the potential to reduce the risk of falls and injuries [25] by restoring visual midline and improving balance, in some cases of traumatic brain injury, stroke and neurological disease.

Bansal, Han and Ciuffreda reported yoked prism prescription improved posture, balance and gait in two-thirds of 60 patients with acquired brain injury[26].

In summary, the clinical applications of yoked prism are rapidly evolving in areas as diverse as acquired brain injury, visual midline shift, postural dysfunctions, and treatment of adverse esophoria. While the theoretical basis of effects of yoked prisms on visual spatial judgement is reasonably well understood, both the theory and practice of application of yoked prisms would benefit from further well-designed research.

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