

Vertical Heterophoria Treatment Ameliorates Headache, Dizziness and Anxiety

Vision Specialists
Institute



Debby Feinberg, OD¹

Mark Rosner, MD^{1,2}

Arthur Rosner, MD³

¹Vision Specialists Institute, Bloomfield Hills MI

²St. Joseph Mercy Hospital, Ann Arbor, MI

³The Oakland University William Beaumont School of Medicine, Rochester, MI

INTRODUCTION

Headache, dizziness and anxiety are common medical problems with significant impact on individual patients as well as society as a whole.

- Active general headache disorders impact 46% of the population
- Dizziness impacts over 20%
- Anxiety disorders impact between 7-16%

The cost of care for these three problems in the US alone exceeds 70 billion dollars annually⁹.

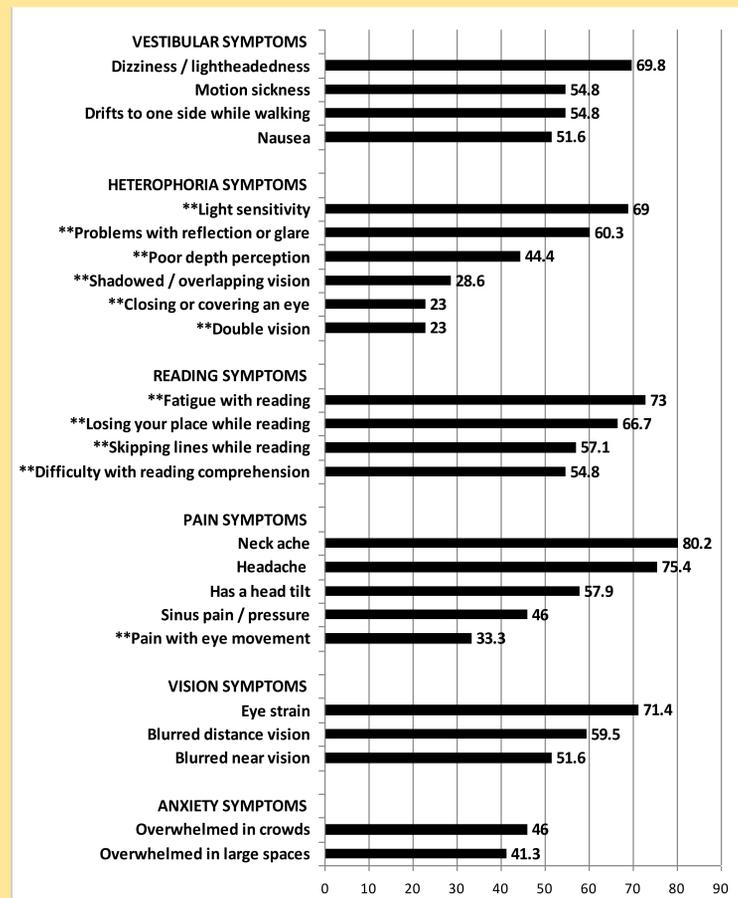
The diagnosis and treatment of headache, dizziness and anxiety is usually approached individually since no single entity is routinely ascribed to be causative of all three symptoms. However, many patients are refractory to or fail standard treatment and/or therapeutic modalities that target symptoms individually.

Vertical heterophoria (VH), a form of binocular vision dysfunction (BVD), can trigger all three symptoms. However, this is not known by the majority of practitioners in the medical and vision communities, and VH is rarely considered as a possible etiology for many reasons including:

- The VH/BVD symptom set is expansive and diverse, and the individual symptoms are common to many medical conditions^{11,14-20}(Figure 1)
- Traditional BVD symptoms like diplopia and blurred/overlapping images are not present in the majority of these patients^{15,21}
- Lack of sensitivity of the current diagnostic tests (associated and dissociated phoria tests) in identifying VH^{11,13,22-26}
- Lack of a screening questionnaire that incorporates all of the symptom domains that are associated with VH/BVD

Our investigation into VH/BVD began in 1995 and to date over 8000 patients have been evaluated and treated with our techniques, and anecdotally patients have experienced marked reduction in their headache, dizziness and anxiety symptoms. The purpose of this study is to document the efficacy of neutralizing prismatic lenses for reduction of headache, dizziness and anxiety in patients diagnosed with vertical heterophoria (VH) using our techniques.

Figure 1. Prevalence of BVD Symptoms (% of patients) in 126 Patients (**indicates traditional BVD symptoms)



METHODS

This retrospective analysis followed 126 patients who were assessed by an optometric binocular vision subspecialist for symptoms consistent with VH, who went on to be diagnosed with VH, who completed both phases of treatment, and who had complete data sets. VH was diagnosed utilizing Prism Challenge, a new technique that consists of the incremental addition of small units of neutralizing vertical prism (0.25D) to a trial frame containing the patient's refractive prescription, with the goal of reducing the patient's BVD symptoms. Prism Challenge is considered positive and the patient is diagnosed with VH when the vertical prism prescription results in a ≥33% reduction of the sum of seven common BVD symptoms (as measured individually on a subjective rating (0-10) scale) both before and after prism application:

Headache Dizziness Anxiety Walking instability Neck ache Nausea Light sensitivity

The examination phase consisted of a complete ocular and refractive exam coupled with a detailed binocular vision examination, which included vertical vergence testing, Von Graefe phoria testing near and far, Titmus tester, utilization of the Bernell light box (all are dissociated phoria tests) and Prism Challenge. Also, the presence and direction of a head tilt was noted.

The treatment phase entailed the patient wearing the initial refraction and prism prescription (as determined by Prism Challenge) for 2-4 weeks, allowing their visual system to progressively relax. As this occurred, patients most often required one or two adjustments (usually minor) to their prescription.

Data was collected before and after prism application and included validated survey instruments for headache (Headache Disability Index (HDI)), dizziness (Dizziness Handicap Inventory (DHI)), anxiety (Zung Self-Rating Anxiety Scale (Zung SAS)) and BVD (Binocular Vision Dysfunction Questionnaire (BVDQ)); and subjective rating (0-10 scale) of headache, dizziness and anxiety severity. Upon conclusion of treatment subjective overall improvement of heterophoria symptoms was measured utilizing a 10 cm visual analogue scale.

RESULTS

- Using the Prism Challenge technique, prism application to neutralize VH markedly reduced all measures of headache, dizziness and anxiety (22.3%-60.8%) and an overall 78.0% subjective reduction of VH symptoms (Figure 3)
- Ophthalmology evaluation occurred in 42.9%, optometry evaluation occurred in 30.2%, and both occurred in 56.3% of patients, yet no patients were diagnosed with or treated for VH (Figure 4)
- The three most common presenting complaints in this group of VH patients was headache (32.5%), dizziness (32.5%) and neck pain (11%). Blurred/doubled vision was the presenting complaint in 1.6%
- Vertical alignment tests predicted the direction of the misalignment between 25.0%-53.7% of the time, while the observed direction of the head tilt predicted the direction of the misalignment 74.6% of the time (Figure 5)
- Mean / median cumulative vertical prism prescription was 1.66 and 1.5 diopters respectively
- Vertical prism prescription between 0.5 and 2.00 diopters was noted for 76.2% of the patients, between 2.50 and 4.00 diopters for 21.4%, and greater than 4.00 diopters for 2.4% (three patients)

Figure 2. Baseline demographics

Female = 73% (92 patients)	Corrective eyewear (glasses and/or contact lenses) were worn by 93 (73.8%).
Average age = 40.1 years old (range 6 to 80 years)	Eye surgeries were reported by 19 patients (15.1%).
Average duration of symptoms = 7.6 years (range 1 month to 58 years).	Brain CT scans were performed for 61 (48.4%), brain MRI was performed for 60 (47.6%) and both tests were performed for 42 (33.3%).

Figure 3. Overall Symptom Reduction, and % Reduction of Headache, Dizziness and Anxiety Metrics With Neutralizing Prism Lenses

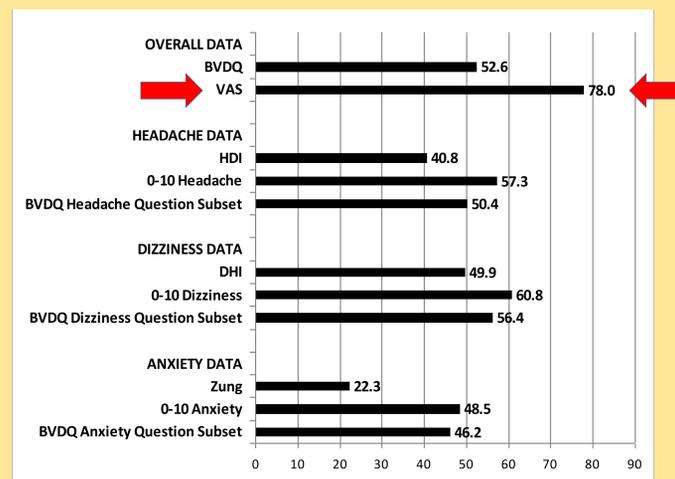


Figure 4. Specialists Seen Prior To VH Diagnosis (% of patients)

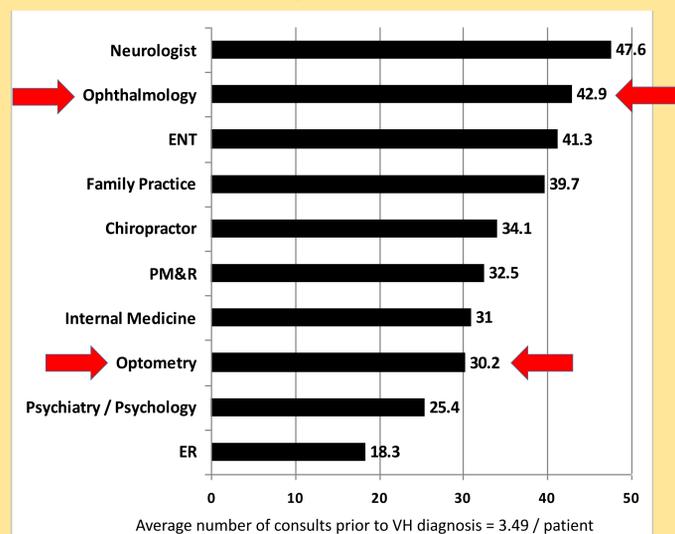
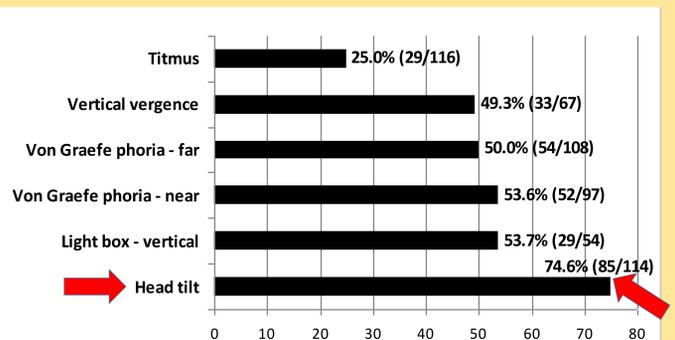


Figure 5. Vertical Alignment Testing Accuracy (# correct tests / # of patients tested)



DISCUSSION

Identification of VH (a form of BVD) in this patient cohort and treatment of the misalignment with neutralizing prismatic lenses led to a marked reduction in all metrics for symptoms of headache, dizziness and anxiety, as well as for subjective metrics for overall symptom reduction (Figure 3). Approximately 30-50% reduction of symptoms occurred within 30 minutes of the initial application of neutralizing prism.

This study demonstrates the ability of the Prism Challenge technique to diagnose and initiate treatment of VH/BVD in patients with headache, dizziness, and anxiety, and the combination of the Prism Challenge technique and the BVDQ to assess treatment efficacy. Utilizing this approach, over 8000 patients (many of whom had had prior visual evaluation) have been diagnosed with BVD, treated, and observed over the last 21 years. This has clarified the set of BVD symptoms, many of which are not usually associated with BVD (Figure 1). This approach holds great promise not just for identifying and treating patients but also for further studying BVD and BVD-associated symptoms.

Symptoms traditionally associated with BVD - diplopia, shadowed / overlapping vision and closing / covering an eye to ease visual tasks - were individually experienced by only approximately 25% of this cohort (Figure 1). Limiting the inquiry of BVD to just traditional symptoms like this is likely to result in most patients with BVD not being identified.

Current questionnaires used to assess binocular vision symptoms do not query all symptoms domains, potentially causing an under-identification of VH/BVD patients. One common validated vision survey instrument that addresses some VH/BVD symptoms (but only with near tasks) is the Convergence Insufficiency Symptom Survey (CISS).^{27,28} Symptoms queried include challenges with reading, headache, asthenopia, difficulty concentrating and visual fatigue. However, the CISS does not address symptoms with far tasks, nor does it query the other symptoms of BVD including dizziness, lightheadedness, nausea, motion sickness, neck pain, head tilt, anxiety, depth perception, and closing/covering an eye to make visual tasks easier. Without a comprehensive survey instrument, many patients with VH/BVD symptoms might not be identified or treated. This prompted the development of the Binocular Vision Dysfunction Questionnaire (BVDQ). This validated instrument²⁹ does query all relevant symptom domains and includes all of the questions listed above that are not included in the CISS. The BVDQ has been an excellent screening tool, as well as an instrument to assess changes in symptom burden with interventions.

Consistent with previous reports, we found that the multiple dissociated phoria tests used in this study lacked adequate sensitivity to reliably identify the presence and direction of vertical misalignment in this patient cohort.^{11,13,19,22-26} For this reason our diagnostic and treatment approach does not rely upon these 'objective' measurements, but uses instead the patient's subjective reduction of symptoms in response to incremental changes in prism (i.e. - Prism Challenge), which has been a much more reliable method of identifying the prism needed to neutralize the vertical heterophoria and reduce the associated symptoms. It should be noted that the presence of and direction of a head tilt observed during physical examination was the most reliable indicator of the presence and direction of vertical misalignment (Figure 5).

The ability to treat medical symptoms that can cause significant morbidity, disability and expense (like headache, dizziness and anxiety) with an optometric treatment (i.e. - prismatic lenses) has significant ramifications for medical economics. Almost 90% of the patients in this study had a past history of evaluation and treatment for headache, dizziness or anxiety, and yet were still symptomatic at the time of presentation to this study. This new approach has the potential to significantly reduce medical expenses, as headache, dizziness and anxiety are quite common and expensive to treat, and the cost of episodic optometric evaluation and treatment with neutralizing prismatic lens is much less than continued care with treatment modalities (including medications) that are in many instances inadequately relieving the patient's symptoms.

There are also significant implications for the field of optometry. This new diagnostic and treatment approach has the potential to significantly increase the size of the pool of patients that would benefit from an optometric intervention, one that would provide significant symptom relief for a very uncomfortable patient cohort that has been unable to obtain adequate symptom relief from any other treatment modality. To be able to service this large influx of patients, the number of practicing optometrists would need to be increased. Optometrists providing this care would be functioning as medical subspecialists, as they would be providing care for patients referred to them by primary care physicians or specialty physicians for treatment of medical symptomatology (like headache, dizziness and anxiety) that was not amenable to standard medical treatment modalities. Lastly, as the treatment is lens-based, this represents a return to the foundation of optometry - caring for patients and reducing their symptoms using lenses.

CONCLUSIONS

- The set of symptoms associated with VH and BVD is much broader than is traditionally understood
- The most common presenting symptoms of VH are headache, dizziness and neck pain. Blurred / doubled vision is rarely the reason why the patient sought care
- Current phoria tests lack adequate sensitivity to reliably identify the presence and direction of vertical misalignment
- Utilization of a new approach to identify the presence, the direction and the amount of vertical misalignment (Prism Challenge technique) allowed for the identification of VH patients that were previously missed when using standard assessment techniques
- Use of the resultant vertical prism prescription led to a rapid and marked reduction of headache, dizziness, and anxiety symptoms in these VH patients
- The minimal risks and cost effectiveness of this therapeutic approach should make screening and treating VH a consideration for patients with headache, dizziness, and anxiety, particularly for those patients who have experienced less than desirable outcomes with standard treatment modalities
- The effectiveness of this treatment approach highlights the need for further prospective and multi-center studies

REFERENCES

1. Steiner L, Hagen K, Jensen R, Katsarava Z, Lipton R, Scher A, Steiner T, Zwart JA. The Global Burden of Headache: A Documentation of Headache Prevalence and Disability Worldwide. Cephalgia 2007;27:189-210.
2. Hawkins K, Wang S, Rupnow M. Direct Cost Burden among Insured Us Employees with Migraine. Headache: The Journal of Head and Face Pain 2008;48:553-63.
3. Stewart WF, Ricci JA, Chee E, Morganstein D, Lipton R. Lost Productive Time and Cost Due to Common Pain Conditions in the Us Workforce. JAMA 2003;290:2443-54.
4. Bisdorf A, Rosner G, Gurevitz R, Ferrer R. The Epidemiology of Vertigo, Dizziness, and Unsteadiness and Its Links to Co-Morbidities. Front Neurol 2013;3:4-9.
5. Bitar RS, Orlino J, Bottino MA, Ganancia F, Dimitrov R. Population Epidemiological Study on the Prevalence of Dizziness in the City of Sao Paulo. Braz J Otorhinolaryngol 2013;79:688-98.
6. Saber Tehrani AS, Coughlin D, Heish YH, Mantoukoudis G, Korley FK, Kerber KA, Frick KD, Newman/Oliver DE. Rising Annual Costs of Dizziness Presentations to Us Emergency Departments. Acad Emerg Med 2013;20:689-96.
7. Baxter AJ, Scott KM, Vos T, Whiteford HA. Global Prevalence of Anxiety Disorders: A Systematic Review and Meta-Regression. Psychol Med 2013;43:987-910.
8. Kessler RC, Aguilar-Gaxiola S, Alonso J, Chatterji S, Lee S, Ormel J, Ustun TB, Wang PS. The Global Burden of Mental Disorders: An Update from the World Mental Health (Wmh) Surveys. Epidemiol Psychiatr Soc 2009;19:23-33.
9. Kessler RC, Greenberg PE. The Economic Burden of Anxiety and Stress Disorders. Neuropsychopharmacology: The Fifth generation of progress 2002;27:982-92.
10. Borish JM. Vestibular and Vergence. In: Clinical Refraction, 3rd ed. Chicago, IL: The Professional Press, Inc.; 1975:129-256.
11. Duke-Elder S, Wybar K. Anomalies of Binocular Fixation. In: System of Ophthalmology, St. Louis, MO: The C. V. Mosby Company, 1973: 513-76.
12. Jackson DM, Bedell HE. Vertical Heterophoria and Susceptibility to Visually Induced Motion Sickness. Strabismus 2012;20:17-23.
13. Sardacki M, Wick B. Diagnostic Occlusion and Clinical Management of Latent Hyperphoria. Optom Vis Sci 1995;72:201-9.
14. Bissman WW. Vertical Prism: Why Avoid Them? Surv Ophthalmol 1984;29:70-8.
15. Doble JE, Feinberg DL, Rosner MS, Rosner AJ. Identification of Binocular Vision Dysfunction (Vertical Heterophoria) in Traumatic Brain Injury Patients and Effects of Individualized Prismatic Spectacle Lenses in the Treatment of Postconcussive Symptoms: A Retrospective Analysis. Physical Medicine and Rehabilitation 2010;2:244-53.
16. Roy RR. Symptomatology of Binocular Stress. Optom Wkly 1958;49:907-12.
17. Schrier M. Practice Notes on Hyperphoria. British Journal of Ophthalmology & Dispensing 1997;5:68-9.
18. Stevens GT. Functional Nervous Diseases. New York, NY: D. Appleton and Company, 1887.
19. Borish JM. Analysis and Prescription. In: Clinical Refraction, 3rd ed. Chicago, IL: The Professional Press, Inc.; 1975: 307-44.
20. Borish JM. History and Eye Strain. In: Clinical Refraction, 3rd ed. Chicago, IL: The Professional Press, Inc.; 1975: 307-44.
21. Rosner MS, Feinberg DL, Doble JE, Rosner AJ. Treatment of Vertical Heterophoria Ameliorates Persistent Post-Concussive Symptoms: A Retrospective Analysis Utilizing a Multi-Faceted Assessment Battery. Brain Inj 2016;Early Online:1-7.
22. Karanian R, Evans BJ. The Mallet Fixation Disparity Test: Influence of Test Instructions and Relationship with Symptoms. Ophthalmic Physiol Opt 2006;26:507-22.
23. Gull R, Wick B. The Symptomatic Patient with Normal Phorias at Distance and Near: What Tests Detect a Binocular Vision Problem? Ophthalmic Opt (St. Louis, Mo) 2003;74:309-22.
24. Gray LS. The Prescribing of Prisms in Clinical Practice. Graefes Arch Clin Exp Ophthalmol 2008;246:627-9.
25. Schroeder TL, Rainey BB, Goss DA, Groveson TP. Reliability of and Comparisons among Methods of Measuring Dissociated Phoria. Optometry & Vision Science 1996;73:389-97.
26. Wick B. Prescribing Vertical Prism - How Low Can You Go? Journal of Optometric Vision Development 1992;28:77-85.
27. Borsting EJ, Rouss MW, Mitchell GL, Scheiman M, Cotter SA, Cooper J, Kulp MT, London R. Validity and Reliability of the Revised Convergence Insufficiency Symptom Survey in Children Aged 9 to 18 Years. Optom Vis Sci 2005;82:832-8.
28. Rouss MW, Borsting EJ, Mitchell GL, Scheiman M, Cotter SA, Cooper J, Kulp MT, London R, Wenzel J. Validity and Reliability of the Revised Convergence Insufficiency Symptom Survey in Adults. Ophthalmic Physiol Opt 2004;24:384-90.
29. Schow T, Teasdale TW, Rasmussen MA. Validation of the Vertical Heterophoria Symptom Questionnaire (VHS-Q) in Patients with Balance Problems and Binocular Visual Dysfunction after Acquired Brain Injury. Sci Psychol 2016;31(1):1-7.